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Community of Creemore, Clearview Township Municipal Class Environmental Assessment (Schedule B) Project File Report for Works Undertaken Within a Watercourse for the Purpose of Flood Control

Prepared By:

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Prepared for:

Township of Clearview

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File No: MCG107700

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Executive Summary

R.J. Burnside & Associates Limited (Burnside) was retained by Clearview Township to undertake a Schedule B Municipal Class Environmental Assessment to identify and evaluate alterative solutions to improve drainage and reduce flooding in the eastern portion of the community of Creemore. The study area is defined as a 456 ha drainage area that comprises the eastern portion of Creemore and a significant upstream external area. The scope of the study included the following:

- Identify existing drainage area, patterns and conditions, localized areas of concern and alternatives to improve drainage.
- Establish alternatives for improving the drainage outlet(s) for the area.
- Consider the design criteria (i.e. urban vs. semi urban) for future drainage work.
- Provide a long term strategy to address existing and future drainage infrastructure for East Creemore.

Public, private and agency stakeholder consultation was key in identifying the issues, constraints, opportunities and potential alternatives for drainage improvements in East Creemore.

The alternatives (Do Nothing, Manage Growth, Local Drainage System Maintenance, Expansion and Rehabilitation of Existing Drainage System) were evaluated using the following criteria: natural environment, social/cultural environment, financial factors and technical factors. The preferred solution was found to be 'Expand and Rehabilitate the Existing Drainage Network.

Several alternative means of achieving this solution were considered with a final solution involving three major conveyance patterns as summarized below.

1) Eastern Conveyance: Upstream Ten Hill drainage will drain to a dedicated drainage block between County Road 9 and Edward Street along the east perimeter of the proposed Alliance Homes property, east along the north side of Edward Street, south easterly across the Jardine property to the existing Airport Road culvert crossing 600m south of Edward Street.

2) Southern Conveyance: Gordon Farm/Alliance Homes north external drainage and Alliance Homes will drain south along a proposed Concession 3 storm outlet to the Mad River. Developed areas east of the proposed Mary Street drainage improvements will be collect via an improved ditch system and storm sewer into the trunk storm outlet on Concession 3. Areas south of the existing and future development envelope will continue to drain via surface conveyance.

3) Mary Street Drainage: Mary Street will be improved to an urban road cross section with a new storm sewer outlet to the Mad River. Improvements in local

drainage will benefit existing residences allowing surface drainage to outlet and mitigate the recycling of water through residential sump pumps.

4) The residual area south of the Eastern Conveyance and east of the Southern Conveyance will overland drain to the Airport Road and Sideroad 6/7 intersection where it will be directed into an existing culvert under Airport Road.

Any potential disturbance to the existing environments will be minimal, given readily implemented mitigation measures.

A Notice of Study Commencement was sent to relevant review agencies and adjacent land owners and published for the general public in the Creemore Echo on September 8 and 15, 2006. Formal comments were provided by the public and agencies. This report is responsive to comments received.

The Notice of Completion for this Municipal Class EA will be prepared and published as described above. The Notice will also be mailed to all agencies and stakeholders that had expressed an interest in the project. If concerns arise regarding this project which cannot be resolved in discussion with Clearview Township, a person or party may request that the Minister of Environment make an Order for the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order). Requests must be received by the Minister within 30 calendar days of the Notice.

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1.0 Introduction and Background

1.1 Introduction

R.J. Burnside & Associates (Burnside) was retained by the Township of Clearview to undertake a Schedule B Class Environmental Assessment (EA) for the eastern section of the community of Creemore (Creemore). The location plan (**Figure 1.1**) illustrates the general geographic location and the study area. The study area (**Figure 1.2**) is defined as the 456 ha drainage area that comprises the eastern portion of Creemore and a significant upstream external area.

The focus of the EA is to recognize the existing drainage conditions and constraints that are facing the existing community and to consider required drainage related infrastructure to service future development of the vacant lands in the eastern portion of the study area. The EA identifies alternatives that are capable of addressing these constraints, evaluates the suitability of each alternative, and provides a cost effective and orderly plan for the improvement of current drainage conditions and servicing of future development in the study area.

The Township's initiative to undertake an EA was brought about by several issues including flooding at several locations including existing residential areas north of County Road 9, Edward Street, George Street, farmland east of Mary Street, farmland adjacent to Airport Road south, and flooding in the community of Avening. As there is the need to address servicing requirements for the remaining vacant land in the eastern part of the Creemore, this EA will serve as a base reference document for the municipality to undertake drainage improvements in the eastern part of Creemore.

This study will serve to be the first drainage study prepared in support of drainage improvements to existing developed areas and future drainage infrastructure to support additional development. Please refer to the Master Drainage Plan (MDP) in **Appendix A** for detailed drainage methodology and calculations.

1.2 Problem/Opportunity Statement

The problem/opportunity statement was prepared in consultation with the Township of Clearview as follows:

"Annual flooding and stormwater management issues in the community of Creemore have created the need for the municipality to review its strategies to mitigate effects of storm water runoff. As a result, the Township needs to consider options to resolve the drainage issues in the vicinity of County Road 9, Edward Street and George Street as well as for the future servicing of the undeveloped lands on the east side of the study area, and residual runoff to the nearby community of Avening. With due consideration to the constraints and opportunities associated with the existing servicing infrastructure, the intent is to identify an orderly and efficient drainage strategy for the lands in the eastern portion of Creemore, while accounting for the technical, environmental, economic, political and social implications."

1.3 Localized Areas of Drainage Concern

The geographic scope of this study includes the following areas of concern. These general areas are identified on **Figure 1.3**. Numerous site visits have been conducted before and after the commencement of this study in April 2006. Among these visits, photos were taken in April 2004, January 12, 2007, March 1, 2007, March 14, 2007, and May 2, 2007. Photos taken April 2004 are included in **Appendix B** to illustrate these concerns:

1.3.1 Ten Hill (Bluffs Area) and Un-developed Eastern Lands

The headwater portion of the study area is located in the Ten Hill (Bluffs) area, northwest of Creemore limits. The steep gradient of the bluffs slopes south easterly to the gently graded topography in the eastern portion of Creemore, and to Airport Road at the farthest easterly limit of the study area.

The majority of un-developed eastern catchment area (from Country Road 9 to Airport Road) experiences significant flooding during large rainfall and snowmelt events due to insufficient drainage infrastructure and is now beginning to experience pressures of development moving easterly from Mary Street. There is an opportunity to refine existing drainage infrastructure and develop a plan to mitigate the effects of flooding up to and including a full built-out condition.

1.3.2 Jardine Cresent

Jardine Cresent is a small residential urban area located at the northern Creemore limits, east of Fairgrounds Road off of County Road 9 (also located within the drainage boundaries of the Ten Hills (Bluffs) Area). This residential area is fully developed characterized by single family dwellings with large estate lots. Homeowners have experienced flooding during large rainfall and snowmelt events as the headwater catchment runoff overtops existing ditches located on the east side of the right of way of Fairgrounds Road. Backwater from the County Road 9 culvert and a poorly defined channel downstream have also lead to flooding on the north side of County Road 9. Corrective measures and alternatives will be considered to contain spills from Fairgrounds Road and improvements downstream of County Road 9 to improve capacity.

1.3.3 George Street

The George Street drainage area examined in this report (east of Mary Street) is characterized by mainly undeveloped lands to the south, while lands located north include a newer residential development to the west and single family dwellings with large estate lots to the east. Drainage in this area is mainly provided by infiltration as lot grading does not provide a sufficient outlet to take water away from the lots. Seasonal high groundwater limits infiltration and localized ponding (nuisance flooding) results. Recycling of ground water to surface water to ground water appears to have sump pumps running too frequently.

1.3.4 Mary Street

The Mary Street drainage area is characterized by a series of ditches and driveway and road culverts, catchbasins and storm sewers. The majority of the drainage area associated with Mary Street is conveyed southerly through these features and then to open ditches and ultimately discharges into the Mad River. Through field investigations and by examining previous works completed, a comprehensive understanding of the existing drainage boundaries and infrastructure of Mary Street will allow development of plans for a future urbanized road section with a new storm sewer outlet to the Mad River to aid in providing better drainage for local residences and future servicing of infill areas.

1.3.5 Airport Road Outlet

Overland flow through the eastern lands of Creemore, north of a line extended from George Street to Airport Road, is conveyed to an existing 1500mm diameter culvert crossing on Airport Road, south of Edward Street. A residential property situated upstream of the culvert crossing experiences flooding due to a lack of conveyance under Airport Road. Based on existing topography, a small amount of runoff is directed through this culvert crossing while a larger portion of runoff spills further south along the westerly ditch line of Airport Road to the community of Avening. The community of Avening experienced significant flooding during the spring months of 2008. Corrective measures and alternatives will be considered to maximize overland flow through the Airport Road culvert crossing to reduce spills towards Avening.

1.3.6 Residences along Edward Street to Concession 3

A lack of a well defined outlet to the east and a seasonal high groundwater table creates similar problems as experienced along George Street. Edward Street residences likely experience sump pump overuse through recycling of groundwater and surface water during the spring freshet.

1.4 Municipal Class EA Planning Process

The planning of major municipal infrastructure projects or activities is subject to the Environmental Assessment Act, R.S.O. 1990, and requires the proponent to complete an Environmental Assessment. The Municipal Class EA process was developed by the Municipal Engineers Association (MEA), in consultation with the MOE, as an alternative method to Individual Environmental Assessments for recurring municipal projects that were similar in nature, usually limited in scale and with a predictable range of environmental impacts, which were responsive to mitigating measures. The Municipal Class EA solicits input and approval from regulatory agencies, the municipality and the public at the local level. This process leads to an evaluation of the alternatives in view of the significance of environmental impacts and the choice of effective mitigation measures.

A flow chart, **Figure 1.4**, prepared by the MEA, shows the Class EA procedure. There are three categories of assessment within the Municipal Class EA procedure dependent

on the complexity and potential for environmental impact (Schedule A and A+ – negligible impacts, Schedule B – modest impacts, Schedule C – significant impacts).

The Municipal Class EA also provides an opportunity for any member of the public or agency to request the Minister of the Environment to order a Municipal Class EA project to become subject to an Individual Environmental Assessment. This is known as a Part II Order (or "bump-up") request and is made in certain circumstances where concerns are unresolved during the Municipal Class EA planning process.

Works undertaken in a watercourse for the purpose of flood control or erosion control (such as bank or slope regarding, deepening the watercourse, relocation, realignment or channelization of the watercourse) or modifications to existing water crossings for the purpose of flood control or the construction of berms along a watercourse for the purpose of flood control are all considered to be a Schedule B Activities (MEA October 2000, as amended 2007). The project has the potential for some adverse, yet mitigable, environmental impacts and requires the completion of only Phases 1 and 2 of the Municipal Class EA procedure (**Figure 1.4**). Public consultation is required at two stages under a Schedule B project. At the completion of Phase 2, if there are no outstanding concerns, then the Township may proceed to implementation.

1.5 The Assessment Project File Report

In accordance with the Municipal Class EA process for a Schedule B project, this Assessment Project File Report identifies the following:

- Alternative solutions to the proposed project;
- The existing technical, natural, social and economic environment;
- Potential impacts of the alternative solutions on the existing environment and appropriate mitigation measures;
- An evaluation of the alternatives;
- The consultation process undertaken throughout the project; and,
- Selection of the preferred alternative.

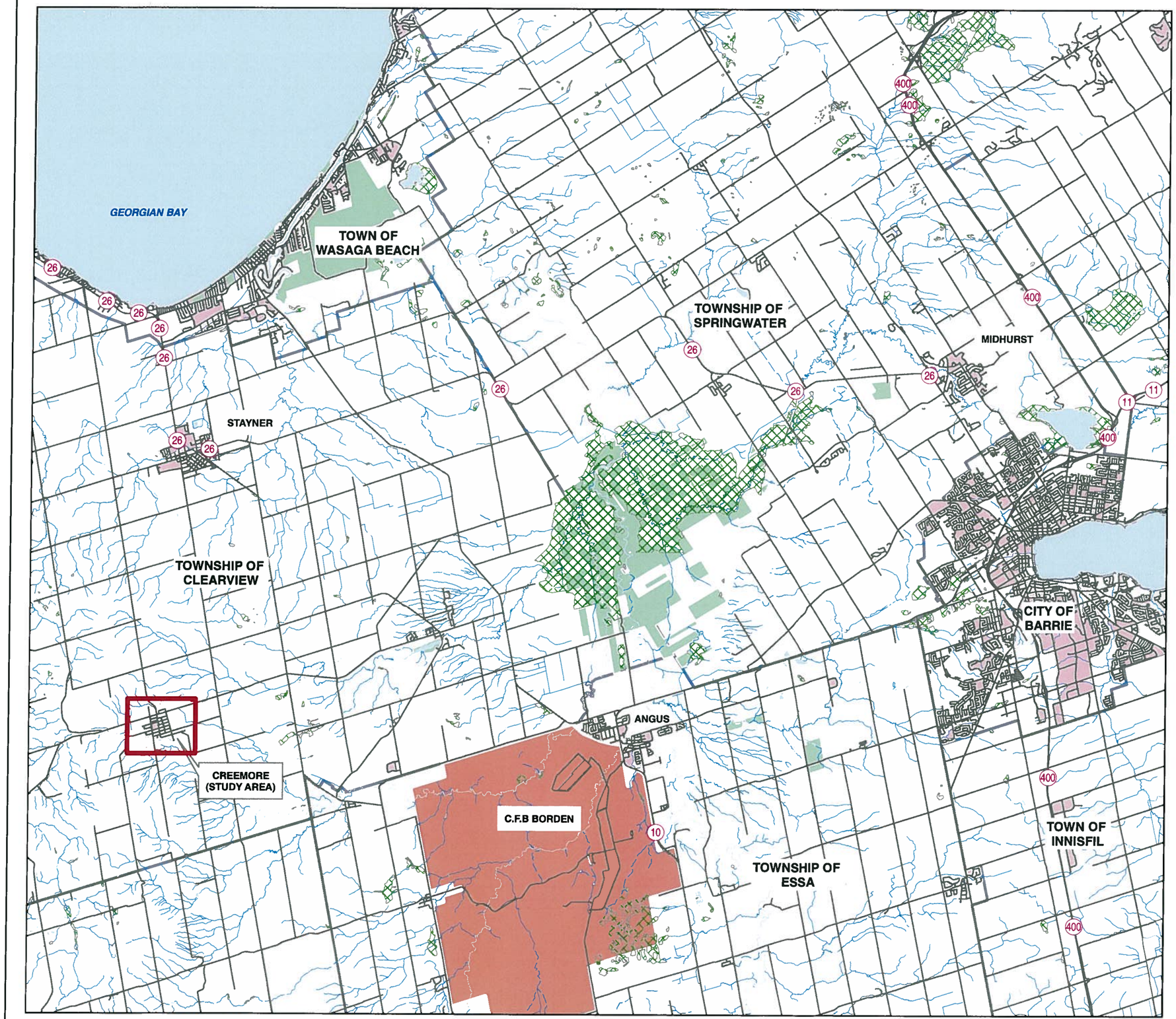


FIGURE 1.1

TOWNSHIP OF CLEARVIEW

CREEMORE MUNICIPAL CLASS EA PROJECT FILE REPORT

LOCATION PLAN

Legend

- Study Area
- Waterbody: Lake / Pond / River
- Seasonally Flooded Area
- Wetland / Swamp / Bog
- Provincial Park
- Built-Up Area: Urban / Sub-Urban
- National Defence Land

Credit: Base Data Supplied by the Ontario Ministry of The Environment

N

0 5 10

Kilometers

Scale: 1:150,000
Date: March, 2010

Projection: UTM Zone 17
Datum: NAD 83

Project: MCG10770
Prepared By: Anthony Jay

Verified By: Dan Miller

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F:\GIS\projects\MCG\10770\Map\Cartography\Figure1CreemoreDrainageStudy.mxd

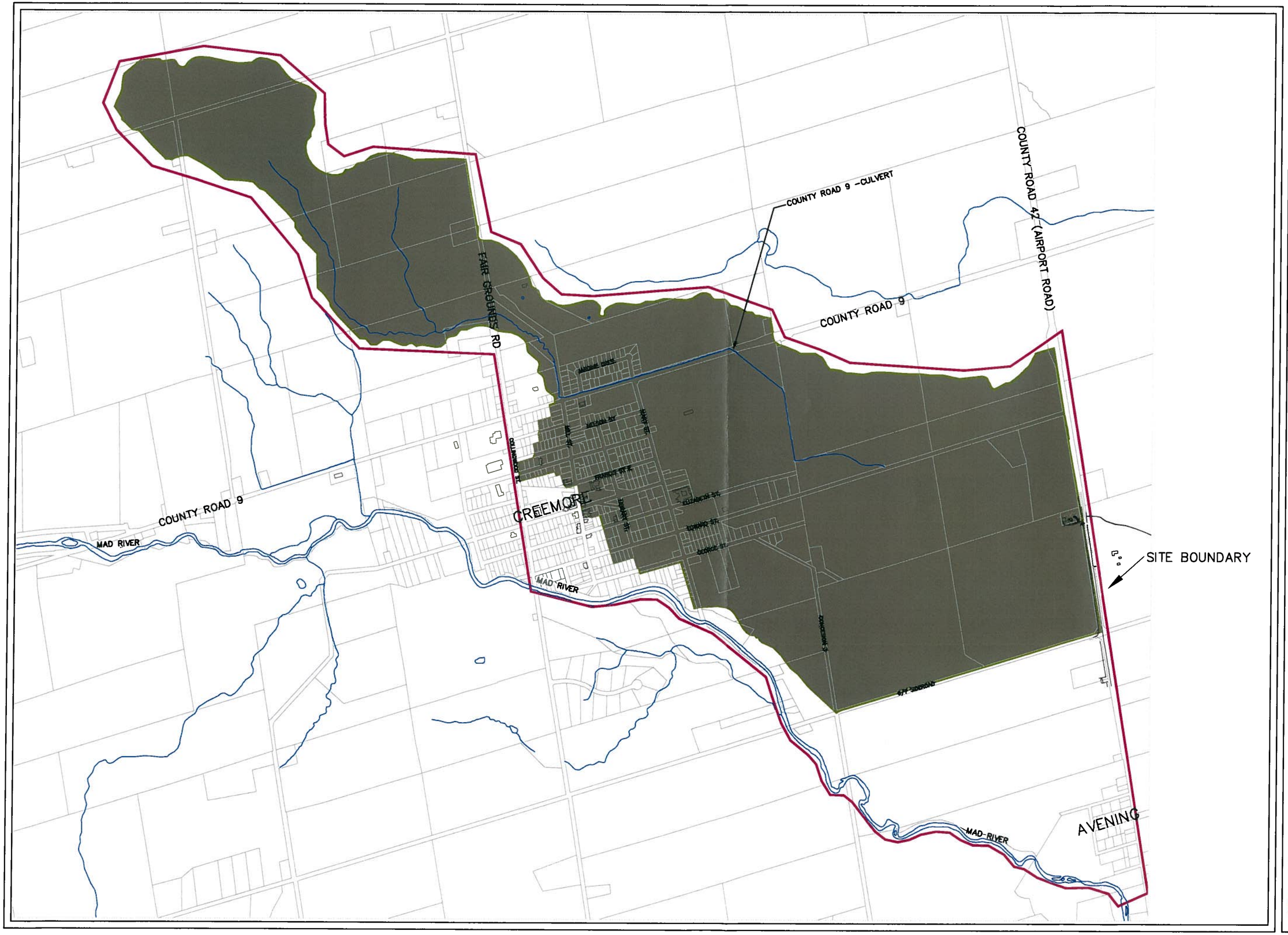


FIGURE 1.2

TOWNSHIP OF CLEARVIEW
MUNICIPAL CLASS EA
PROJECT FILE REPORT

CREEMORE ONTARIO
STUDY AREA

LEGEND

APPROXIMATE STUDY AREA OUTLINE

EAST CREEMORE DRAINAGE AREA (456 ha)

N

0 10 20 30 40 50 60 70 80
Metres

Scale N.T.S.
Month 2010
Project Number: MCG10770

Projection: UTM Zone ?
Datum: NAD??

Prepared by: K.B.

Verified by: D.R.M.

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MCG10770-FIGURE 4.1.dwg

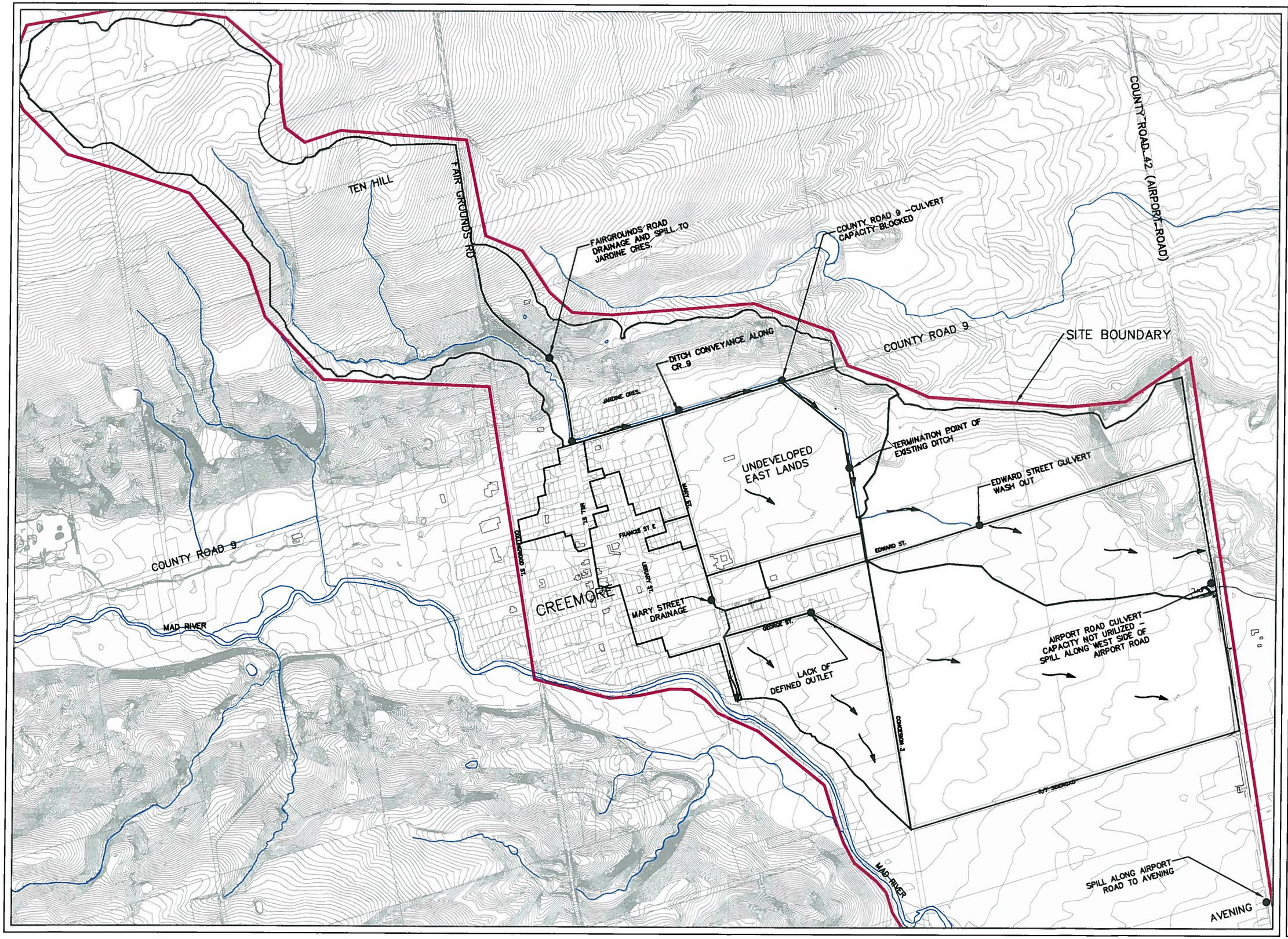


FIGURE 1.3

TOWNSHIP OF CLEARVIEW
MUNICIPAL CLASS EA
PROJECT FILE REPORT

CREEMORE ONTARIO
LOCALIZED AREAS OF CONCERN

LEGEND

- APPROXIMATE STUDY AREA OUTLINE
- AREA OF CONCERN
- FLOW DIRECTION

N

0 10 20 30 40 50 60 70 80
Metres

Scale N.T.S.
Month 2010
Project Number: MCG10770
Prepared by: K.B.

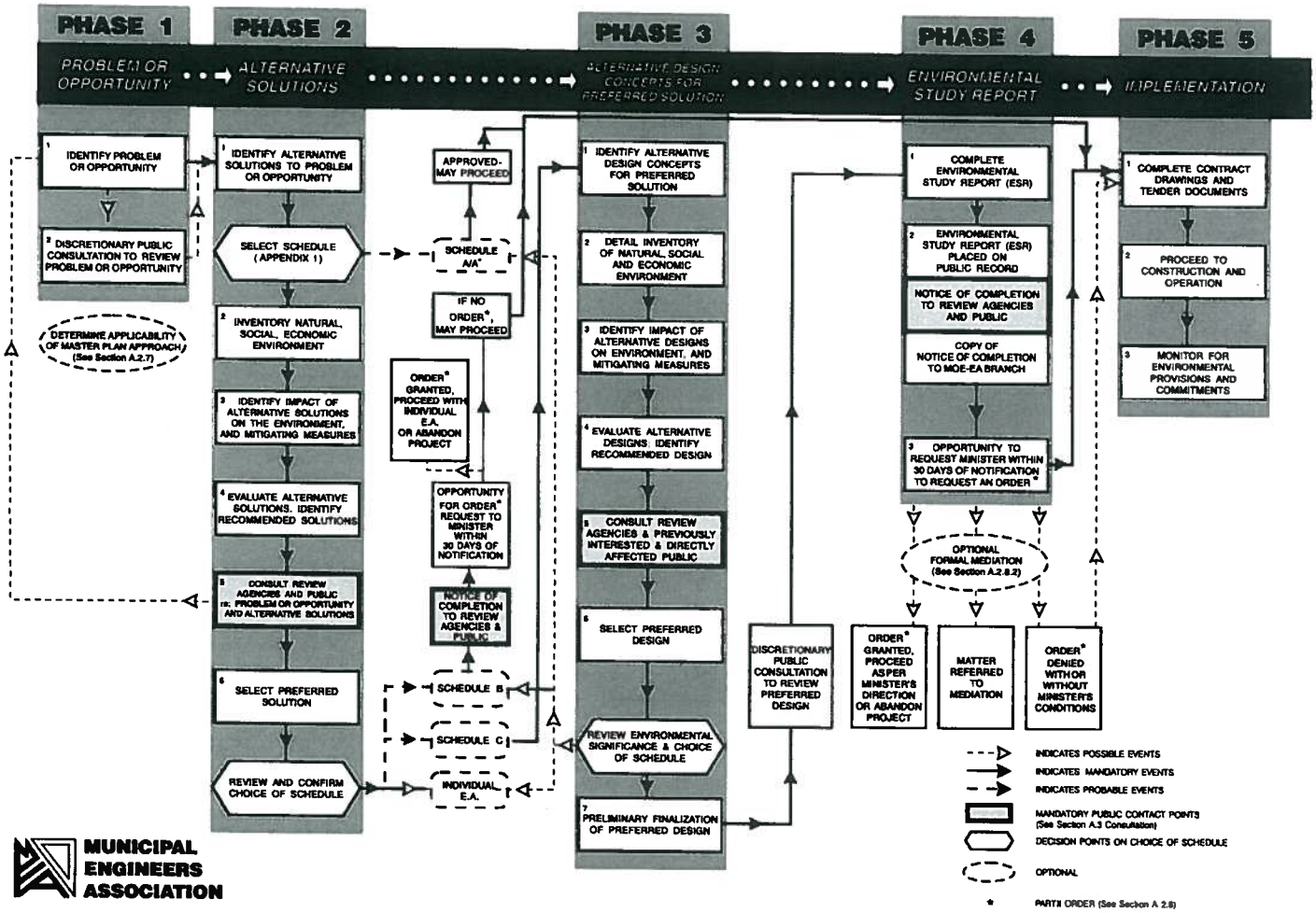
Projection: UTM Zone 7
Datum: NAD77
Verified by: D.R.M.

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MCG10770-FIGURE 4.1.dwg

Figure 1.4 Municipal Class EA Process
(Source: MEA, 2000, as amended 2007)

NOTE: This flow chart is to be read in conjunction with Part A of the Municipal Class EA



2.0 Alternative Solutions

In order to address the problem/opportunity statement, the following alternative solutions have been proposed. These alternatives have been evaluated in **Section 5.0**

2.1 Do Nothing

This is a mandatory alternative for consideration under the Municipal Class EA and serves as a reference point for comparing other alternative solutions. The "Do Nothing" alternative means to take no action in addressing the problem statement.

2.2 Manage Growth

This alternative would involve revising current planning policies with the aim of influencing future economic growth and development in the general vicinity of the study area.

2.3 Local Drainage System Maintenance

The purpose of this alternative is to maintain the existing surface and ditch drainage systems by removing system blockages that reduce conveyance capacity. The maintenance program could involve:

- Increasing the frequency of removal of debris and sediment from catch basins, ditches; and,
- Deepen the drainage system to improve the gradient of local ditches provide improved conveyance away from residences.

2.4 Expansion and Rehabilitation of Existing Drainage System

This alternative would involve an expansion and rehabilitation of the existing drainage network. Activities could involve:

- Drainage feature cleanouts;
- Culvert replacements;
- Realignment of existing stormwater ditches/channels; and,
- Construction of new stormwater ditches/channels and storm sewers.

3.0 Description of Existing Drainage System

The existing drainage system includes three main conveyances, identified as the "Eastern Conveyance," "Southern Conveyance," and "Mary Street Conveyance" (**Figure 3.1**). All three contain several smaller subcatchments.

The drainage system under investigations includes a variety of swales, ditches, overland sheet flow, storm sewers and watercourses. Flow is intermittent, and only occurs during significant snowmelt and storm events. The entire system is typically dry between May and September each year. Based on aerial photography and field visits, it does not appear that any portions of the system provide fish habitat; however, the system outlets to a tributary of the Mad River and the Eastern Conveyance just downstream of Airport Road exhibits signs of permanent flow. Flow, groundwater inputs and nutrients are provided to downstream fish habitats.

3.1 Eastern Conveyance

The Eastern Conveyance areas are the largest areas examined in this report, and pertain to areas north of County Road 9 and east of Concession 3.

Surface water is conveyed from the Ten Hills area south easterly through farmland and eventually discharges to Airport Road. This conveyance experiences flooding during large rainfall and snowmelt events upstream of Edward Street with localized flooding south of Edward Street due to minimal drainage infrastructure. Catchment boundaries in general follow natural defined contours located in the bluffs area to the north and through the easterly portion of the study area to Airport Road. The conveyance patterns have been seen to vary during spring runoff conditions depending on snowpack, blockages and consolidate snowmobile trails given the shallow drainage system.

The headwater portion of this drainage study is characterized by Catchment 4, a 122ha undeveloped area located in the Ten Hill (Bluffs area) north west of Creemore. This conveyance is steeply sloped (elevation drop of approximately 165m) from the top of the conveyance located just north of the 12/13 Nottawasaga Sideroad to County Road 9.

Runoff is conveyed southerly from the bluffs area following the steep gradient, south easterly through a natural channel corridor located on the west limit of Fairgrounds Road to County Road 9. Flow is directed under Fairgrounds Road and conveyed easterly through driveway culverts and ditching for a distance of 850m along the north side of the right of way of County Road 9 to a 1.65 x 3.3m open box culvert.

South of the box culvert, flow is conveyed through a 250m section of man-made channel/ditch that is heavily vegetated and filled in over time due to sediment deposition and farming activities.

Overland sheet flow further meanders through undeveloped farm land and continues 600m southerly to Edward Street. Overland flow typically flows south easterly from Gordon Farm limits to Edward Street, but has also flooded built out commercial and

industrial areas located at the eastern study limit and fronting the north limit of Edward Street. Edward Street acts as a flow barrier for minor event runoff with conveyance through limited culverts under the road, while major event runoff overtops Edward Street and has resulted in road washouts and the road being closed seasonally.

3.1.1 Gordon Farm (future Alliance Homes Development) (Sub-Catchment 2)

Some eastern conveyance drainage has been reported to spill onto the un-developed Gordon Farm lands to the west (Catchment 2), now known and referred to as the future Alliance Homes Development. Through field investigations of Mary Street and confirmed by Clearview Township, it has been determined a 9.12 ha external area (EXT1) also drains to Catchment 2. Runoff from the Gordon Farm lands and external areas to the west merges with the Ten Hill and Jardine Crescent drainage along the eastern boundary of the Gordon Farm, upstream of Edward Street.

The backwater from Edward Street causes some overland sheet flow to be conveyed east along the Edward Street right of way via low-lying depressions. Ditching is very limited in this area. Runoff is permitted to cross under Edward Street via a 450mm dia CSP located approximately 700m west of Airport Road and further sheets overland through fields and meadows to the Airport Road culvert where a natural watercourse begins just downstream.

3.2 Southern Conveyance

The southern drainage areas have been examined in the existing condition as three separate entities consisting of the George Street Corridor, South Eastern Vacant Lands located adjacent to the Mad River draining towards Avening and Mad River Vacant Lands (south of George Street to Concession 3 and east of Mary Street). The westerly limits of the drainage boundary are generally confined by Mary Street, and southerly limits confined by the Mad River.

3.2.1 George Street Corridor and South Eastern Vacant Lands (Sub-Catchment 5)

The George Street corridor consists of single family residential dwellings on estate lots on the north side of the right of way and random dwellings located on the south side of the right of way. Flow from the Mary Street Subdivision, located at the north east corner of Mary Street and George Street is conveyed easterly along the north side of the right of way of George Street via storm sewer to existing road side ditching and driveway culverts. Flow is further conveyed to an existing 600mm dia. CSP (at the intersection of George Street and Concession 3) which has been angled southerly to an existing road side ditch located at the easterly limit of the Nottawasaga Concession 3. With the outlet of this existing CSP plugged with debris and little in the way of ditching downstream, a sufficient outlet is not present for runoff in the George Street area. Through field reconnaissance and previous discussions with local residents and Township officials, ponding and flooding is present in this area during large rainfall events and spring snowmelt due to poor drainage and the lower lying residential lawns within Quanbury

development. Recycling of ground water to surface water to ground water appears to have sump pumps running too frequently.

Further south of the 600mm dia. CSP there exists a heavily vegetated road side ditch which follows the bends at the east limit Concession 3 for approximately 300m where the road side ditch ends and produces overland sheet flow south easterly into the vacant adjacent farmland. Overland sheet flow occurs south easterly to Airport Road.

3.2.2 Mad River Vacant Lands (Sub-Catchment 6)

Located adjacent to the Mad River, this catchment area is entirely comprised of undeveloped farmland and naturalized floodplain bound to the north by George Street, to the East by Concession 3 and to the west and south by the Mad River. Overland sheet flow is conveyed in a south easterly manner toward the Mad River.

3.3 Mary Street Conveyance

The Mary Street Conveyance is defined as lands east of Mill Street that were unable to drain into the new Mill Street storm sewer system and to a high point west of Concession 3. Mary Street has a rural cross section with numerous culverts and ditches and collects drainage as far north as Francis Street. North of Francis Street cross culverts drain the northern portions of Mary Street to the Gordon Farm property.

FIGURE 3.1

TOWNSHIP OF CLEARVIEW
MUNICIPAL CLASS EA
PROJECT FILE REPORT

CREEMORE ONTARIO
EXISTING DRAINAGE PLAN

LEGEND

- APPROXIMATE STUDY AREA OUTLINE
- FLOW DIRECTION
- CATCHMENT BOUNDARY
- CATCHMENT ID / DRAINAGE AREA
- EAST CATCHMENT
- MARY STREET CATCHMENT
- SOUTH CATCHMENT

FAIR GROUNDS RD

COUNTY ROAD 42 (AIRPORT ROAD)

COUNTY ROAD 9

SITE BOUNDARY

FLOW NODE 1

FLOW NODE 2

FLOW NODE 3

FLOW NODE 5

FLOW NODE 6

FLOW NODE 7

4
182.25

3
41.32

EXT1
9.12

2
57.17

1a
48.72

1b
49.02

MRYEXT
7.63

EXT2
1.54

MARY
20.57

6
27.63

5
101.11

JARDINE CRES.

MARY ST.

FRANCES ST E

COLLINGWOOD ST.

EDWARD ST.

GEORGE ST.

CONCESSION 3

8TH SIDEROAD

CREEMORE

MAD RIVER

AVENING

N

0 10 20 30 40 50 60 70 80
Metres

Scale N.T.S.
Month 2010
Project Number: MCG10770
Prepared by: K.B.

Projection: UTM Zone ?
Datum: NAD?7
Verified by: D.R.M.

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MCG\10770-FIGURE 4.1.dwg

4.0 Description of the Existing Natural and Socio-Economic Environment

A desktop review and several site visits as noted in **Section 1.3** to obtain photographs of the natural environment of the study area were completed. Descriptions of the various components of the natural environment were supported using aerial photography and are provided in the following sections. The natural and built environments of the study area are illustrated on **Figure 4.1**.

4.1 Land Use

4.1.1 Provincial Policy Statement

The 2005 Provincial Policy Statement (PPS) states that growth should be directed to existing settlement areas, create stronger and improved communities, and have little to no impact on the natural features of the area. In general projects should have consideration for future needs to ensure the benefits of the project are far-reaching. Section 1.6 of the PPS contains specific guidance on Infrastructure and Public Service Facilities:

1.6.1 Infrastructure and public services facilities shall be provided in a coordinated, efficient and cost-effective manner to accommodate projected needs.

Planning for infrastructure and public service facilities shall be integrated with planning for growth so that these are available to meet current and projected needs.

1.6.2 The use of existing infrastructure and public service facilities should be optimized wherever feasible, before consideration is given to developing new infrastructure and public services facilities.

Furthermore, Section 2.2 provides guidance with respect to water management, as follows:

2.2.1 Planning authorities shall protect, improve or restore the quality and quantity of water by:

g) Ensuring stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.

The Project is considered to be consistent with the above policies of the PPS.

4.1.2 Niagara Escarpment Plan

The Niagara Escarpment Plan (NEP 2005) area follows the Mad River adjacent to the study area. NEP lands adjacent to and across the Mad River from Catchment 6 (south of the Mad River) are designated as Escarpment Natural Area. *"Escarpment features*

which are in a relatively natural state and associated stream valleys, wetlands and forests which are relatively undisturbed are included within this designation. These contain important plant and animal habitats and geological features and cultural heritage features and are the most significant natural and scenic areas of the Escarpment. The policy aims to maintain these natural areas (NEP, 2005)".

Uses permitted within the Escarpment Natural Area include essential watershed management and flood and erosion control projects carried out or supervised by a public authority.

Escarpment Protection Areas are also located to the south of the Mad River in close proximity to the study area. Escarpment Protection Areas are intended to buffer more significant Escarpment Natural Areas and provide protection to visually prominent escarpment features that may have been modified by land use activities. Permitted uses include watershed management and flood and erosion control projects carried out or supervised by a public authority.

4.1.3 Simcoe County Official Plan

The County of Simcoe Official Plan designates the Creemore urban area as a Settlement Area. Lands outside of the urban boundary are designated as Agricultural and Rural while lands along the Mad River are designated as Greenlands.

Section 4.5.1.4 states that development, *"shall occur in a manner that will protect human life and property from water related hazards such as flooding and erosion."*

Section 4.5.2.4 indicates that work associated with flood and erosion-sediment control is permitted within floodplain areas.

4.1.4 Clearview Township Official Plan

According to Schedule A1 of the Clearview Township Official Plan (OP) (2001), the various catchments under consideration are designated as indicated in **Table 4.1**.

Table 4.1 Clearview Township Official Plan Designations

Problem Area (Catchment)	Official Plan Designations	Description of Existing Land Uses
Ten Hill Bluffs Area (Catchment 4)	Rural; Agricultural.	Rural lands outside of the Creemore urban boundary.
Jardine Crescent (Catchment 3)	Residential; Future Development.	Existing developed areas along Jardine Cres.; remaining lands are rural/agricultural lands and natural vegetation.
Edward St. Area (Catchments 1A and 2)	Residential; Commercial; Industrial; Waste Disposal; Future Development; Future Commercial; Agricultural.	Existing residential, commercial and industrial development along Edward St. and Elizabeth St.; remaining lands in Catchment 2 have been designated for future residential and commercial development; An existing waste disposal site is located north of Edward St. E. and east of Mary St.; Catchment 1A is located outside of the Creemore urban boundary.
Mary St. Area (Catchments EXT1, EXT2, MARY, MRYEXT)	Residential; Commercial; Future Commercial.	Creemore urban centre.
George St. Area and South Eastern Vacant Lands (Catchment 5 and 1B)	Residential; Future Development.	Some residential development along George St.; remainder is in rural and agricultural use.
Mad River Vacant Lands (Catchment 6)	Greenland- Hazard Land Area	Rural and Agricultural land uses.

Improvements made to public infrastructure are permitted under all land use designations, subject to the recommendations of a completed Environmental Assessment process.

Growth areas have been identified on the Gordon Farm lands east of Mary Street, commonly known as the Alliance Homes development and areas north and south of Edward Street, east of Mary Street towards Airport Road. These land use descriptions have been identified on **Figure 4.2.**

4.2 Natural Hazards

The floodplain of the Mad River and its tributaries is regulated by the Nottawasaga Valley Conservation Authority ("NVCA") under O. Reg. 172/06, Development, Interference with Wetlands and Alterations to Shorelines and Watercourses.

The Authority may grant permission for development in regulated areas if, in its opinion, the control of flooding, erosion, pollution or the conservation of land will not be affected by the development.

According to NVCA regulation mapping, lands on both sides of Jardine Cresent, George Street, the south end of Mary Street, portions of Edward Street and much of the future development lands are regulated. Fill regulated areas and natural hazard boundaries are provided in **Figure 4.3**.

4.3 Terrestrial Environment

4.3.1 Vegetation Communities

The project location is situated within the Lake Simcoe-Rideau Site Region which occupies the northern portion of Southern Ontario. This Region is also called the Great Lakes-St. Lawrence Forest Region. The area is characterized by mixed forests of white pine, red pine, eastern hemlock, sugar maple, red maple, yellow birch, red oak, basswood and white elm. Other wide-ranging species include eastern white cedar, largetooth aspen, beech, white oak, butternut and white ash (Lee et. al, 1998).

Natural vegetation communities are present in Catchment 3 north of Jardine Crescent and along the Mad River south of Creemore. A review of the Natural Heritage Information Centre ("NHIC") database identified no provincially rare vegetation communities within the study area, or in the vicinity of the study area.

4.3.2 Designated Sites

The County of Simcoe prepared a Natural Heritage Study (Gartner Lee Ltd., 1996). According to the study and Schedule 5.4 of the County of Simcoe Official Plan, the study area is adjacent to the Noisy River (NE1) portion of the Niagara Escarpment natural heritage unit. The NE1 unit is described as providing the ecological and hydrological functions identified in **Table 4.2**.

Table 4.2. Ecological and Hydrological Functions Provided by the NE1 Unit.

Functions		NE1 Unit
Terrain Functions	Recharge	-
	Discharge	X
	Flood Storage	-
	Conveyance	X
Vegetation Functions	Erosion Protection	X
	Temperature Control	X
	Water Quality Enhancement	X
	Aquatic Habitat	X
	Terrestrial Habitat	X
Attributes	Coldwater Habitat	X
	Warmwater Habitat	-
	Fish Spawning	X
	Deer Concentrations	X
	Waterfowl Concentrations	-
	Prov. Rare Animals	-
	Prov. Rare Plants	X
	Uncommon Vegetation	X
Linkage	Large Core Areas	-
	Number of Links	3
	Aquatic	X
	Riparian/lowland	-
	Upland	X
	Narrow Link in Agriculture	X
	Linkage Beyond Simcoe	X
	Restoration Opportunity	-
Status Designations	Provincial ANSI	2
	Regional ANSI	1
	Site of Interest	-
	ESA	-
	PSW	-
	Local Sig. Wetland	-
	Prov. Park/Cons. Area	-

The ANSIs noted in Table 4.2 are not located within the vicinity of the study area.

4.3.3 Wildlife and Wildlife Habitat

The Ontario Breeding Bird Atlas ("OBBA") was reviewed for records of breeding birds in the vicinity of the study area. A total of 99 species were identified in OBBA square 17Nk70, a 10 x 10km block covering the study area and its vicinity. Within the square, surveys were conducted at 50 point count locations between Creemore and Glencairn as well as smaller communities north and south of the Mad River. No point counts were taken from within the study area. However, coverage included areas in close proximity and with similar habitat characteristics. This coverage is, therefore, sufficient to gain a

general understanding of the bird community in the study area. A full species list is provided in **Appendix C**.

The 99 species identified are ranked as follows:

- 80 are ranked S5, common and demonstrably secure in the province;
- 13 are ranked S4, apparently secure;
- One is ranked S4S5, secure- apparently secure; and,
- 5 are ranked SE, exotic and not native to Ontario.

In addition, 23 species are considered to be area-sensitive, requiring large habitat tracts in which to breed, as shown in **Table 4.3**.

Table 4.3 Area-Sensitive Species in the Vicinity of the Study Area.

Common Name	Scientific Name
Forest Area-Sensitive Species	
Veery	*Catharus fuscescens*
Hairy Woodpecker	*Picoides villosus*
White-breasted Nuthatch	*Sitta carolinensis*
American Redstart	*Setophaga ruticilla*
Black-and-white Warbler	*Mniotilta varia*
Black-throated Blue Warbler	*Dendroica caerulescens*
Black-throated Green Warbler	*Dendroica virens*
Brown Creeper	*Certhia americana*
Canada Warbler	*Wilsonia canadensis*
Hermit Thrush	*Catharus guttatus*
Least Flycatcher	*Empidonax minimus*
Ovenbird	*Seiurus aurocapillus*
Pine Warbler	*Dendroica pinus*
Red-breasted Nuthatch	*Sitta canadensis*
Scarlet Tanager	*Piranga olivacea*
Sharp-shinned Hawk	*Accipiter striatus*
Winter Wren	*Troglodytes troglodytes*
Yellow-bellied Sapsucker	*Sphyrapicus varius*
Marsh/ Water Area-Sensitive Species	
Northern Harrier	*Circus cyaneus*
Open Country Area Sensitive Species	
Bobolink	*Dolichonyx oryzivorus*
Grasshopper Sparrow	*Ammodramus savannarum*
Eastern Meadowlark	*Sturnella magna*
Savannah Sparrow	*Passerculus sandwichensis*

Habitat for mixed forest area-sensitive breeding birds is not present directly within the study area. Large forested areas are present south of the Mad River adjacent to the area under investigation. Wetlands may also exist along the Mad River providing habitat for marsh and open water species. Agricultural lands surrounding Creemore have the potential to provide habitat for open country area-sensitive bird species. The following area-sensitive species have the potential to inhabit the area:

- Boblink (*Dolichonyx oryzivorus*);
- Grasshopper Sparrow (*Ammodramus savannarum*);
- Savannah Sparrow (*Passerculus sandwichensis*); and,
- Eastern Meadow Lark (*Sturnella magna*).

None of these species are rare in the province. Agricultural lands are prevalent in the wider region surrounding the study area. Therefore impact to potential habitat as a result of the proposed projects for these species is not anticipated to be of significant concern.

4.3.4 Designated Species

A review of the Natural Heritage Information Centre ("NHIC"), Ontario Breeding Bird Atlas ("OBBA") and federal Species At Risk databases identified 12 designated species within the general vicinity of the study areas. Species status' is based on their designation under the Ontario Endangered Species Act ("OESA") or federal Species at Risk Act ("SARA") as listed in **Table 4.4**.

Table 4.4 Designated Species Identified Within the Vicinity of the Site

Species	Scientific Name	Provincial Status (OESA)	Federal Status (SARA)	Habitat Preference	Potential to be located within the study area
Mammals					
Grey Fox	*Urocyon cinereo-argenteus*	THR	THR Sched. 1	Found on the outskirts of cities in deciduous forests and marshes. Their dens are usually located in areas of dense brush, close to water sources and are made out of rock outcrops, hollow trees, underground burrows dug by other animals or piles of brush. The Grey Fox is considered a habitat generalist.	Potentially present.
Birds					
Cerulean Warbler	*Dendroica cerulea*	SC	SC Sched. 1	Found in mature deciduous forests with large trees and open understorey in wet bottomland areas or dry ridges in upland locations. They also prefer to nest in older, second growth forests.	No habitat present in study area. Habitat may exist in adjacent woodlands in NEP.
Henslow's Sparrow	*Ammo-dramus henslowii*	END	END Sched. 1	Occupies open fields including tall grasses interspersed with tall herbaceous plants, or shrubby species, and avoid grazed or burned areas.	No habitat present in or adjacent to, study area.
Least Bittern	*Ixobrychus exilis*	THR	THR Sched. 1	Prefers to nest in freshwater marshes with dense tall aquatic vegetation interspersed in clumps of woody vegetation and open	No habitat present in or adjacent to, study area.

Species	Scientific Name	Provincial Status (OESA)	Federal Status (SARA)	Habitat Preference	Potential to be located within the study area
				water. They are usually found in marshes greater than 5 ha.	
Canada Warbler	*Wilsonia canadensis*	SC	N/A	Most abundant in wet, mixed deciduous-coniferous forest, riparian forests or regenerating lands where a well-developed shrub layer is present.	No habitat present in study area. Habitat may exist in adjacent woodlands in NEP.
Golden-winged Warbler	*Vermivora chrysoptera*	SC	THR Sched. 1	Breed in regeneration zones, forest edges and open canopy areas where young shrubs grow, surrounded by mature forest. Place their nests in clusters of herbaceous plants and low bushes.	No habitat present in study area. Habitat may exist in adjacent woodlands in NEP.
Amphibians/Reptiles					
Eastern Hog-nosed Snake	*Heterodon platirhinos*	THR	THR Sched. 1	Prefer sandy, well-drained habitats such as beaches and dry woods to lay their eggs in burrows and hibernate. Need access to wet areas such as swamps to hunt.	No habitat present in or adjacent to, study area.
Milksnake	*Lampro-peltis triangulum*	SC	SC Sched. 1	Occurs predominantly in rural areas, and in and around buildings, especially old structures. It can be found in a variety of habitats including prairie, pasture, hayfields, rocky hillsides and a wide variety of forest types. Proximity to water and suitable locations for basking and egg-laying are important features of good Milksnake habitat.	Potentially present.
Spotted Turtle	*Clemmys guttata*	END	END Sched. 1	Can be found in ditches, ponds, streams, swamps, bogs, and marshes, and prefer soft muddy substrate with some aquatic vegetation. They require quiet waters, and their presence in swift-flowing bodies indicates marshy areas along the shore.	No habitat present in or adjacent to, study area.

Lepidoptera					
Monarch	*Danaus plexippus*	SC	SC Sched. 1	Exists primarily where milkweed (*Asclepius*) and wildflowers (such as Goldenrod, asters, and Purple Loosestrife) are present including abandoned farmland, along roadsides, and other open spaces where these plants grow.	Potentially present.
Plants					
American Ginseng	*Panax quinque-folius*	END	END Sched. 1	Grows in rich, moist, undisturbed and relatively mature deciduous woods in areas of neutral soil with a forest canopy usually dominated by Sugar Maple, White Ash, Bitternut Hickory, and Basswood. Colonies are usually found at the bottom of gentle slopes facing south in a warm and well-drained area.	No habitat present in study area. Habitat may exist in adjacent woodlands in NEP.
American Hart's-tongue Fern	*Asplenium scolopen-drium*	N/A	SC Sched. 1	Requires basic, i.e., non-acidic, substrate, generally found only at sites on or near dolomitic limestone. Most Ontario sites are along or close to the Niagara Escarpment where damp crevices and mossy, rock outcrops are present with calcareous soil and a hardwood canopy cover.	No habitat present in study area. Habitat may exist in adjacent woodlands in NEP.

As noted in the table above, the only species that have the potential to be located within the study area are:

- Grey fox;
- Milksnake; and,
- Monarch.

Although the Grey fox and Milksnake could potentially be found foraging throughout the study area, significant habitats for both species, including dens and hibernacula, would not be present along roadsides or drainages ditches where drainage improvement work is proposed.

Habitat for Monarch may potentially be present along roadsides, abandoned farm fields and field edges within the study area. These areas are not significant for the species and similar habitats are in abundance throughout the wider region. Minor and temporary disturbances to these areas are not a concern for the species.

4.4 Aquatic Environment

4.4.1 Mad River

The Mad River flows west to east, south of Creemore and is one of the main tributaries to the Nottawasaga River. The Mad River watershed is comprised of the Noisy and Mad Rivers, which flows through a mix of agricultural land and wetlands. The Mad River is classified and managed as a coldwater fishery by the Nottawasaga Valley Conservation Authority (NVCA) within, and adjacent to, the study area.

This reach of the Mad River is located in an area of mixed land use with forest patches interspersed within a landscape dominated by agricultural production and rural communities. Most reaches of the river corridor have well developed riparian forest that maintains the thermal regime due to the shading provided.

The river is geomorphicaly stable as evidenced by the moderate degree of sinuosity, meandering, within an unconfined river valley. Typical morphology consists of runs and riffles with sporadic pools. At one location near the WWTP, areas of bank erosion adjacent to the site have been hardened by placement of armour stone along the outside meander with bank erosion also observed downstream of WWTP.

Based on a review of photos taken by Burnside staff the substrate consists mainly of large gravel/cobble with silt and sand in depositional areas, and sporadic large woody debris. No major macrophyte beds were observed in the photos taken upstream or downstream of the WWTP (Mary Street Area).

Fish species within the Mad River consist primarily of a coldwater assemblage including resident brown trout (Salmo trutta), migratory rainbow trout/steelhead (Oncorhynchus mykiss), and Chinook salmon (Oncorhynchus tshawytscha). Sucker, darter and sculpin species could also use sections of the river depending on available habitat. .

A review of the Conservation Ontario/Department of Fisheries and Oceans, Fish Species at Risk (SAR) was completed and no fish or mussel SAR have been noted for the area.

4.5 Archaeology and Cultural Heritage

If the preferred alternative will have the potential to impact cultural heritage resources, then the Ministry of Culture will recommend that a Stage 1 be conducted prior to the initiation of construction activities. No effects on cultural heritage resources are anticipated.

4.6 Socio-economic Features

This section profiles the socio-economic characteristics of the Clearview Township data provided in Statistics Canada's Population Census of 2001 and 2006. Statistics Canada conducts the Census once every five years.

4.6.1 Demographics

The population and employment rate of Clearview Township is shown in **Table 4.5**. At the time of the 2006 census 14,088 people lived in Clearview Township. Between 2001 and 2006, the population of the Township increased by 2.1% while the population of Ontario had increased by 6.6%.

Table 4.5 Population & Employment Rate in Clearview Township, 1996-2006

Population			Employment Rate	
Census Year	Total Population	Change in Population (between census periods)	Employment Rate	Unemployment Rate
1996	12,407	N/A	N/A	N/A
2001	13,796	11.2%	67.7%	3.7%
2006	14,088	2.1%	67.1%	4.5%

Source: Statistics Canada, Population Profile of Canada (2006).

4.6.2 Economic Development

Business services, manufacturing and other services employ approximately half of the people in Township, and represent the greatest source of jobs for residents of the Township as well as in Ontario (**Table 4.6**).

Table 4.6 Employment by Industrial Sector in Clearview Township, 2006

Industrial Sector	Clearview Township (% of total)	Ontario (% of Total)
Agriculture and other resource-based industries	535 (6.9%)	190,000 (2.9%)
Construction	845 (10.9%)	384,775 (5.9%)
Manufacturing	1,260 (16.3%)	899,670 (13.9%)
Wholesale trade	285 (3.7%)	307,465 (4.7%)
Retail trade	800 (10.4%)	720,235 (11.1%)
Finance and real estate	305 (4.0%)	442,610 (6.8%)
Health care and social services	620 (8.0%)	611,740 (9.4%)
Educational services	395 (5.1%)	433,485 (6.7%)
Business services	1,175 (15.2%)	1,274,345 (19.7%)
Other services	1,500 (19.4%)	1,209,390 (18.7%)
Total - Experienced labour force	7,725	6,473,730

4.6.3 Dwellings

According to data obtained from Statistics Canada, approximately 33.2% of the dwellings in Clearview Township were constructed between 1986 and 2006, compared with 31.4% in Ontario. The average value of dwellings in Clearview Township in 2006 was $297,237. This figure is on par with the value of dwellings in Ontario ($297,479) in the same year.

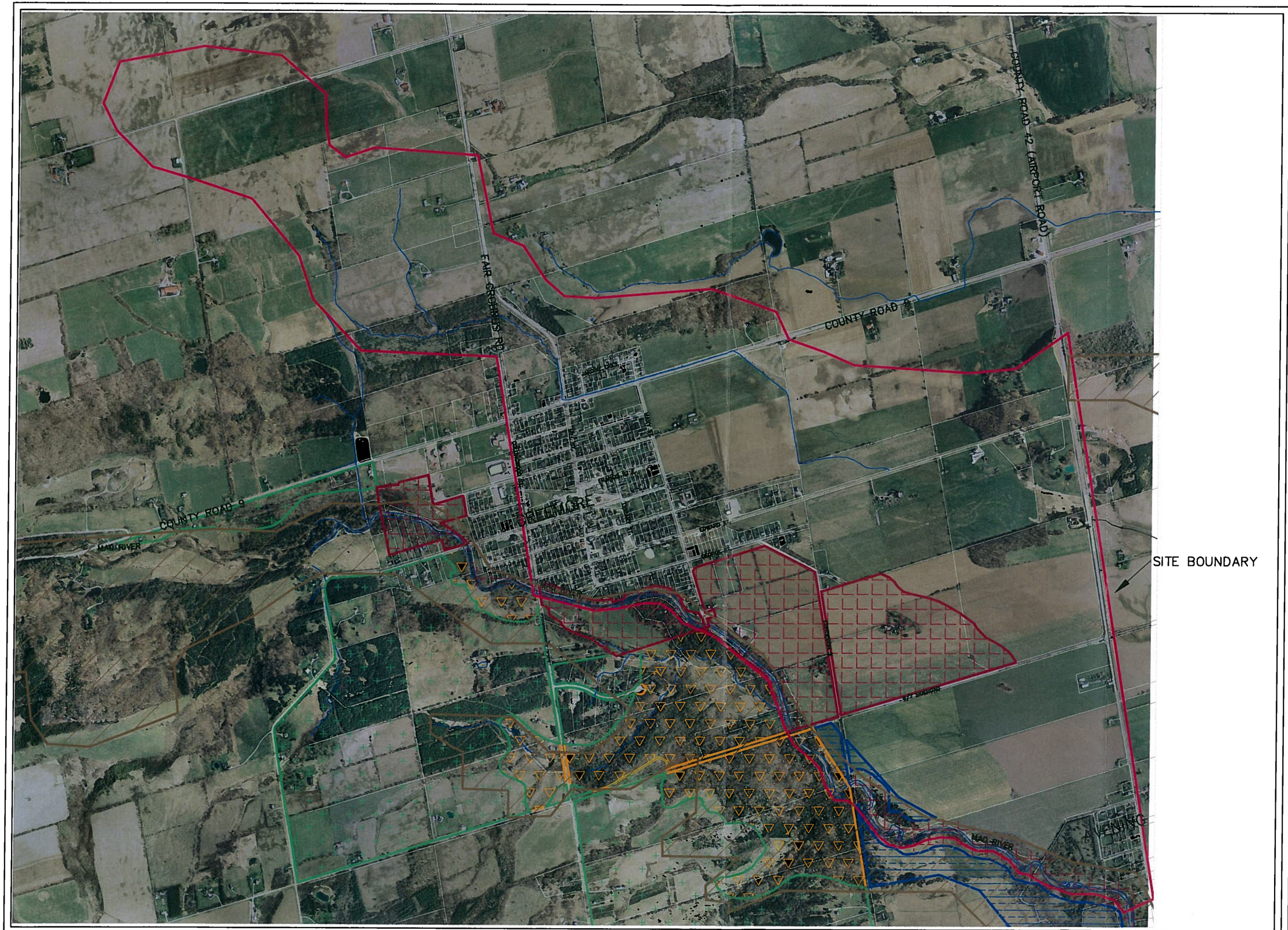


FIGURE 4.1

TOWNSHIP OF CLEARVIEW
MUNICIPAL CLASS EA
PROJECT FILE REPORT

CREEMORE ONTARIO
NATURAL ENVIROMENT

LEGEND

APPROXIMATE SITE OUTLINE

TOWNSHIP OF CLEARVIEW OFFICIAL PLAN

GREENLAND - NATURAL HERITAGE AREA

GREENLAND - NATURAL HAZARD AREA

ESCARPMENT NATURAL AREA

ESCARPMENT PROTECED AREA

COUNTY OF SIMCOE OFFICAL PLAN

NE1 - NATURAL HERITAGE UNIT DESIGNATION

N

0 10 20 30 40 50 60 70 80
Metres

Scale N.T.S.
Month 2010
Project Number: MCG10770
Prepared by: K.B.

Projection: UTM Zone ?
Datum: NAD77
Verified by: D.R.M.

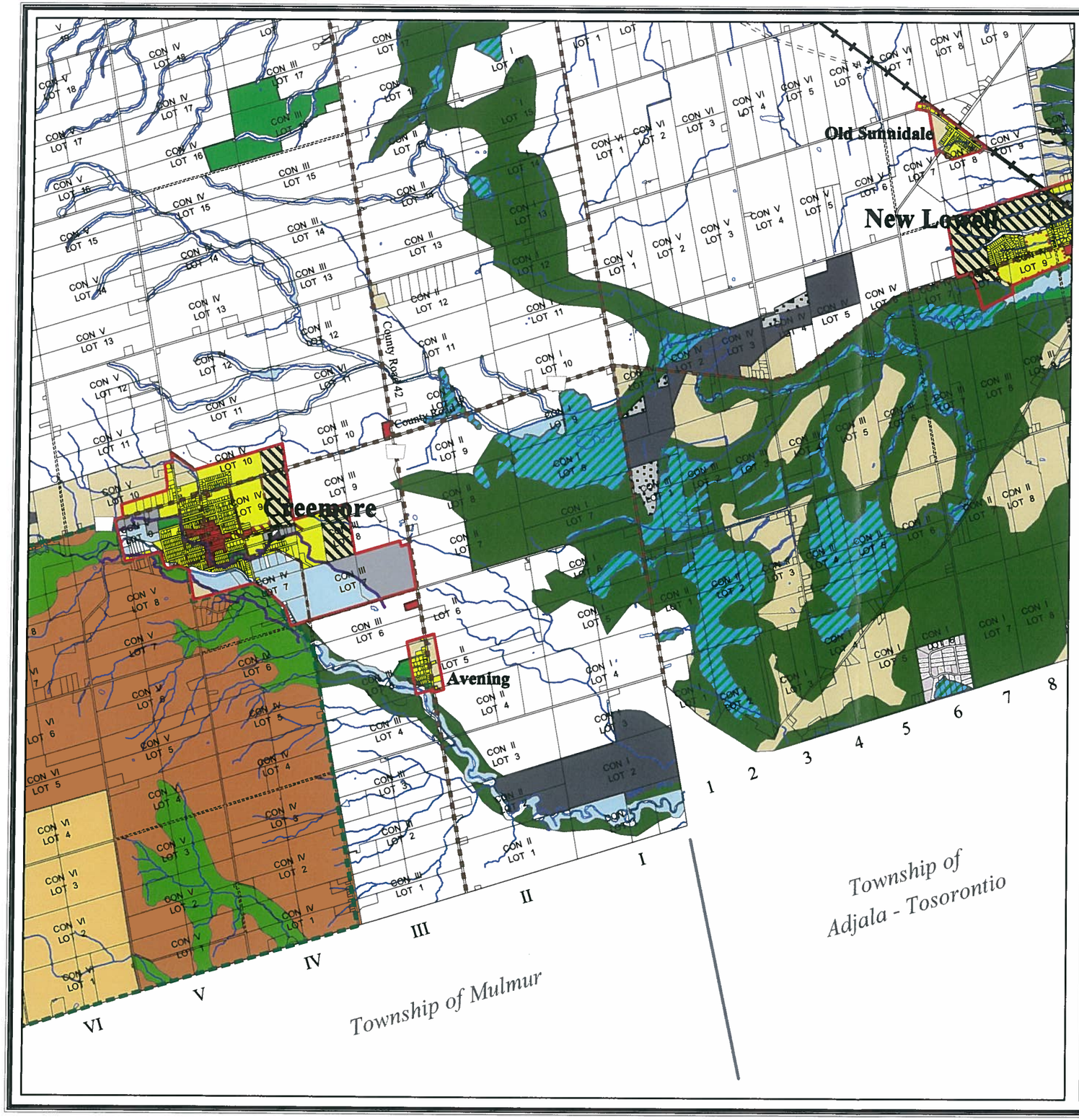
BURNSIDE

MCG10770-FIGURE 4.1.dwg

FIGURE 4.2

OFFICIAL PLAN of the TOWNSHIP OF CLEARVIEW

Schedule A - Map 5 - South Central Land Use and Transportation Plan



Land Use - General

- Greenland - Hazard Land Areas
- Greenland - Natural Heritage Areas
- Greenland - Wetland Areas
- Open Space
- Agriculture
- Rural
- Residential
- Estate Residential
- Special Policy Residential
- Future Development
- Commercial
- Commercial Transition Area
- Future Commercial
- Extractive Industrial
- Industrial
- Mineral Aggregate Resource Area
- Waste Disposal Industrial

Land Use - Niagara Escarpment Plan Area

- Escarpment Natural Area
- Escarpment Protection Area
- Escarpment Recreation Area
- Escarpment Rural Area
- Mineral Resource Extraction Area
- Public Land in the Parks System

Boundary Classifications

- Waste Disposal Assesment Area
- Boundary of the Niagara Escarpment Plan
- Special Development Area - Collingwood Airport
- Urban Settlement Area Boundary
- Special Servicing Area
- Recreational District

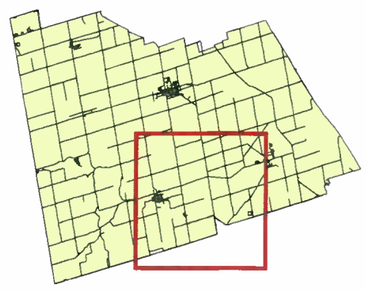
Transportation

- Provincial Highways
- Arterial Roads
- Collector Roads
- Local Roads
- Railway Lands / Water Transmission Line

0 0.5 1 2 3

Kilometers

1 centimeter equals 500 meters



Projection: Universal Transverse Mercator
Mapping Date: 21 March, 2002

Parcel and hydrological data provided by Simcoe County Land Information Network Co-Operative.

NOTE: This map is not a legal survey.



FIGURE 4.3

TOWNSHIP OF CLEARVIEW
MUNICIPAL CLASS EA
PROJECT FILE REPORT

CREEMORE ONTARIO
FILL REGULATED LANDS ONT REG 172/06

LEGEND

- APPROXIMATE SITE OUTLINE
- MUNICPAL BOUNDARY
- NVCA JURISDICTION
- REGULATION LIMIT
- LOT & CONCESSION FABRIC

N

0 10 20 30 40 50 60 70 80
Metres

Scale 1:2500
Month 2010
Project Number: MCG10770
Projection: UTM Zone 7
Datum: NAD77
Prepared by: K.B.
Verified by: D.R.M.

BURNSIDE

MCG10770-FIGURE 4.1.dwg

5.0 Evaluation of Alternatives and Selection of the Preferred Solution

5.1 Description of Planning Alternatives

This section identifies the initial planning alternatives that were considered as a part of this Schedule B Municipal Class EA. The alternatives were evaluated using the following criteria: natural environment, social/cultural environment, financial factors and technical factors. The evaluation of each of the alternatives using the identified criteria is presented in **Table 5.1**.

These alternatives give due consideration to the existing drainage and flooding problems as well as future development as per the Township of Clearview Official Land Use Plan and has been examined to determine areas requiring future infrastructure to support such developments. These alternatives have been developed based on previous conversations and drainage preferences expressed by the Municipality and project stakeholders.

5.1.1 Do Nothing

The "Do Nothing" alternative means to take no action in addressing the problem statement and would result in the continuation of periodic flooding in the identified problem areas affecting existing homeowners and properties and would limit the development potential for areas currently identified for future development. This alternative would not address the problem statement and was therefore not pursued as a viable option.

5.1.2 Manage Community Growth

This alternative would reduce the need for drainage improvements in the undeveloped lands but would not resolve the existing flooding problems in existing neighbourhoods or further downstream in Avening. The undeveloped lands have been designated for Residential and Future Development uses in the Township of Clearview Official Plan. This alternative does not address the problem/opportunity statement, which was developed to resolve and existing problem, and is not consistent with planning policies; therefore it was not pursued as a viable option

5.1.3 Local Drainage System Maintenance

The purpose of this alternative is to maintain the existing surface and ditch drainage systems by removing system blockages that reduce conveyance capacity. The maintenance program could involve:

- Increasing the frequency of removal of debris and sediment from catch basins, ditches; and,
- Deepen the drainage system to improve the gradient of local ditches providing improved conveyance away from residences.

This alternative partially addresses the problem/opportunity statement. Continued flooding is expected after major storm events. Therefore this alternative forms part of the recommended solution.

5.1.4 Expansion and Rehabilitation of Existing Drainage System

This alternative would involve an expansion and rehabilitation of the existing drainage network. Activities could involve:

- Drain cleanouts;
- Ditch cleanouts;
- Culvert replacements;
- Realignment of existing stormwater ditches/channels; and,
- Construction of new stormwater ditches/channels and storm sewers.

This alternative fully addresses the problem/opportunity statement.

5.2 Preliminary Preferred Planning Solution

The preliminary preferred alternative is to expand and rehabilitate the existing drainage network. This solution provides a long-term flood reduction solution in conformity with Official Plan policies. Several concepts for expansion and rehabilitation of the existing drainage system have been reviewed and are summarized in **Section 7.0**. Additional details are provided in **Appendix A**.

Table 5.1 Evaluation of Alternative Solutions

CRITERIA FOR EVALUATING ALTERNATIVES	Do Nothing	Manage Community Growth	Expand Drain/Sewer Cleaning Program	Expand/Rehabilitate Existing Drainage System
A Natural Environment *Rating:*	**Least Preferred**	**Least Preferred**	**Partially Preferred**	**Partially Preferred**
1 Designated Sites/Species	No impact over existing conditions.	No impact over existing conditions.	Potential impacts to designated sites and species associated with Mad River	Potential impacts to designated sites and species associated with Mad River
2 Water Quality and Quantity	Regular flooding will continue to convey sediment and contaminants to downstream watercourses (Mad River).	Regular flooding will continue to convey sediment and contaminants to downstream watercourses (Mad River).	Slight improvement in downstream water quality as flooding becomes marginally less frequent. Potential for sedimentation and spills from clean out equipment.	Long-term improvements to downstream water quality as flooding frequency is reduced. Potential for sedimentation and spills during expansion /rehabilitation activities.
3 Floodplain Lands	No impact over existing conditions.	No impact over existing conditions.	May reduce overland flooding during minor events. No impact over existing conditions during major storm events.	Reduction in flooding during minor and major storm events.
4 Terrestrial Habitat	No impact over existing conditions.	No impact over existing conditions.	No impact over existing conditions.	Some clearing of terrestrial habitat may be required in Jardine Cresent area and along Mad River.
5 Aquatic Habitat	No impact over existing conditions.	No impact over existing conditions.	Slight improvement to aquatic habitat as flooding becomes marginally less frequent.	Long-term improvements to downstream water quality as flooding frequency is reduced. Potential for sedimentation and spills during expansion /rehabilitation activities.
B Socio-economic/Cultural Environment *Rating:*	**Least Preferred**	**Least Preferred**	**Most Preferred**	**Partially Preferred**
1 Conformity to Local Planning Provisions	Incompatible.	Incompatible.	Compatible.	Compatible
2 Heritage Resources (archaeological features, built heritage, and cultural heritage landscapes)	No impact over existing conditions.	No impact over existing conditions.	If the preferred alternative will have the potential to impact heritage resources, then the Ministry of Culture will recommend that a Stage 1 be conducted prior to the initiation of construction activities. No effects on cultural heritage resources are anticipated.	If the preferred alternative will have the potential to impact heritage resources, then the Ministry of Culture will recommend that a Stage 1 be conducted prior to the initiation of construction activities. No effects on cultural heritage resources are anticipated.
3 Nuisance Impacts (noise, traffic, aesthetics, disruption during construction)	No impact over existing conditions. Continued nuisance from existing flooding.	No impact over existing conditions. Continued nuisance from existing flooding.	Increased frequency of nuisance impacts with increase in frequency of cleaning activities.	Temporary noise and traffic disturbances during expansion/rehabilitation construction.
4 Land Acquisition	No impact over existing conditions.	May be a need to acquire Future Development lands in order to limit future growth.	Not required. We currently have no right of access to maintain ditches.	May require easement/land acquisition for channel realignments/new drainage structures.

C Financial Factors *Rating:*	**Partially Preferred**	**Partially Preferred**	**Least Preferred**	**Partially Preferred**
1 Capital and O & M Costs	Moderate to high expense associated with clean up and reconstruction of any damaged infrastructure after a flood event.	Moderate to high expense associated with clean up and reconstruction of any damaged infrastructure after a flood event.	Moderate O & M costs associated with increased cleaning work. Continued flood clean-up expenses after major storm events.	Moderate to high capital costs for expansion /rehabilitation work. Reduced costs associated with flood clean-up.
D Technical Factors *Rating:*	**Least Preferred**	**Least Preferred**	**Partially Preferred**	**Most Preferred**
1 Addresses Technical Concerns/Strategies	No	No	Partially. Continued flooding expected during major storm events.	Yes
RECOMMENDED SOLUTION	**Not preferred**	**Not preferred**	**Not preferred (however forms part of recommended solution)**	**Preferred**

Understanding the Rating System:

Most preferred; fully responds to, and/or has fewest impacts in, evaluation criterion

↑ Increase in preference

Least preferred; largely does not respond to, and/or has potential for unacceptable impacts in, evaluation criterion

6.0 Description of Preferred Solution

The preferred alternative solution is denoted by three major conveyances as summarized below and shown on **Figure 6.1**, **Figure 6.2** and **Figure 6.3**, and in **Appendix A.**

6.1.1 Eastern Conveyance

Upstream drainage (Catchment 4 Ten Hill drainage) will drain along the Edward Street East north ditch via the existing Edward Street culvert crossing to the existing Airport Road culvert. The existing ditch from Jardine Crescent along County Road 9, and south to the mid block of the Gordon Farm (Alliance Homes property) would be cleaned out to improve conveyance and reduce backwater flooding upstream of County Road 9. A new ditch system from the mid block of the Gordon Farm south to Edward Street and east on Edward Street to the toe of the Edward Street hill. The section along Edward Street would be contained within the Township's right of way. South of Edward street the ditch would follow the base of the hill. The ditch would continue south between the property lines of the Jardine and Nash properties. The ditch would continue along the south limits of the Nash property to the Airport Road culvert.

The Airport Road crossing will be bermed to flood-proof the existing residence and direct runoff through the existing culvert. Downstream of the Airport Road culvert crossing, a portion of the flow will continue along the existing watercourse, with the remaining flowing south in the Airport Road east ditch to Sideroad 6/7 where an existing secondary outlet will pick up the residual flow.

6.1.2 Eastern Conveyance Split Flow to Southern Conveyance

Excess runoff draining to the Eastern Conveyance above the 25-year storm will be diverted to the Southern Conveyance using a flow splitter to send a portion of major events southerly along Concession 3 right of way to the Mad River. Historically, it should be noted that the Ten Hill drainage directly discharged to the Mad River through Creemore along what is called Mill Street now. The diversion around the community's downtown core occurred in the 1950s. Therefore, the diversion of flood waters along Concession 3 mimics what occurred historically prior to the 1950s. It should also be noted that during major flood events that runoff spills to the Hamlet of Avening and ends up in the Mad River a short distance downstream of the proposed outlet on Concession 3. Improvements along Edward Street and at the Airport Road Culvert will ultimately reduce flooding potential of Avening.

6.1.3 Southern Conveyance

Both the Alliance Homes north external (EXT1) and Alliance Homes (2W) drainages will be overcontrolled to pre-development 5-year flow (0.951m^3/s) conditions up to the 100-year storm event at a SWM facility at the SE corner of Catchment 2W. Preliminary hydrologic calculations estimate a total of 11,000m^3 in storage volume will be required. Hydrologic calculations are detailed in the MDP Report (**Appendix A**). The outflow will

be conveyed by storm sewer through private property and along Concession 3 and terminate south of the Sideroad 6/7 intersection. South of Sideroad 6/7, the entire conveyance will flow by ditch south to the Mad River. Remaining drainage areas west of Concession 3 and south of Alliance Homes will be conveyed by ditch along Edward Street and George Street to a Concession 3 west ROW ditch and connect to the storm sewer system.

Catchments 5 and 6 are assumed developed but without quantity controls to mimic current developed conditions.

Peak flows were calculated using the SWMHMYO hydrologic model software; results are summarized in the MDP report provided in **Appendix A**.

6.1.4 Mary Street Improvements

Mary Street would be improved from its current road side ditches and various culverts and pipes to a typical urban section with curbs and gutters, and storm sewer with a new outlet to the Mad River (similar to the outlet recently built on Mill Street).

FIGURE 6.1

TOWNSHIP OF CLEARVIEW
MUNICIPAL CLASS EA
PROJECT FILE REPORT

PREFERRED ALTERNATIVE
PROPOSED DRAINAGE IMPROVEMENTS
MINOR SYSTEM DRAINAGE

LEGEND

- APPROXIMATE STUDY AREA OUTLINE
- MINOR SYSTEM FLOW DIRECTION (UP TO 25yr)
- CATCHMENT BOUNDARY
- 3 / 4.5ha — CATCHMENT ID / DRAINAGE AREA
- EASTERN CONVEYANCE (CHANNEL FLOW)
- SOUTH CONVEYANCE (PIPE)
- MAD RIVER HAZARD (SHEET FLOW)
- MARY STREET CONVEYANCE (PIPE)
- SOUTH EAST (SHEET FLOW)

FAIR GROUNDS RD
COUNTY ROAD 42 (AIRPORT ROAD)
COUNTY ROAD 9
SITE BOUNDARY
CREEMORE
MAD RIVER
AVENING
JARDINE CRES.
MARY ST.
FRANCIS ST E
EDWARD ST.
CONCESSION 4
4 / 122.26
LOCAL IMPROVEMENT TO SEND FLOW ON EAST SIDE OF FAIRGROUNDS ROAD TO WEST SIDE
CLEAN OUT EXISTING DITCH WORK WITH COUNTY
ROAD ELEV=264.0m
DITCH ELEV=262.3m
3 / 41.32
FLOW NODE 2
EX.ELEV=257.5m
PR.ELEV=255.8m
CLEAN OUT EXISTING DITCH TO IMPROVE CULVERT CAPACITY
FLOW SPLITTER
2E / 9.72
IMPROVE EXISTING CULVERTS
1a / 48.72
FLOW NODE 1
FLOW NODE
EXT1 / 9.12
2W / 39.51
EX.ELEV=253.0m
PR.ELEV=251.3m
EX.ELEV=248.3m
PR.ELEV=246.8m
MRYEXT / 7.63
EXT2 / 1.54
6 / 4.79
FLOW NODE 3
EASTERN CONVEYANCE
FLOW NODE 5
EX.ELEV=258.2m
PR.ELEV=256.0m
FLOW NODE 6
1b / 39.77
ROAD ELEV=245.0m
PR.ELEV=243.5m
MARY / 20.56
5 / 3.15
SOUTHERN CONVEYANCE
FLOW NODE 7
8 / 27.63
7 / 9.80ha
9 / 100.54
FLOW NODE 8
LOCAL DRAINAGE IMPROVEMENT
EX.ELEV=249.4m
PR.ELEV=247.9m
OUTLET TO MAD RIVER

N

0 10 20 30 40 50 60 70 80
Metres

Scale N.T.S.
Month 2010
Project Number: MCG10770
Prepared by: K.B.
Projection: UTM Zone 7
Datum: NAD77
Verified by: O.R.M.

BURNSIDE

MCG10770-FIGURE 4-1.dwg

FIGURE 6.2

TOWNSHIP OF CLEARVIEW
MUNICIPAL CLASS EA
PROJECT FILE REPORT

PREFERRED ALTERNATIVE

PROPOSED DRAINAGE IMPROVEMENTS
MAJOR SYSTEM DRAINAGE

LEGEND

- APPROXIMATE STUDY AREA OUTLINE
- MINOR SYSTEM FLOW DIRECTION
- MAJOR SYSTEM FLOW DIRECTION
- CATCHMENT BOUNDARY
- 3 / 45ha — CATCHMENT ID / DRAINAGE AREA
- TEN HILL / JARDINE MAJOR SYSTEM TO SOUTH MAJOR CONVEYANCE
- TEN HILL / JARDINE FLOWS LESS THEN 25 YRS TO EASTERN CONVEYANCE
- ALLIANCE OVER CONTROL / GEORGE STREET TO PIPE ON CONC 3
- MAD RIVER HAZARD LANDS (SHEET FLOW)
- SOUTHEAST SHEET FLOW
- MARY STREET CONVEYANCE (ROAD SURFACE) FOR MAJOR FLOWS

FAIR GROUNDS RD
COUNTY ROAD 42 (AIRPORT ROAD)
LOCAL IMPROVEMENT TO SEND FLOW ON EAST SIDE OF FAIRGROUNDS ROAD TO WEST SIDE
CLEAN OUT EXISTING DITCH WORK WITH COUNTY
4 — 122.26
ROAD ELEV=284.9m
DITCH ELEV=282.3m
3 — 41.32
EX.ELEV=257.5m
PR.ELEV=255.8m
COUNTY ROA
S TE BOUNDARY
FLOW NODE 2
N OUT EXISTING DIT TO IMPROVE CULVE T CAPACITY
FLOW SPLITTER
2E — 9.72
IMPROVE EXISTING CULVERTS
1a — 48.72
FLOW NODE 1
EXT1 — 9.12
2W — 39.51
EX.ELEV=253.0m
PR.ELEV=251.3m
EX.ELEV=248.3m
PR.ELEV=246.8m
FLOW NODE 4
MRYEXT — 7.63
EXT2 — 1.54
6 — 4.79
EA TERN CONVEYANCE
FLOW NODE 5
FLOW NODE 3
EDWARD ST.
1b — 39.77
ROAD ELEV=245.0m
PR.ELEV=243.5m
EX.ELEV=256.2m
PR.ELEV=255.0m
FLOW NODE 6
MARY — 20.56
SOUTHERN CONVEYANCE
FLOW NODE 7
COUNTY ROAD 9
MAD RIVER
CREEMORE
5 — 3.15
8 — 27.63
7 — 9.80ha
9 — 100.54
OCAL DRAINAGE IMPROVEMENT
FLOW NODE 8
EX.ELEV=249.4m
PR.ELEV=247.9m
OUTLET TO MAD RIVER
AVENING

N

0 10 20 30 40 50 60 70 80
Metres

Scale N.T.S.
Month 2010
Project Number: MCG10770
Prepared by: K.B.
Projection: UTM Zone 7
Datum: NAD77
Verified by: D.R.M.

BURNSIDE

MCG10770-FIGURE 4.1.dwg

FAIRGROUNDS RD

FAIRGROUNDS ROAD / DITCH IMPROVEMENTS

CLEAN OUT EXISTING DITCH

COUNTY ROAD 9

JARDINE CRES.

HILL ST.

MARY ST.

NELSON ST

WELLINGTON ST E

FRANCIS ST E

CAROLINE ST E

LIBRARY ST.

ELIZABETH ST E

EDWARD ST E

GEORGE ST.

COLLINGWOOD ST.

CREEMORE

MARY STREET STORM SEWER AND ROAD IMPROVED TO URBAN CROSS SECTION

ALLIANCE HOMES SWM POND OUTLET

NEW 750mmø STORM SEWER TO EDWARD ST

CLEAN OUT EXISTING DITCH

CONSTRUCT NEW DITCH (WITHIN R.O.W.) AND REGRADE EDWARD ST AS NEEDED

EASTERN CONVEYANCE

REMOVE EX. 450mmø CPS

REPLACE EX 600mmø CSP WITH TRIPLE 900mmø CSP

CONSTRUCT NEW DITCH AT BASE OF HILL

COUNTY ROAD 42 (AIRPORT ROAD)

CREATE BERMING TO PROTECT RESIDENCE AND TO INCREASE CAPACITY AT AIRPORT ROAD CULVERT

INTAKE INTO STORM SEWER

DITCH IMPROVEMENTS

SOUTHERN CONVEYANCE

DIVERSION WEIR
-UP TO 25yr FLOW FROM TEN HILL / JARDINE AREA TO AIRPORT ROAD
-GREATER THE 25yr FLOW TO CHANNEL DOWN CONC. 3 TO MAD RIVER

CONSTRUCT NEW DITCH ALONG PROPERTY LINES

CONSTRUCT NEW MAJOR SYSTEM DITCH ON EAST SIDE OF AIRPORT ROAD

NEW MAJOR SYSTEM SWALE AND STORM SEWER TO SIDEROAD 6/7

PROPOSED 450mmø CSP

DITCH IMPROVEMENTS

INTAKE INTO STORM SEWER

NEW HEADWALL

MAD RIVER

6/7 SIDEROAD

HEADWALL

OPEN DITCH TO MAD RIVER

FIGURE 6.3

TOWNSHIP OF CLEARVIEW
MUNICIPAL CLASS EA
PROJECT FILE REPORT

CREEMORE ONTARIO
DRAINAGE IMPROVEMENTS

LEGEND

APPROXIMATE SITE OUTLINE

N

Scale 1:5000
Month: MARCH 2010
Project Number: MCG10770

Projection: UTM Zone 7
Datum: NAD77

Prepared by: K.B.

Verified by: D.R.M.

BURNSIDE

MCG10770-FIGURE 4.1.dwg

7.0 Impacts and Mitigation

The following measures should be implemented in order to mitigate negative impacts of the proposed projects on the environmental features of the study area. All design and construction reports and plans will be based on a best management approach that centre on the prevention of impacts, protection of the existing environment and opportunities for rehabilitation and enhancement of the impacted areas.

7.1.1 Surface Water/Hydrology & Soils and Sedimentation

Effect

A. Potential for sediments to enter downstream natural watercourses as a result of the following project activities:

- Drain cleanouts;
- Ditch cleanouts;
- Channel realignments;
- Culvert replacements; and,
- Outlet construction to Mad River and watercourse at Airport Road.

B. Potential for localized water quality impacts as a result of erosion and spills.

C. Diversion of major system flows from Ten Hill Catchment and Jardine Crescent to Concession 3 and the Mad River.

Mitigation

A. The work will be planned and constructed in accordance with the MOE's Guideline B-6, *Evaluating Construction Activities Impacting on Water Resources.* Channel realignments, culvert replacements and drain and ditch cleanouts should not be conducted at times when flows are present due to local rain events, storms or seasonal floods. Work will be done in the dry.

In the event of an unexpected rain event, silt barriers and/or traps will be placed in the channel during any in-channel work and maintained until the banks have been stabilized. Silt or sand accumulated in the barriers/traps will be removed and stabilized on land.

Dredged material will be disposed on land above the high water level and suitably contained/stabilized to prevent dredged material from re-entering the water.

The footprint of disturbed area will be minimized as much as possible.

An erosion and sediment control plan will be developed. Implementation of the erosion and sediment control measures will conform to recognized standard specifications such as Ontario Provincial Standards Specification (OPSS).

Any stockpiled material will be stored at a safe distance from the waterway to ensure that no deleterious substances enter the water.

Sediment and erosion control measures (silt curtains, silt fence) will be installed and will be maintained during the work phase and until the site has been stabilized. Control measures should be inspected daily to ensure they are functioning and are maintained as required. If control measures are not functioning properly, no further work will occur until the problem is resolved.

Any temporary mitigation measures will be installed prior to the commencement of any site clearing, grubbing, excavation, filling or grading works and will be maintained on a regular basis, prior to and after runoff events.

All disturbed soils on the banks and within the channel, including spoil, will be stabilized immediately upon completion of work.

B. All equipment fuelling and maintenance will be done at a safe distance from the water to ensure that no deleterious substances enter the watercourse.

The contractor will be required to develop spill prevention and contingency plans for construction and operational phases of the project. Personnel will be trained in how to apply the plans and the plans will be reviewed to strengthen their effectiveness and ensure continuous improvement. Spills will be immediately contained and cleaned up in accordance with provincial regulatory requirements and the contingency plan. A hydrocarbon spill response kit will be on site at all times during the work. Spills will be reported to the Ontario Spills Action Center at 1-800-268-6060.

All waste generated during construction must be disposed of in accordance with MOE requirements.

The above mitigation measure will be implemented for any construction activity and will have to be identified and implemented in order to secure relevant agency permits (e.g. NVCA).

C. In consultation with the Township of Clearview and the Nottawasaga Valley Conservation Authority (NVCA) it was agreed that diversion of major flood flows to Mad River along Concession 3 will assist to prevent flooding of Avening. It should also be noted that during a major flood event that runoff spills to the Hamlet of Avening and ends up in the Mad River a short distance downstream of the proposed outlet on Concession 3. Improvements along Edward Street and at the Airport Road Culvert will ultimately reduce flooding potential of Avening.

7.1.2 Groundwater

Effect

A. Potential for localized groundwater quality impacts as a result of spills. The proposed project does not involve the taking of groundwater. No discharge is anticipated during construction activities.

B. Potential for localized impacts to well water supplies if any pumping is required during the construction process.

Mitigation

A. Refuelling of equipment and fuel storage should be conducted in designated areas with spill protection.

B. The location of water supply wells will be determined and assessed prior to any pumping. Mitigation will be developed on an individual basis with landowners to address each specific situation.

7.1.3 Fish and Fish Habitat

Effect

A. Fish habitat is not present within the drainage system where channel realignments, drain cleanouts and new culverts are proposed. Downstream fish habitats, including the natural watercourse at Airport Road and the Mad River, could experience potential water quality impairments (sediment loading; fuels and lubricants from machinery). In-water works will be undertaken at the edge of the Mad River to construct the outlet of the Concession 3 ditch and a headwall for the Mary Street storm sewer.

B. Diversion of major system runoff from the Ten Hill area may affect downstream fisheries and base flow contributions.

Mitigation

A. Channel realignments, cleanouts and installation of new culverts should take place during dry conditions when flow is not present, as described above. The fishery window of no in-water work between April 1 and July 1 will be respected. An NVCA permit will need to be sought and environmental monitoring be completed at the construction stage.

Sediment and erosion control measures (such as silt fence barriers, turbidity curtains, etc.) will be installed and maintained during the work phase and until the site has been stabilized. Control measures will be inspected daily to ensure they are functioning and are maintained as required. If control measures are not functioning properly, no further work will occur until the problem is resolved. All temporary erosion and sediment control measures will be installed in

accordance with recognized provincial standards. Extra silt fence/turbidity curtain will be on site, should additional sediment control be required.

Prevent any in-water operation of heavy equipment and minimize operation of the same on the banks of the watercourse. All equipment fuelling and maintenance will be done a safe distance from the edge of the water to ensure that no deleterious substances enter the water.

Any stockpiled material will be stored and stabilized away from the watercourse. All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance (i.e. petroleum products, silt, etc.) from entering the water. All disturbed areas of the work site should be stabilized immediately and re-vegetated as soon as conditions allow.

B. In consultation with NVCA it was agreed that base flow and runoff up to the 25-year event will be maintained to the tributary that crosses Airport Road south of Edward Street. Major events provide little in the way of clean cool water. There will be no loss in riparian base flow downstream.

7.1.4 Vegetation, Wildlife/Habitat

Effect

A. Minor loss of vegetation/Habitat loss due to site clearing at the new outlet to the Mad River. Only a narrow vegetation strip is present along the river at the outlet location. No impact to Species At Risk, or their associated habitats, is anticipated.

Mitigation

A. Minimize disturbance to existing vegetation. Disturbed areas will be stabilized and re-vegetated upon project completion and restored to a pre-disturbed state. Topsoil will be stockpiled separately and used for restoration to facilitate natural regeneration of native species. Should the proponent encounter a Species At Risk at any time during the project, they should contact Environment Canada – Ontario Region and the Ministry of Natural Resources (MNR) for advice on how to proceed.

7.1.5 Soils and Contamination

Effect

A. A waste disposal site is located on Edward St. E, east of Mary St. Soils from this site have the potential to be contaminated.

Mitigation

A. If soils are to be moved or removed from the water disposal site or its vicinity, soils should be tested for contaminant levels. If soils are contaminated, they will be disposed of in accordance with Part XV.1 of the Environmental Protection Act and Ontario Regulation 153/04, Records of Site Condition. MOE's Barrie District Office will be contacted if contaminated soils are present.

7.1.6 Noise/Vibration/Air Quality

Effect

A. Temporary nuisance noise during construction activities. Increased dust in air from construction activities.

Mitigation

A. Noise control measures, such as restricted hours of operation, the use of appropriate machinery/mufflers, will be implemented where required. Vehicles/machinery and equipment should be in good repair, equipped with emission controls, as applicable, and operated within regulatory requirements. If required, dust control measures may include the wetting of surfaces using a non-chloride based compound to protect water quality.

7.1.7 Archaeology/Heritage

Effect

A. Potential to expose items of archaeological interest, however project is predominantly located in previously disturbed area.

Mitigation

A. A Stage 1 Archaeological Assessment may be required in undisturbed areas. Should human remains be identified during operation, all works in the vicinity of the discovery will be suspended immediately. Notification will be made to the Ontario Provincial Police or local police, who will conduct a site investigation. Should other cultural heritage values be identified during operations, all activity in the vicinity of the recovery will be suspended and the Ministry of Culture Archaeologist will be contacted.

7.1.8 Human Health and Safety

Effect

A. Potential safety hazard from construction activities, heavy equipment and increased traffic.

Mitigation

A. The contactor will be required to implement a Health and Safety Plan (OHSA 1990).

7.1.9 Utilities and Storage Tanks

Effect

A. Potential to impact underground transmission lines and other underground infrastructure and storage tanks, resulting in potential damage or spills.

Mitigation

A. Utility companies will be contacted regarding any potential underground infrastructure. All utilities will be located prior to any construction activities. Individual landowners will be contacted regarding the location of underground storage tanks. If any tanks are identified in the construction area, the integrity of the tank will be assessed and a spills response plan will be prepared. The MOE Spills Action Centre in the Barrie District will be contacted in the event of a spill.

7.1.10 Traffic Management

Effect

A. Potential disruption to local traffic during construction activities.

Mitigation

A. If required, a traffic management plan will be prepared for the project.

8.0 Follow-up Commitments

The completion of the Municipal Class EA Process does not mean that a project can proceed directly. There are details, beyond the scope of a Schedule B undertaking that must be expanded upon by the Township before the project can proceed.

8.1 Permits and Approvals

The Township will be required to secure all necessary permits and/or authorizations required for the project. The following applications and additional consultation should be undertaken:

- Application for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Permit from NVCA;
- Consultation with NVCA to confirm that fish habitat is not present in the existing drainage system and that Fisheries Act authorization is not required;
- Archaeological Clearance from MOC, and,
- Certificate of Approval, Ministry of Environment for storm sewer on Mary Street and Concession 3.

8.2 Monitoring

The following activities should occur before construction:

- Preparation of an erosion and sediment control plan;
- An on-site review with the contractor of his installed environmental protection measures before construction begins. At this time the importance of maintaining these measures can be stressed with the contractor; and,
- Photo documentation of existing conditions at the site to provide a comparison of the baseline environmental conditions to post construction conditions.

During the construction phase the following monitoring activities are required:

- Maintenance and fuelling of construction equipment well away (i.e. 30m +) from any water or drainage courses;
- Stockpiling of fill, granulars, topsoil and other materials away from drainage courses in allocated storage areas. These materials should be enveloped by silt control fence or other measures as appropriate to control sediment and erosion;
- Maintain limited and controlled access of construction equipment in and around environmentally sensitive areas such as watercourses and other naturalized areas;
- Control of potential dust and noise particularly near existing residential properties; and,
- On-going monitoring and maintenance of the pre-construction environmental protection measures.

During the period following construction, monitoring of the environmental mitigation measures should continue to ensure that they are functioning as intended. Some of the post-construction monitoring activities include:

- A review of the sediment and erosion controls to ensure that they are operating properly;
- All new vegetation and natural restoration must continue to be watered and monitored during the contractor's maintenance period;
- Maintenance of the sediment and erosion control measures during the period immediately following construction until vegetative restoration and ground cover has established; and,
- A comparison of the environmental impacts outlined in this Class EA regarding aquatic and terrestrial impacts versus the actual conditions in the field. This is to ensure that no unforeseen impacts are taking place.

9.0 Public Consultation

9.1 Public Consultation Process

Public consultation is a key component of the Municipal Class EA process. Agencies, which may have been interested in the proposed project, received a Notice of Study Commencement. These agencies were asked to comment on the following: their required level of involvement in this Class EA study, how this Class EA study might affect their mandated areas of responsibility, and how their concerns or comments could be addressed. The following departments/agencies received the commencement notice:

Federal
- Indian and Northern Affairs Canada;
- Environment Canada; and,
- Department of Fisheries and Oceans.

Provincial
- County of Simcoe;
- Ministry of Aboriginal Affairs;
- Ministry of Agriculture, Food and Rural Affairs;
- Ministry of Culture;
- Ministry of Education;
- Ministry of Energy and Infrastructure;
- Ministry of Environment;
- Ministry of Municipal Affairs and Housing;
- Ministry of Natural Resources;
- Ministry of Transportation;
- Ontario Provincial Police; and,
- Simcoe Muskoka District Health Unit.

First Nations
- Beausoleil First Nation;
- Chippewas of Georgina Island;
- Chippewas of Mnjikaning First Nation (Rama);
- Curve Lake First Nation;
- Hiawatha First Nation;
- Mississaugas of Scugog Island First Nation;
- Moose Deer Point First Nation;
- Saugeen Ojibway Nation;
- Whata Mohawk Territory;
- Wasauksing First Nation; and,
- Union of Ontario Indians.

Other
- Nottawasaga Valley Conservation Authority; and,
- Niagara Escarpment Commission.

A complete list of agency contacts is provided in **Appendix D1**.

The Notice of Study Commencement (NOC) was published on September 8 and 15, 2006 in the Stayner Sun and the Creemore Echo. This notice provided a brief introduction to the study and encouraged interested individuals to contact the Project Team directly for more information. The NOC was also sent to all property owners within the study area. The NOC letter to agencies and the newspaper advertisement are provided in **Appendices D2** and **D3**.

9.2 Summary of Issues and Resolutions

The following comments and study team responses have been received:

- Clearview Planning Coalition Inc (November 27, 2009 and December 8, 2009); and,
- Hasketon Ventures (January 27, 2010).

Copies of the correspondence with the above agencies and stakeholders are provided in **Appendix D4**. Burnside's responses are included both in **Appendix D4** and incorporated within this report.

9.3 Public Information Centres

At their own discretion, Clearview Township decided to hold two Public Information Centres ("PIC"s) for this EA. Notification of each PIC was sent to applicable agencies and all stakeholders within the study area, and was published in the Stayner Sun and Creemore Echo prior to the PIC (September 8 and 15, 2006) and (June 15, 21 and 22 2007). The PICs were held on September 28, 2006 from 4:00 p.m. to 8:00 p.m. and June 28, 2007 from 4:00 p.m. to 8:00 p.m. at the Creemore Arena and Community Center. The preferred alternative was presented at Township Council on November 23, 2009.

A total of 27 people attended the first PIC. The study team received comments from 7 stakeholders following the PIC (presentation boards and comment forms are provided in **Appendix D5**). A summary of comments received is provided below:

- Issues with high ground water in the spring and sump pumps working excessively.
- Clean out of ditches along roadways and County Road 9.
- Keeping ditches within Town owned land.
- Concerns about diversion of drainage onto private lands.
- Concerns about existing tile drainage.
- Concerns about flooding in the spring time following snow melt.

A total of 12 people attended the second PIC. The study team received comments from 1 stakeholder following the PIC.

A stakeholder requested a plan of the final preferred solution that the Notice of Completion will support. This information will be provided upon filing the Notice.

Several additional meetings (November 13, 2007, December 19, 2007, June 10, 2008, November 5, 2008, and November 23, 2009) were held with key stakeholders and landowners following the second PIC to discuss alternatives for proposed drainage patterns and agree on a final plan that would be supported by the landowners. A draft final plan was agreed to in principle by Mr. Jardine and Mr. Nash at the Creemore Arena on October 8, 2009.

The PIC Notices, display materials, PowerPoint presentation, comments received and responses given are provided in **Appendix D5 and D6**.

9.4 Notice of Completion

The Notice of Completion for this Municipal Class EA will be prepared and published in two editions of the Stayner Sun and Creemore Echo. The Notice will also be mailed to all agencies and stakeholders that had expressed an interest in the project.

If concerns arise regarding this project which cannot be resolved in discussion with Clearview Township, a person or party may request that the Minister of Environment make an Order for the project to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order), which addresses individual Environmental Assessments. Requests must be received by the Minister within 30 calendar days of the Notice.

If the Minister does not receive Part II orders regarding this project, then the project will continue forward to detailed design, approvals processes, and implementation of the preferred design.

10.0 Sign-Off

Written by:

Signature _____ Date July 16, 2010
Tricia Radburn, BSc.
Environmental Planner
R.J. Burnside & Associates Limited

Reviewed by:

Signature _____ Date July 16, 2010
Daniel R. Miller P.Eng.
Senior Water Resources Engineer and Manager
R.J. Burnside & Associates Limited

Approved by:

Signature _____ Date July 16, 2010
Don McNalty, P.Eng.
V.P. Municipal Sector, Central Ontario
R.J. Burnside & Associates Limited

11.0 References

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Appendix A

East Creemore Master Drainage Plan

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CELEBRATING 1970-2010 40 YEARS

Creemore East
Master Drainage Plan Report

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Prepared for:

Township of Clearview

July 2010

File No: MCG107700

The material in this report reflects best judgement in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. R.J. Burnside & Associates Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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1.0 Introduction

The following Master Drainage Plan report accompanies the July 2010 Creemore East Drainage Environmental Assessment Report, and provides supplementary discussion regarding drainage details. The site location is provided in F**igure 1**.

2.0 Existing Watershed Hydrology

2.1 Rainfall Data

The 6, 12, and 24-hour SCS Type-II as well as the 4-hour Chicago Storm rainfall distributions were used for the 1:2, 1:5, 1:10, 1:25, 1:50 and 1:100 year storm event calculations. The Regional storm event is based on the Timmins storm. The SCS and Chicago storm distributions were developed from recorded rainfall data collected by Environment Canada's Atmospheric Environment Service and summarized in the Owen Sound Intensity-Duration-Frequency (IDF) tables as per Clearview Township recommendations. When comparing flows generated by the 6, 12 and 24-hour SCS Type-II and the 4-hour Chicago Storm Distributions, the 6-hour SCS Type-II storm distribution has been determined to generate the highest peak flows and as a result has been used for design purposes.

2.2 Time of Concentration

The Uplands Method was used to calculate the time of concentration for the study area. The time of concentration is a function of "time to peak" which represents the time from the beginning of rainfall to the peak of the runoff hydrograph. It is indicative of the basin's response to storm events. It depends on the physical characteristics of the watershed such as length, slope, area and surface cover. Estimates of time to peak were determined using the area's time of concentration determined by computing a travel time of an overland flow component and, where applicable, a channel/pipe travel time and then adding the respective travel times together. This established the time of concentration for the area. The required overland flow lengths and slopes were determined from the topographic mapping.

2.3 Soil Conditions and Ground Cover

According to the Simcoe County Soils map, prepared for the Department of Agriculture in 1959, there are three soil types pre-dominant within the study area. **Table 1** lists the soils conditions within the confines of the individual catchment boundaries along with their corresponding Ministry of Transportation (MTO) Hydrologic Soil Group classification:

Table 1: Soils Characteristics

Existing Catchment	Area (ha)	Hydrologic Soil Group
1a AGR	48.72	A
1b AGR	49.02	A
2 AGR	2.60	A
	46.96	BC
2 COM	2.75	A
2 IND	4.86	A
3 AGR	2.60	A
	32.32	BC [1]
3 RES	6.40	BC [1]
4 AGR	1.50	A
	117.18	BC [1]
4 COM	1.38	BC [1]
4 RES	2.20	BC [1]
5 RES	6.30	A
5 AGR	94.81	A
6 AGR	27.60	A
EXT1	9.12	A

[1] Note: soils located in Catchments 3 and 4 having Osprey-Dunedin composition have been assumed to have Hydraulic Soils Group of BC. It has been assumed that since the individual soils, Osprey and Dunedin have hydraulic soil groups of A and D respectively, an average hydraulic soil group of BC will be used for calculation purposes.

The majority of the soils located within the study area are located within the Hydrologic Soil Group A classification as seen in **Table 1**. Soils falling in this range generally provide excellent drainage characteristics and promote infiltration. These soils qualities can be witnessed during minor rainfall events as a large portion of the storm water runoff is infiltrated.

The Runoff Curve Number for the individual drainage areas have been computed by calculating weighted curve numbers based on the corresponding land use and soil type. A summary of these calculations for each drainage area is included in **Appendix A1**.

2.4 Land Use Patterns

Land use patterns of individual catchment areas have been determined by field investigations and aerial photography. As illustrated on the existing conditions drainage plan on **Figure 2**, farmland/crop occupies a significant portion of each catchment area. It should be noted there are small commercial and industrial parcels present at the westerly limits of the study area fronting Mary Street and Edward Street. These areas have been defined and used in the SWMHYMO hydrologic model to accurately represent existing drainage conditions.

2.5 Existing Conditions Hydrologic Analysis and Results

By establishing watershed boundaries, soil conditions and land use patterns, existing conditions flows have been determined using the SWMHYMO Hydrologic Model. Pre-development flows have been determined for the 2-year, 5-year, 10-year, 25-year, 50-year, 100-year and Regional storm events. These flows are summarized at individual flow nodes and the output is summarized in **Table 2** below:

Table 2: Pre-Development/Existing Condition Peak Flows

Flow Node	Total Area (ha)	Peak Flows to Flow Nodes (6-hour SCS Type-II Storm Distribution)						
		2 yr. (m^3/s)	5 yr. (m^3/s)	10 yr. (m^3/s)	25 yr. (m^3/s)	50 yr. (m^3/s)	100 yr. (m^3/s)	Regional (m^3/s)
		SCS	SCS	SCS	SCS	SCS	SCS	Timmins
EXT1 & Catchment 2	66.29	0.697	0.951	1.193	1.543	1.823	2.118	3.576
2	163.58	0.997	1.765	2.367	3.207	3.883	4.590	9.027
3	229.87	1.350	2.322	3.091	4.155	5.010	5.904	12.346
4	278.59	1.465	2.463	3.272	4.391	5.289	6.226	14.529
5	327.61	1.665	2.751	3.638	4.882	5.881	6.915	16.803
9 [1]	101.10	0.605	0.994	1.296	1.710	2.043	2.390	4.897
8 [1]	27.63	0.109	0.193	0.258	0.349	0.423	0.500	1.248

[1] Note that Nodes 9 and 8 assume there is no overflow from the upstream watercourses.

A flow schematic has been prepared for existing conditions, and is provided in **Figure 3**. The SWMHYMO runs and peak catchment flows for the 6-hour SCS Type-II storm distributions are included in **Appendix A1**. A digital version of the SWMHYMO model is also enclosed, and is provided in **Appendix A4**.

2.6 Proposed Hydrology

2.6.1 General

Due to the lack of existing infrastructure, there is an opportunity to develop multiple means of conveyance and future infrastructure to improve drainage conditions. By assuming that all future developments will attenuate post-development flow to pre-development rates, the existing condition hydrologic model was modified to generate alternatives by which flow may be directed through the study area's road networks and lot fabrics.

A total of 4 alternatives have been examined to determine the most beneficial approach to improving the existing drainage conditions while also preparing to service future developing areas.

2.6.2 Analysis of Alternatives

Two ultimate discharge points are present at the southerly limits of the study area, namely the natural watercourse (tributary of the Mad River) currently discharging under Airport Road at the easterly limits of Creemore, and the Mad River through a variety of discharge locations. By initially establishing the discharge locations, alternatives have been created by collectively grouping land parcels together to determine and compare timing and magnitudes of peak flows. The timing and magnitude of peak flows influence the infrastructure required to convey such flows to the ultimate discharge points and associated impacts and costs associated with creating such infrastructure can be developed.

As outlined previously, the approach to creating alternatives has assumed that all future developments will attenuate post-development flow to pre-development rates. As such, the existing condition hydrologic model has been utilized and modified to generate these alternatives.

2.6.3 Hydrologic Model Assumptions

As a condition for draft plan approval, the Township is in negotiations with Alliance Homes to dedicate space for and construct an easement for safe conveyance of drainage from upstream lands. Alliance Homes is also to provide storm water overcontrol prior to discharge into Township lands. As such, this study was developed with the understanding Alliance Homes catchment (2W) and north external area (EXT1) will be overcontrolled 100-year post-development to 5-year existing conditions ($0.951m^3/s$) at a SWM facility at the SE corner of catchment 2W. Preliminary design estimates a total of $11,000m^3$ of storage volume will be required.

We are under the understanding EXT2, MARY, and MRYEXT catchments will be conveyed external to the study area by the Mary Street storm sewer.

Catchments 5, 6, and 7 will be assumed developed but not quantity controlled. Existing conditions has been assumed for all remaining areas since post-development is to equal existing conditions flow.

3.0 Evaluation of Design Alternatives for Achieving the Preferred Solution

Hydrologic modeling was used as part of the evaluation of four proposed drainage alternatives. It should be noted several downstream catchment and flow node naming conventions for proposed conditions are slightly different than the existing conditions. The four proposed drainage alternatives are shown in **Figure 4**, and are presented below:

3.1 Alternative 1

- This alternative maintains the existing flow direction generated at the northern study limits by conveying runoff from the Ten Hills Area (Catchment 4) and Catchment 3 to the easterly limit of the Gordon farm (Alliance Homes Development) southerly to the Edward Street right-of-way and further east through a proposed easement to the

existing Airport Road culvert (Flow Node 5). Development areas south of Edward Street will be conveyed via channel or pipe southerly to the Mad River.

- This alternative retains use of existing easements along road ROWs. However, the SWM infrastructure required as a result of the amount of conveyance required to Concession 3 was determined to be costly.

3.2 Alternative 2

- This alternative is similar to Alternative 1 with the exception of a new Edward Street culvert that will direct the flow along half-lot lines to the existing Airport Road crossing. Unlike Alternative #1, proposed development areas north of Edward Street will also be directed east to the Airport Road crossing.
- Similar to alternative 1, this alternative was originally developed with the intention of facilitating future stormwater drainage for the property south of Edward Street, west of Airport Road. Since development of this parcel is no longer included in this study, additional work needed for acquisition of land and grading of a drainage ROW would not be necessary.

3.3 Alternative 3

- Alternative 3 directs the majority of storm water runoff southerly to the Mad River via Airport Road. Catchments east of Concession 3 will be directed to Airport Road. All remaining catchments are to be conveyed south along Concession 3 to the Mad River.
- This alternative was originally developed with the intention of facilitating future stormwater drainage for the property south of Edward Street, west of Airport Road. Since development of this parcel is no longer included in this study, additional work needed for acquisition of land and grading of a drainage ROW would not be necessary.

3.4 Alternative 4

- Alternative 4 directs storm water runoff from the Southern Conveyance to the Mad River via Concession 3. The majority of this drainage will be piped, with the remainder conveyed by ditching along the right-of-way. The Eastern Conveyance drains a portion of external drainage from the north easterly along Edward Street to outlet at the existing Airport Road crossing. Any excess external drainage will be redirected south to the Southern Conveyance.
- This alternative maintains drainage along road ROWs, minimizes drainage easements, and minimizes discharge rates of the proposed Alliance Homes post-development peak flow. By constructing a storm sewer and ditching along Concession 3, this additional capacity accepts additional spill flows from Airport Road drainage in excess of the 25-year storm to prevent uncontrolled spills across private property. The use of this additional stormsewer infrastructure permits safe conveyance of the existing Airport Road crossing up to the 100-year design storm.

3.5 Preferred Design

The basis for considering the alternatives have been to determine the most optimal solution to improving the drainage conditions within the study area while considering feasibility, social and environmental impacts and the natural flow of runoff. The alternative designs were the subject of studies and consultations conducted over the past four years, and are included to indicate the range of options considered. As Alternatives 1 through 3 have since been determined to be unfeasible based on insufficient capacity and/or property ownership issues, there will be no further evaluation of these alternatives. Based on correspondence with affected property owners and Township staff, it has since been determined Alternative 4 is the desired and remaining feasible solution.

Alternative 4 effectively conveys runoff by maximizing existing drainage patterns and the proposed storm sewer southerly along Concession 3 to the Mad River will improve drainage to existing available outlets.

3.5.1 Preferred Alternative (Alternative #4)

The preferred alternative is denoted by two major conveyances as shown on **Figures 5** and **6** and detailed below. A flow schematic has been prepared for proposed conditions, and is provided in **Figure 7**.

3.5.1.1 Eastern Conveyance

This conveyance is formed in the upstream reaches by Alternative #4 Catchments 4, 3, and 2E.

The Eastern Conveyance begins along the north ditch of County Road 9, through the 1.65m x 3.30m open box culvert to an easement along the east perimeter of the Alliance Homes property, south to Edward Street East. Peak flow from the combined areas up to approximately the 25-year storm ($3.237m^3/s$) is proposed to drain east along the north side of Edward Street East, through the existing Edward Street culvert, and east along the existing natural watercourse to the Airport Road culvert crossing.

The hydraulic model HEC-RAS was used for the existing 1500mm dia. CSP Airport Road crossing culvert. Based on existing structure and topography up to the existing conveyance capacity, the Airport Road crossing culvert has a capacity of approximately $1.27m^3/s$, or less than the 2-year design storm before overflowing onto the adjacent residence and south along the Airport Road ROW.

Should peak flow exceed the culvert capacity with a raised berm (discussion follows in **Section 3.5.3**), overflow will be directed south along the Airport Road west ROW ditch to Sideroad 6/7. The west ROW spill will be conveyed using existing ditching so no further work is proposed along the west ROW. Downstream of the Airport Road crossing, the existing watercourse is assumed to provide sufficient capacity for the existing culvert capacity of $1.27m^3/s$. Therefore, any residual will flow south along a new east ROW ditch to Sideroad 6/7. A summary of the Eastern Conveyance ditch dimensions are provided in T**able 3** below and in **Appendix A1**:

Table 3: Summary of Eastern Conveyance Ditch Dimensions

Reach	Top Width	Depth of Flow	Bottom Width	3.0m Maintenance Access Required?
Alliance Homes East Easement	6.1	1.2	1.25	Yes, unless adjacent road provided by Alliance
Elizabeth Street to Edward Street	6.1	1.2	1.25	No
Along Edward Street	5.8	1.2	1.00	No
Edward Street to Airport Road Culvert	6.6	1.2	1.80	Yes
Airport Road East ROW to Sideroad 6/7	5.2	1.2	0.40	No

3.5.1.2 Southern Conveyance

The Southern Conveyance originates at the Alliance Homes SWM Pond outlet and the conveyance is provided by a 750mm dia. sewer to Edward Street. East Conveyance drainage from Catchments 4, 3, and 2E above 3.237m^3/s (approximately the 25-year flow) will be diverted at the Edward Street-Concession 3 crossing via an overflow weir and custom ditch inlet catchbasin structure along with the Alliance Homes and the north Alliance Homes external area to a 1200mm dia. concrete storm sewer from Edward Street to Sideroad 6/7 (sized to 1.744m^3/s based on minimum 0.2% grade). The sewer will likely be located along the centreline of the roadway and be fitted with maintenance tees for access.

The Alliance and McIntosh properties (within Catchment 2W) are to be drained down Concession 3 to the Mad River; however, the determination of the exact location of this pipe between Edward Street and Concession 3 will not be finalized under the East Creemore Drainage Study. Once the Municipal Class EA process is complete, the Township will meet with landowners to secure necessary lands or easements to undertake the works.

All remaining subcatchments west of Concession 3 and south of Alliance Homes (Catchments 5, 6, 7) will be conveyed by overland flow to a Concession 3 west ROW ditch and connect to the storm sewer system via a series of ditch inlet catchbasins.

Catchment 8 is proposed to be conveyed to Concession 3 by ditch flow only. The 1200mm dia. storm sewer pipe will be sized to maximize the underground conveyance, with the roadside ditch design to accommodate excess flows. Alignment of the South Conveyance has not been confirmed; however, the Township is in the process of consulting with landowners along Concession 3 to seek sufficient ROW for ditch conveyance. A summary of the Concession 3 ditch dimensions are provided in **Table 4.**

Table 4: Summary of Southern Conveyance Ditch Dimensions

Reach	Top Width	Depth of Flow	Bottom Width	3.0m Maintenance Access Required?
Elizabeth to Edward (Node 6)	4.3	0.85	0.90	No
Edward to George (Node 7)	3.6	0.85	0.20	No
George to Sideroad 6/7 (Node 8)	3.9	0.85	0.50	No
Sideroad 6/7 to Mad River	4.85	1.00	0.85	No

The Southern Conveyance storm sewer is proposed to terminate at the Concession 3-Sideroad 6/7 intersection, whereby the outfall is combined with the west ditch and conveyed south to the Mad River. South of Sideroad 6/7, the downstream ditch to the Mad River will be designed to outlet the combined ditch/pipe 100-year peak flow of 3.041m^3/s. As summarized in **Table 4** above, this can be conveyed by a 4.85m top-width trapezoidal ditch at 0.67% grade. Concession 3 terminates at Mad River at an elevation of 246.3m, as reported in the *November 2004 Existing Infrastructure Review - Water Resources* report.

Design calculations for the preferred alternative are provided in **Appendix A1**.

3.5.1.3 Mary Street Improvements

Mary Street would be improved from its current road side ditches and various culverts and pipes to a typical urban section with curbs, gutters, and storm sewer with a new outlet to the Mad River (similar to the outlet recently built on Mill Street).

3.5.1.4 Additional Catchment 9 Drainage Area

The lands east of Concession 3 and north of Sideroad 6/7 (denoted by proposed Catchment 9) were removed from this study; however, the land naturally drains southeast to the Airport Road – Sideroad 6/7 intersection. If developed, the property owners will ensure quality and quantity requirements for stormwater management are met.

3.5.2 Alternative #4 Flow Summary

The SWMHYMO model results are summarized in **Table 5**.

Table 5: Preferred Alternative Peak Flow Summary

Design Storm	2-Year (m^3/s)	5-Year (m^3/s)	10-Year (m^3/s)	25-Year (m^3/s)	50-Year (m^3/s)	100-Year (m^3/s)	Timmins Regional (m^3/s)
Eastern Conveyance (Edward Street to Airport Road East)							
Node 2	0.997	1.765	2.367	3.207	3.883	4.590	9.027
Node 2b	1.045	1.848	2.478	3.357	4.064	4.804	9.509
Node 4	1.180	2.079	2.783	3.711	3.973	4.317	6.111
Node 5	1.315	2.310	3.091	4.153	4.591	5.131	8.026
Airport Road West ROW	0.174	0.497	0.762	1.272	1.504	1.790	4.025
d/s of Airport Road Culvert	1.141	1.813	2.329	2.881	3.087	3.341	4.001
Existing Watercourse	1.141	1.270	1.270	1.270	1.270	1.270	1.270
Airport Road East ROW	0.000	0.543	1.059	1.611	1.817	2.071	2.731
To Avening	0.174	1.040	1.821	2.883	3.321	3.861	6.756
Southern Conveyance (Concession 3 to Mad River)							
Pond Outflow	0.356	0.496	0.595	0.727	0.828	0.932	0.951
Node 6	0.621	0.846	1.007	1.215	1.730	2.582	10.015
Node 7	0.777	1.074	1.287	1.566	1.819	2.659	10.284
Node 8 Surface	0.109	0.193	0.258	0.349	0.497	1.393	9.732
Node 8 Total	0.787	1.091	1.311	1.602	2.156	3.041	11.476

As summarized above, Eastern Conveyance flows for all design events up to and including the 100-year storm will be reduced in the post-development condition. To mitigate the diversion of Eastern Conveyance flows to Concession 3, a 1200mm dia. concrete sewer is proposed to ensure existing conditions surface flows are piped up to the 25-year design storm. Road and driveway crossings over proposed ditching will be designed to provide weir conveyance for flows in excess of the 25-year design pipe up to the 100-year design storm.

3.5.3 Effect on Downstream Properties

By diverting Eastern Conveyance flows above the 25-year storm to Concession 3 and by better utilizing the Airport Road crossing, an overall reduction of flows from the Airport Road crossing south to the community of Avening is expected. This demonstrates the preferred alternative will reduce existing flood risk currently experienced by homeowners along Airport Road south to the community of Avening. It should also be noted the timing of peak flows from the study area will be offset from the timing of localized sources of flooding as most drainage from the study area to Avening is from undeveloped areas upstream of the study area.

3.5.4 Existing Crossing Culverts

There are four existing crossings of significance within the study area. Each existing culvert is summarized below:

- The County Road 9 crossing just east of Alliance Homes is a 1.65m x 3.3m open box culvert.
- The west Edward Street crossing (440m east of Concession 3) is a 450mm dia. CSP and appears to be ineffective.
- The east Edward Street crossing (450m west of Airport Road) is a 600mm dia. CSP.
- Based on existing structure and topography, the existing 1500mm dia. CSP culvert at Airport Road has a capacity of approximately 1.27m^3/s (less than the 2-year design storm) before overflowing onto the adjacent residence and south along the Airport Road ROW.

3.5.5 Proposed Culvert Locations

As discussed earlier, various infrastructure improvements will be required to ensure proper conveyance for the Alternative #4 concept. Both the County Road 9 and County Road 42 (Airport Road) culvert crossings have been designed to the 25-year design storm without overtopping as per County of Simcoe standards. Additionally, proposed ditching downstream of the Airport Road crossing provides safe passage of large flows from overtopping Airport Road (County Road 42).

The County Road 9 crossing appears to be in good condition, and based on the design of the downstream Edward Street crossing is of sufficient hydraulic capacity, provided regular inspection and clean-out maintenance is performed.

Ditching along the north Edward Street ROW will be completed along with road regrading to eliminate the possibility of spilling. The west crossing (existing 450mm dia. CSP) will be removed, while the east crossing (existing 600mm dia. CSP) will be replaced by triple 900mm dia. CSPs. Refer to **Appendix A3** for CulvertMaster design calculations.

Independent of the alternatives being considered, several crossing structure alternatives were proposed for the Airport Road culvert crossing at Flow Node 5. Ultimately, the Township has decided to retain the existing culvert with berming to develop sufficient head to maximize the capacity of the culvert. The hydraulic model HEC-RAS was used for the Airport Road crossing culvert, and is provided in **Appendix A3**.

Since the driveway at the residence southwest of the crossing regularly experiences overtopping, an earthen berm is proposed along the perimeter of the property line to prevent floodwaters from spilling into the residence and south along the Airport Road west ROW. The berm will be 1.0m wide at the base with 2:1 embankment slope to match existing grade. At the eastern-most section of the berm adjacent to the Airport Road crossing, two 600mm dia. culverts will be installed to permit runoff along the Airport Road west ROW. A 5.0m wide trapezoidal overflow weir will also be constructed at this location to direct any high flows between 245.90m and 246.20m south.

These measures will create a split flow to maximize the amount of runoff away from the bermed area thereby minimizing flood risk to the existing residence, and to direct any

additional overflow conveyance along Airport Road. At a berm height of 246.20m, the 1500mm dia. culvert capacity will be increased to enable safe conveyance of the 100-year design storm prior to breaching the 246.20m berm elevation. **Table 7** below shows the split flow comparison between the existing conditions and the proposed 246.20m berm:

Table 7: HEC-RAS Airport Road Proposed Culvert Crossing Comparison

Peak Flow Results	Upstream Regional Storm Total Flow (100-year) (m^3/s)	Regional Storm Flow Through Culvert (100-year) (m^3/s)	Regional Storm Flow South (100-year) (m^3/s)	Regional Storm Water Surface Upstream of Culvert (100-year) (m)
Existing Conditions Single 1500mm dia. CSP without Berm	16.803 (6.915)	2.159 (1.788)	14.636 (5.123)	245.69 (245.56)
Alt #4 Single 1500mm dia. CSP with Berm	8.026 (5.131)	3.921 (3.327)	4.025 (1.790)	246.29 (246.14)

Note: existing conditions flow (and Alternative #4 flow under the Regional Storm) is limited by the lack of existing ditch capacity. Elevations above the weir height 246.20m are conservatively high, as these are based on ponding elevations of available cross-section geometry.

Additional options considered included replacement with a larger capacity culvert(s). Ultimately, the Township decided to utilize the existing culvert.

East of Airport Road crossing – Downstream of the Airport Road crossing, the natural watercourse either continues approximately 5km downstream along a poorly-defined channel easterly to the Minesing Swamp before discharging to the Mad River. As a result of culvert upgrades to increase the Airport Road crossing conveyance, the downstream watercourse through to its outlet at Mad River may require additional hydraulic capacity to prevent further downstream flooding and erosion. Should the Township consider this alternative, further consultation and study will be required for design of this additional reach.

Additionally, minor drainage areas within the South Conveyance will be routed to the Concession 3 storm sewer via ditch inlet catchbasins. Several driveway crossings and minor road crossings will be required depending on the final alignment of the ditching, and will be designed in the detailed design stage.

3.5.6 Construction Phasing

It is envisaged that the portion of the East Conveyance from Edward Street to Airport Road and south will be completed first. The project will start at the downstream section and progress upstream. The Township has not determined whether to construct the East Conveyance of the east side of the Alliance Lands if that project has not proceeded at the time the Township implements the balance of the East Conveyance. The East

Conveyance downstream of the Alliance Lands can still be constructed regardless of the status of the Alliance Lands conveyance.

Design and construction of the Southern Conveyance will be detailed after properties adjacent to Concession 3 are secured. Construction will start from the Mad River and progress upstream, ending with a storm sewer extension to the Alliance Homes SWM outlet pipe.

3.5.7 Cost Estimate

Most of the proposed drainage improvements will be along the Township ROWs. The Township, following distribution of the Project File Report, will begin negotiations to secure adjacent property along Concession 3 due to the wider ROW required for the proposed South Conveyance.

The Township is to secure the property along Alliance Lands in the Subdivision Agreement with the developer. Prior to development of the Alliance property, the developer will be paying the capital cost of constructing the East Conveyance on the east side of the Alliance property as will be set out in the future Subdivision Agreement as per Draft Plan conditions. After construction, Alliance Homes would transfer the deed to the Municipality to own and maintain.

Preliminary cost estimate for the preferred Alternative #4 is estimated to be $1,300,000. Note that the capital costs for construction of the Alliance property easement are not included.

Maintenance costs are estimated to be $7,000 annually. For ditches, this comprises occasional ditch inspection and cleanout. For storm sewer maintenance, the annual estimate includes an annual visit inspecting the physical condition and removal of sediment. The cost estimate is provided in **Appendix A4**.

4.0 Closing

This Creemore East Master Drainage Plan Report provides the technical background information in support of the July 2010 Community of Creemore Municipal Class Environmental Assessment (Schedule B) Profile File Report for Works Undertaken within a Watercourse for the Purpose of Flood Control.

Upon completion of this study, the Township and County will seek to secure adjacent lands to meet proposed ROW widths. This will allow all drainage infrastructure to be managed by the Township of Clearview, with the exception of the County Road 9 and County Road 42 (Airport Road) crossings and ditches which will be maintained by the County of Simcoe.

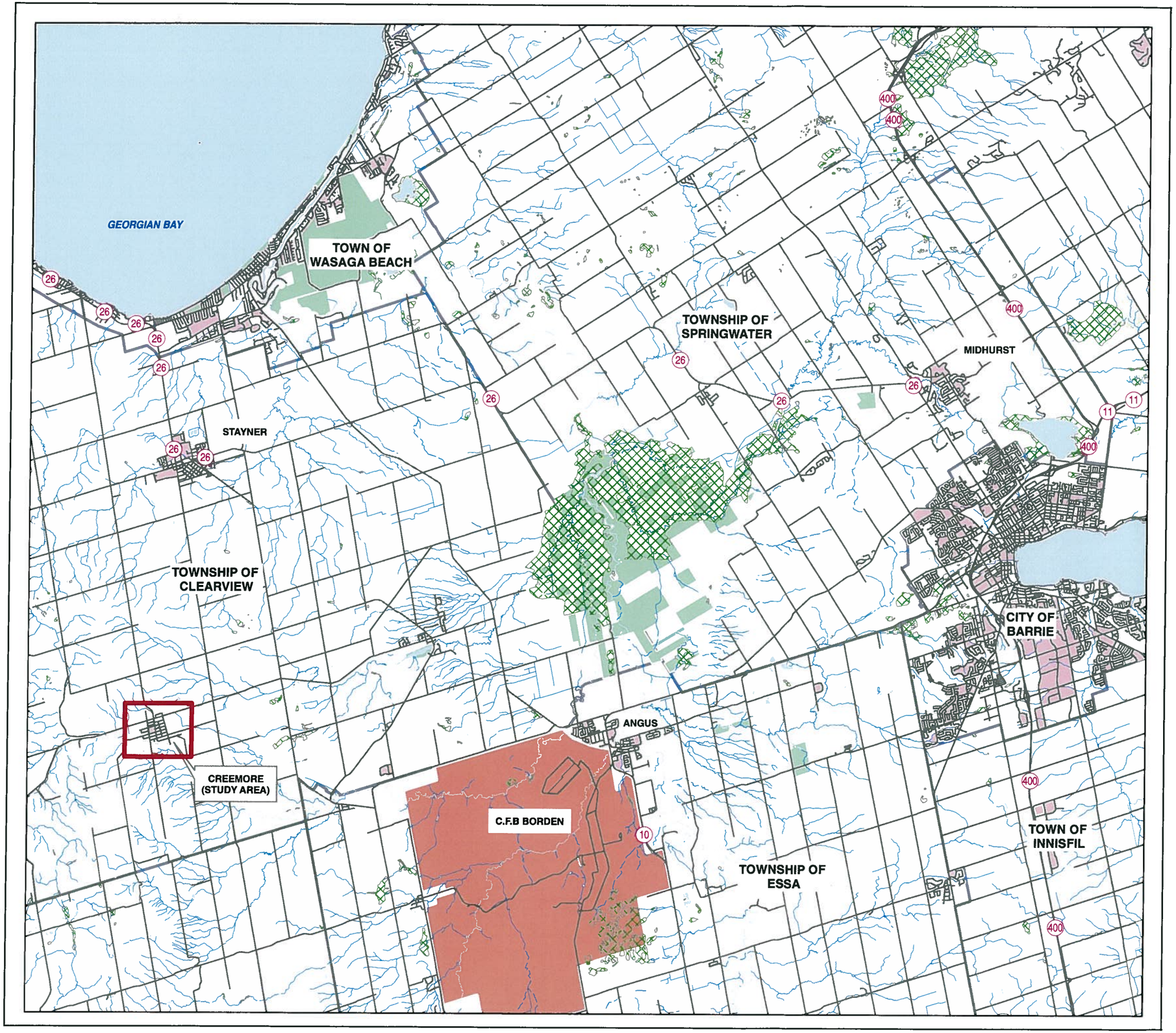


FIGURE 1

TOWNSHIP OF CLEARVIEW

CREEMORE DRAINAGE STUDY

LOCATION PLAN

Legend

- Study Area
- Waterbody: Lake / Pond / River
- Seasonally Flooded Area
- Wetland / Swamp / Bog
- Provincial Park
- Built-Up Area: Urban / Sub-Urban
- National Defence Land

Credit: Base Data Supplied by the Ontario Ministry of The Environment

N

0 5 10

Kilometers

Scale: 1:150,000
Date: March, 2010

Projection: UTM Zone 17
Datum: NAD 83

Project: MCG10770
Prepared By: Anthony Jay

Verified By: Dan Miller

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F:\GIS\projects\MCG\10770\Map\Cartography\Figure1CreemoreDrainageStudy.mxd

FIGURE 2

TOWNSHIP OF CLEARVIEW
CREEMORE ONTARIO
CREEMORE EAST DRAINAGE STUDY

EXISTING DRAINAGE PLAN

LEGEND
- APPROXIMATE STUDY AREA OUTLINE
- FLOW DIRECTION
- CATCHMENT BOUNDARY
- 3 / 45ha — CATCHMENT ID / DRAINAGE AREA
- EAST CATCHMENT
- MARY STREET CATCHMENT
- SOUTH CATCHMENT

FAIR GROUNDS RD
COUNTY ROAD 42 (AIRPORT ROAD)
COUNTY ROAD 9
SITE BOUNDARY
FLOW NODE 1
FLOW NODE 2
FLOW NODE 3
FLOW NODE 5
FLOW NODE 7
FLOW NODE 8
4 — 122.25
3 — 41.32
EXT1 — 9.12
2 — 57.17
1a — 48.72
MRYEXT — 7.63
EXT2 — 1.54
1b — 49.02
MARY — 24.57
6 — 27.63
5 — 101.11
JARDINE CRES.
MARY ST.
FRANCES ST E
OLDWOOD ST.
EDWARD ST.
GEORGE ST.
CONCESSION 3
CREEMORE
MAD RIVER
AVENING

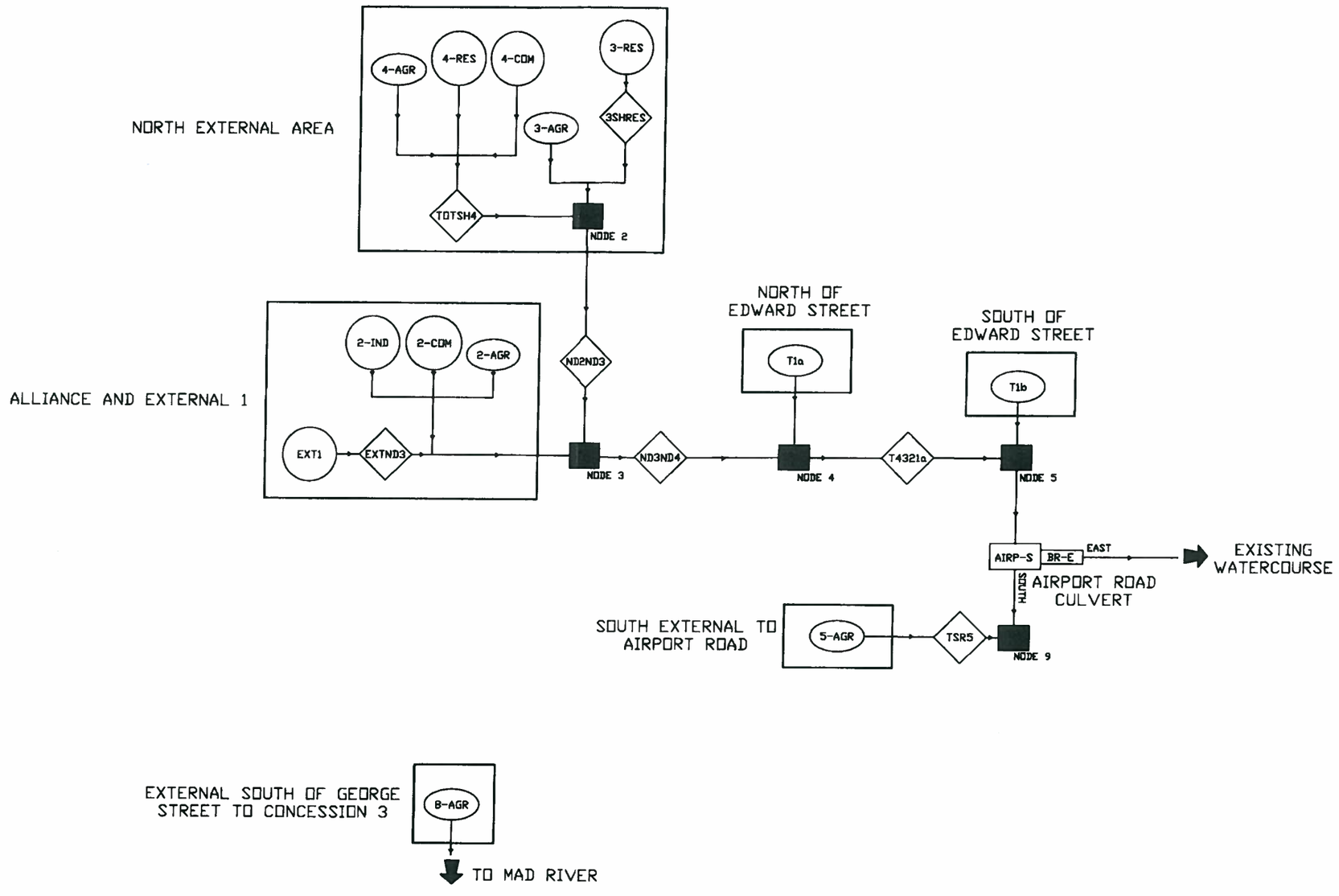
N

0 10 20 30 40 50 60 70 80
Metres

Scale N.T.S.
Month 2010
Project Number: MCG10770
Prepared by: K.B.
Projection: UTM Zone 7
Datum: NAD77
Verified by: D.R.M.

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MCG10770-FIGURE 4.1.dwg



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2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.

3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

4. Do not scale the drawings.

No.	Issue / Revision	Date

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Client
TOWNSHIP OF CLEARVIEW

BOX 200
217 GIDEON STREET
STAYNER, ONTARIO
L0M 1S0

Drawing Title
CREEMORE EAST DRAINAGE STUDY

EXISTING CONDITIONS
DRAINAGE SCHEMATIC

Drawn By	Checked By	Drawing No.
K.B.		FIG3
Scale	Project No.	
N.T.S.	MCG 10770	

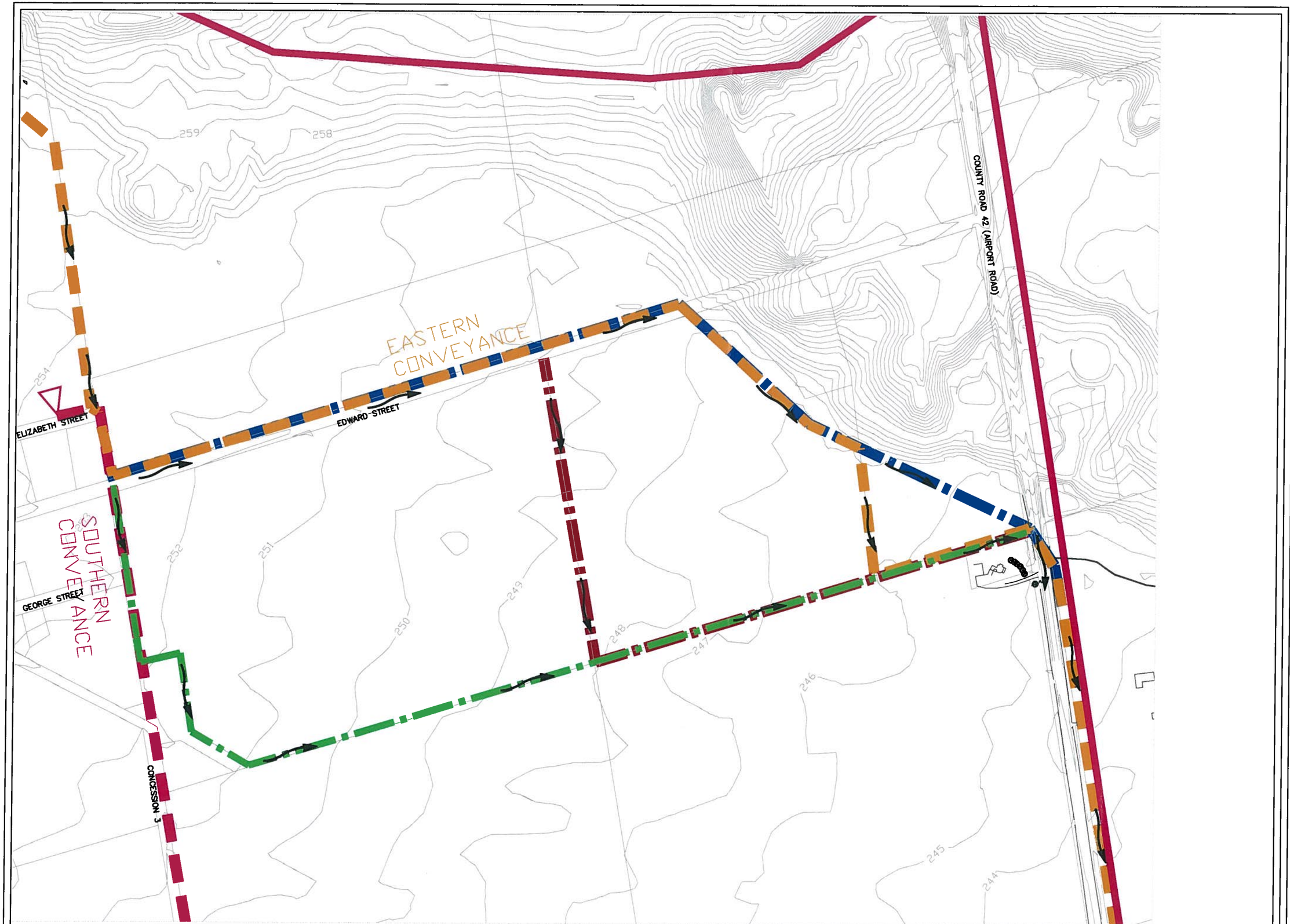


FIGURE 4

TOWNSHIP OF CLEARVIEW
CREEMORE ONTARIO
CREEMORE EAST DRAINAGE STUDY

PROPOSED OUTLET ALTERNATIVES

LEGEND

- APPROXIMATE SITE OUTLINE
- ALTERNATIVE #1 CHANNEL ALIGNMENT
- ALTERNATIVE #2 CHANNEL ALIGNMENT
- ALTERNATIVE #3 CHANNEL ALIGNMENT
- ALTERNATIVE #4 EASTERN CONVAYANCE CHANNEL ALIGNMENT
- ALTERNATIVE #4 SOUTHERN CONVEYANCE CHANNEL ALIGNMENT

N

0 10 20 30 40 50 60 70 80
Metres

Scale 1:2500
Month: MARCH 2010
Project Number: MCG10770
Projection: UTM Zone 7
Datum: NAD77
Prepared by: K.B.
Verified by: D.R.M.

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MCG10770-FIGURE 4.1.dwg

FIGURE 5

TOWNSHIP OF CLEARVIEW
CREEMORE ONTARIO
CREEMORE EAST DRAINAGE STUDY

PREFERRED ALTERNATIVE

PROPOSED DRAINAGE IMPROVEMENTS
MINOR SYSTEM DRAINAGE

LEGEND

- APPROXIMATE STUDY AREA OUTLINE
- MINOR SYSTEM FLOW DIRECTION (UP TO 25yr)
- CATCHMENT BOUNDARY
- CATCHMENT ID
- DRAINAGE AREA
- EASTERN CONVEYANCE (CHANNEL FLOW)
- SOUTH CONVEYANCE (PIPE)
- MAD RIVER HAZARD (SHEET FLOW)
- MARY STREET CONVEYANCE (PIPE)
- SOUTH EAST (SHEET FLOW)

FAIR GROUNDS RD
COUNTY ROAD 42 (AIRPORT ROAD)
COUNTY ROAD 9
SITE BOUNDARY
CREEMORE
MAD RIVER
AVENING
JARDINE CRES.
FRANCES ST E
MARY ST
EDWARD ST.
OLD MILL RD
CONCESSION 3

4 — 122.26
3 — 41.32
2E — 9.72
1a — 48.72
1b — 39.77
2W — 39.51
6 — 4.79
EXT1 — 9.12
EXT2 — 1.54
MRYEXT — 7.63
MARY — 20.56
5 — 3.15
8 — 27.63
7 — 9.80ha
9 — 100.54

ROAD ELEV=284.0m
DITCH ELEV=282.3m
EX.ELEV=257.5m
PR.ELEV=255.8m
EX.ELEV=253.0m
PR.ELEV=251.3m
EX.ELEV=256.2m
PR.ELEV=255.0m
EX.ELEV=248.3m
PR.ELEV=246.8m
ROAD ELEV=245.0m
PR.ELEV=243.5m
EX.ELEV=249.4m
PR.ELEV=247.9m

FLOW NODE 1
FLOW NODE 2
FLOW NODE 3
FLOW NODE 4
FLOW NODE 5
FLOW NODE 6
FLOW NODE 7
FLOW NODE 8

LOCAL IMPROVEMENT TO SEND FLOW ON EAST SIDE OF FAIRGROUNDS ROAD TO WEST SIDE
CLEAN OUT EXISTING DITCH WORK WITH COUNTY
CLEAN OUT EXISTING DITCH TO IMPROVE CULVERT CAPACITY
FLOW SPLITTER
IMPROVE EXISTING CULVERTS
EASTERN CONVEYANCE
SOUTHERN CONVEYANCE
LOCAL DRAINAGE IMPROVEMENT
OUTLET TO MAD RIVER

N

0 10 20 30 40 50 60 70 80
Metres

Scale N.T.S.
Month 2010
Project Number: MCG10770
Projection: UTM Zone 7
Datum: NAD77
Prepared by: K.B.
Verified by: D.R.M.

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MCG10770-FIGURE 4.1.dwg

FIGURE 6

TOWNSHIP OF CLEARVIEW
CREEMORE ONTARIO
CREEMORE EAST DRAINAGE STUDY

PREFERRED ALTERNATIVE

PROPOSED DRAINAGE IMPROVEMENTS
MAJOR SYSTEM DRAINAGE

LEGEND

- APPROXIMATE STUDY AREA OUTLINE
- MINOR SYSTEM FLOW DIRECTION
- MAJOR SYSTEM FLOW DIRECTION
- CATCHMENT BOUNDARY
- 3 / 45ha — CATCHMENT ID / DRAINAGE AREA
- TEN HILL / JARDINE MAJOR SYSTEM TO SOUTH MAJOR CONVEYANCE
- TEN HILL / JARDINE FLOWS LESS THEN 25 YRS TO EASTERN CONVEYANCE
- ALLIANCE OVER CONTROL / GEORGE STREET TO PIPE ON CONC 3
- MAD RIVER HAZARD LANDS (SHEET FLOW)
- SOUTHEAST SHEET FLOW
- MARY STREET CONVEYANCE (ROAD SURFACE) FOR MAJOR FLOWS

FAIR GROUNDS RD
COUNTY ROAD 42 (AIRPORT ROAD)
COUNTY ROAD 9
SITE BOUNDARY
CREEMORE
MAD RIVER
AVENING
LOCAL IMPROVEMENT TO SEND FLOW ON EAST SIDE OF FAIRGROUNDS ROAD TO WEST SIDE
CLEAN OUT EXISTING DITCH WORK WITH COUNTY
CLEAN OUT EXISTING DITCH TO IMPROVE CULVERT CAPACITY
FLOW SPLITTER
IMPROVE EXISTING CULVERTS
LOCAL DRAINAGE IMPROVEMENT
OUTLET TO MAD RIVER
EASTERN CONVEYANCE
SOUTHERN CONVEYANCE
FLOW NODE 1
FLOW NODE 2
FLOW NODE 3
FLOW NODE 4
FLOW NODE 5
FLOW NODE 6
FLOW NODE 7
FLOW NODE 8
ROAD ELEV=264.0m
DITCH ELEV=262.3m
EX.ELEV=257.5m
PR.ELEV=253.8m
EX.ELEV=253.0m
PR.ELEV=251.3m
EX.ELEV=248.3m
PR.ELEV=246.8m
ROAD ELEV=245.0m
PR.ELEV=243.5m
EX.ELEV=256.2m
PR.ELEV=255.0m
EX.ELEV=249.4m
PR.ELEV=247.9m
4 — 12.26
3 — 41.32
2E — 9.72
1a — 48.72
1b — 39.77
2W — 39.51
EXT1 — 9.12
EXT2 — 1.54
MRYEXT — 7.63
MARY — 20.56
5 — 3.15
6 — 4.79
7 — 9.80ha
8 — 27.63
9 — 100.54

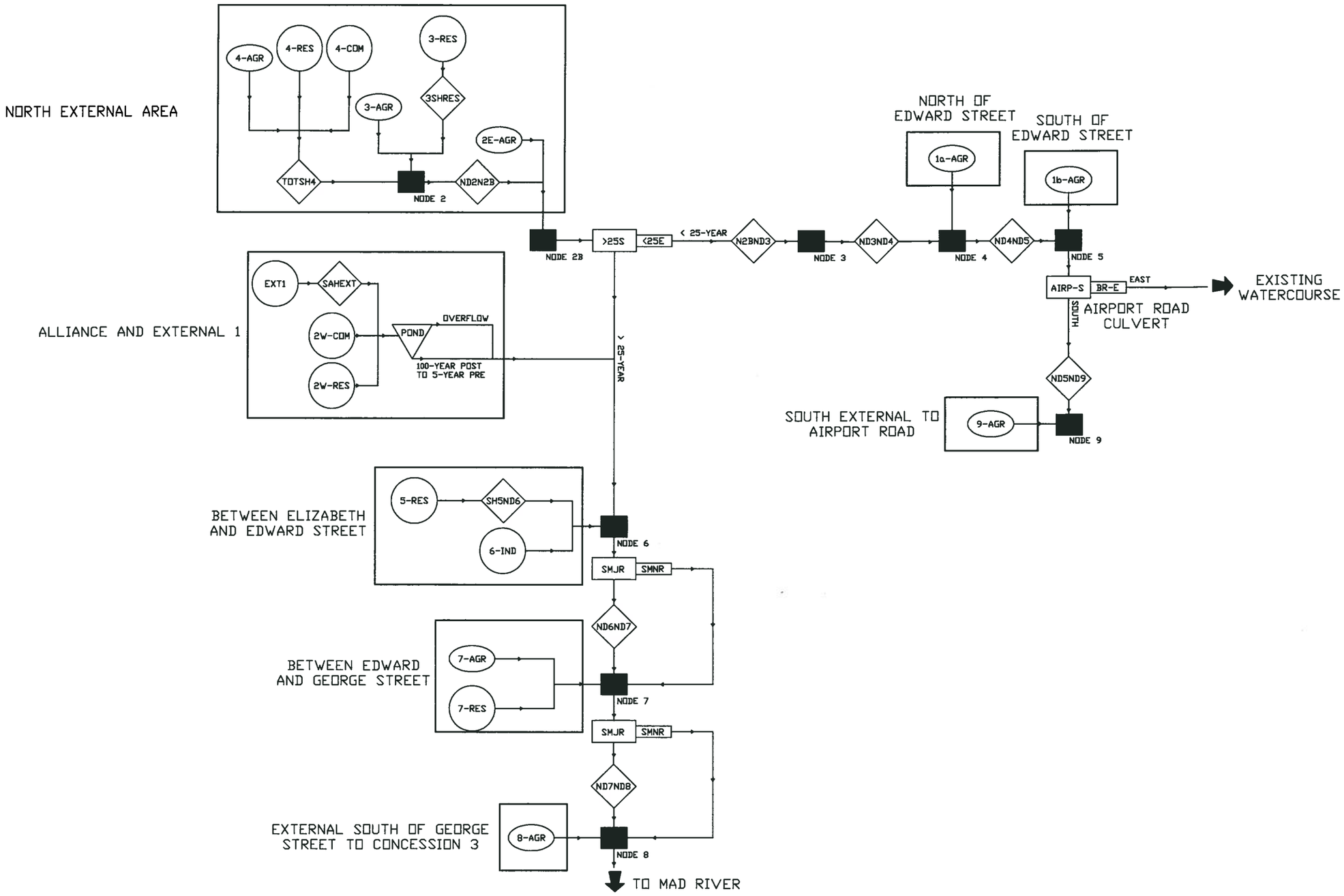
N

0 10 20 30 40 50 60 70 80
Metres

Scale N.T.S.
Month 2010
Project Number: MCG10770
Prepared by: K.B.
Projection: UTM Zone 7
Datum: NAD77
Verified by: D.R.M.

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MCG10770-FIGURE 4.1.dwg



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No.	Issue / Revision	Date

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Client
TOWNSHIP OF CLEARVIEW

BOX 200
217 GIDEON STREET
STAYNER, ONTARIO
L0M 1S0

Drawing Title
CREEMORE EAST DRAINAGE STUDY

PREFERRED ALTERNATIVE DRAINAGE SCHEMATIC

Drawn By	Checked By	Drawing No.
K.B.	I.H.C.	FIG7
Scale: N.T.S.	Project No. MCC 10770	

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Appendix A1 – Design Calculations

- Existing Conditions Hydrology
- Alternative #4 Hydrology
- Alternative #4 Design Calculations

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Existing Conditions Hydrology

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	20-Jan-2010

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SWMHYMO INPUT TABLE - EXISTING CONDITION

AREA No.	AREA (ha)	CN/CCN	XIMP	TIMP	Tp (hr)	Iaper	SLPP	LGP	MNP	Iaimp	SLPI	LGI	MNI
Catchment #4 - Agricultural Land Use	118.68	66	N/A	N/A	0.91	8.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #4 - Commercial Land Use	1.55	71	0.90	0.90	N/A	5.0	2.00	5	0.250	2.0	2.00	35	0.013
Catchment #4 - Residential Land Use	2.20	71	0.30	0.50	N/A	5.0	6.00	50	0.250	2.0	1.50	120	0.013
Catchment #3 - Agricultural Land Use	34.92	66	N/A	N/A	0.82	8.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #3 - Jardine Crescent Residential	6.40	71	0.30	0.40	N/A	5.0	6.67	45	0.250	2.0	1.49	370	0.013
Alliance Homes External Area #1 Residential	9.19	44	0.30	0.40	N/A	5.0	1.8	40	0.250	2.0	0.8	400	0.013
Catchment #2 - Agricultural Land Use	49.56	66	N/A	N/A	0.91	8.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #2 - Commercial Land Use	2.75	44	0.90	0.90	N/A	5.0	0.5	20	0.250	2.0	0.5	245	0.013
Catchment #2 - Industrial Land Use	4.86	44	0.75	0.75	N/A	5.0	0.5	20	0.250	2.0	0.5	70	0.013
Catchment #1a - Agricultural Land Use	45.72	66	N/A	N/A	0.49	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #1b - Agricultural Land Use	49.02	66	N/A	N/A	1.21	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #5 - Residential Land Use	6.97	44	0.30	0.40	N/A	5.0	1.0	50	0.250	2.0	0.5	534	0.013
Catchment #5 - Agricultural Land Use	94.81	66	N/A	N/A	1.39	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #6 - Agricultural Land Use	27.83	66	N/A	N/A	1.70	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

AREA	The total catchment area (ha)
CN/CCN	The composite SCS Curve Number for NASHYD commands, and the pervious SCS Curve Number for STANDHYD commands
XIMP	The ratio of the directly connected impervious area
TIMP	The ratio of the total impervious area
Tp	The time of peak of the unit hydrograph (hrs)
Iaper	The composite initial abstraction for NASHYD commands, and the pervious intial abstraction for STANDHYD commands (mm)
SLPP	The average pervious surface slope over which runoff travels (%)
LGP	The average lot depth or pervious length over which surface water travels along the longest flow path (m)
MNP	The representative roughness coefficient for the pervious surface over which water travels before reaching the street or sewer system
Iaimp	The impervious initial abstraction for STANDHYD commands (mm)
SLPI	The average impervious surface slope over which runoff travels (%)
LGI	The impervious travel length of the longest flow path (m)
MNI	The average roughness coefficient for the impervious surface over which water travels

Project Name: Creemore East Drainage Study
Project No: MCG 10770
Location: Creemore, ON
Designer: T. Lozon
Date: 18-Jun-2007
Date Modified: 20-Jan-2010

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SWMHYMO SHIFT INPUT TABLE
Existing Condition

Catchment	TLAG(min)
Node 1 to Node 2-SHIFT	31.7
Catchment #3 Residential-SHIFT	27.5
Alliance External to Node 3 - SHIFT	84.0
Node 2 to Node 3-SHIFT	42.5
Node 3 to Node 4-SHIFT	47.9
Node 4 to Node 5-SHIFT	25.2
Catchment 5 Residential-SHIFT	116.5

TLAG The Time LAG by which the inflow hydrograph is to be shifted (min)

W:\100113 SWMHYMO Existing MCG10770\[071029 EX CN, IA, Tp CALCS_10770.xls]Catchment6AGR

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #4 - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		1.5				
AB						
B						
BC		117.18				
C						
CD						
D						

Total area (ha):	118.7	Composite CN(I):	47		
Pervious area (ha):	118.7	Composite CN(II):	68	Composite Ia (mm):	8.0
Impervious area (ha):	0.0	Composite CN(III):	83		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	733	2317				3050
h_1 (m)	420	397				420
h_2 (m)	397	265				265
Δh (m)	23	132				155
Slope (%)	3.14	5.70				5.08
x	1.5	4.6				N/A
V (m/s)	0.27	1.10				N/A
Tc (min)	45.98	35.17				81.15
Tc (hr)	0.77	0.59				1.35
Tp (hr)	0.51	0.39				0.91

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #4 - Commercial Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				
AB				
B				
BC				0.138
C				
CD				
D				

Total area (ha):	1.4	Pervious CN(I):	51
Pervious area (ha):	0.1	Pervious CN(II):	71
Impervious area (ha):	1.2	Pervious CN(III):	85

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	5	Length (m)	35
h_1 (m)	N/A	h_1 (m)	N/A
h_2 (m)	N/A	h_2 (m)	N/A
Δh (m)	N/A	Δh (m)	N/A
Slope (%)	2.0	Slope (%)	2.0
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		90	90
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #4 - Residential Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				
AB				
B				
BC				1.32
C				
CD				
D				

Total area (ha):	2.2	Pervious CN(I):	51
Pervious area (ha):	1.3	Pervious CN(II):	71
Impervious area (ha):	0.9	Pervious CN(III):	85

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	50	Length (m)	120
h_1 (m)	N/A	h_1 (m)	N/A
h_2 (m)	N/A	h_2 (m)	N/A
Δh (m)	N/A	Δh (m)	N/A
Slope (%)	6.0	Slope (%)	1.5
Ia (mm)	5.0	Ia (mm)	2.0
Manninge n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		30	50
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Node 1 to Node 2-SHIFT

SWMHYMO Shifthyd Modelling Parameters

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	850					850
h_1 (m)	265.00					265
h_2 (m)	257.00					257
Δh (m)	8.00					8
Slope (%)	0.94					0.94
x	4.8					N/A
V (m/s)	0.45					N/A
Tc (min)	31.74					31.74

x = Land Cover Coefficient (see below)		
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #3 - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		2.6				
AB						
B						
BC		32.32				
C						
CD						
D						

Total area (ha):	34.9	Composite CN(I):	45		
Pervious area (ha):	34.9	Composite CN(II):	66	Composite Ia (mm):	8.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	930	811				1741
h_1 (m)	342	265				342
h_2 (m)	265	260				260
Δh (m)	77	5				82
Slope (%)	8.28	0.62				4.71
x	1.5	4.6				N/A
V (m/s)	0.43	0.36				N/A
Tc (min)	35.91	37.42				73.33
Tc (hr)	0.60	0.62				1.22
Tp (hr)	0.40	0.42				0.82

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #3 - Jardine Crescent Residential Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				
AB				
B				
BC				3.84
C				
CD				
D				

Total area (ha):	6.4	Pervious CN(I):	51
Pervious area (ha):	3.8	Pervious CN(II):	71
Impervious area (ha):	2.6	Pervious CN(III):	85

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	45	Length (m)	370
h_1 (m)	263	h_1 (m)	265.5
h_2 (m)	260	h_2 (m)	260
Δh (m)	3	Δh (m)	5.5
Slope (%)	6.7	Slope (%)	1.5
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		30	40
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
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Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #3 Residential-SHIFT

SWMHYMO Shifthyd Modelling Parameters

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	487					487
h_1 (m)	259.00					259
h_2 (m)	257.00					257
Δh (m)	2.00					2
Slope (%)	0.41					0.41
x	4.6					N/A
V (m/s)	0.29					N/A
Tc (min)	27.53					27.53

x = Land Cover Coefficient **(see below)**

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Alliance Homes External Area #1 Residential Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				5.47
AB				
B				
BC				
C				
CD				
D				

Total area (ha):	9.1	Pervious CN(I):	25
Pervious area (ha):	5.5	Pervious CN(II):	44
Impervious area (ha):	3.7	Pervious CN(III):	64

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	40	Length (m)	400
h_1 (m)	258	h_1 (m)	261.5
h_2 (m)	257.5	h_2 (m)	258.5
Δh (m)	0.5	Δh (m)	3
Slope (%)	1.3	Slope (%)	0.8
Ia (mm)	5.0	Ia (mm)	2.0
Manningₛ n	0.25	Manningₛ n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		30	40
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
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Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
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Alliance External to Node 3 - SHIFT

SWMHYMO Shifthyd Modelling Parameters

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	975					975
h_1 (m)	258.00					258
h_2 (m)	253.00					253
Δh (m)	5.00					5
Slope (%)	0.51					0.51
x	2.7					N/A
V (m/s)	0.19					N/A
Tc (min)	84.04					84.04

x = Land Cover Coefficient **(see below)**

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #2 - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		2.6				
AB						
B						
BC		46.96				
C						
CD						
D						

Total area (ha):	49.6	Composite CN(I):	45		
Pervious area (ha):	49.6	Composite CN(II):	66	Composite Ia (mm):	8.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	1117					1117
h_1 (m)	262					262
h_2 (m)	254					254
Δh (m)	8					8
Slope (%)	0.72					0.72
x	2.7					N/A
V (m/s)	0.23					N/A
Tc (min)	81.47					81.47
Tc (hr)	1.36					1.36
Tp (hr)	0.91					0.91

x = Land Cover Coefficient (see below)

x = 0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
2.3	Short grass pasture (overland flow)
2.7	Cultivated Straight row (overland flow)
3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
4.6	Grassed Waterway
6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
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Catchment #2 - Commercial Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				0.275
AB				
B				
BC				
C				
CD				
D				

Total area (ha):	2.8	Pervious CN(I):	25
Pervious area (ha):	0.3	Pervious CN(II):	44
Impervious area (ha):	2.5	Pervious CN(III):	64

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	20	Length (m)	245
h_1 (m)	N/A	h_1 (m)	N/A
h_2 (m)	N/A	h_2 (m)	N/A
Δh (m)	N/A	Δh (m)	N/A
Slope (%)	0.5	Slope (%)	0.5
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		90	90
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #2 - Industrial Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				1.215
AB				
B				
BC				
C				
CD				
D				

Total area (ha):	4.9	Pervious CN(I):	25
Pervious area (ha):	1.2	Pervious CN(II):	44
Impervious area (ha):	3.6	Pervious CN(III):	64

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	20	Length (m)	70
h_1 (m)	N/A	h_1 (m)	N/A
h_2 (m)	N/A	h_2 (m)	N/A
Δh (m)	N/A	Δh (m)	N/A
Slope (%)	0.5	Slope (%)	0.5
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		75	75
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
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Location:	Creemore, ON
Designer:	T. Lozon
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Node 2 to Node 3-SHIFT

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	820					820
h_1 (m)	257.00					257
h_2 (m)	253.00					253
Δh (m)	4.00					4
Slope (%)	0.49					0.49
x	4.6					N/A
V (m/s)	0.32					N/A
Tc (min)	42.54					42.54

x = Land Cover Coefficient **(see below)**		
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #1a - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			48.72			
AB						
B						
BC						
C						
CD						
D						

Total area (ha):	48.7	Composite CN(I):	45		
Pervious area (ha):	48.7	Composite CN(II):	66	Composite Ia (mm):	7.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	Total
Length (m)	873					873
h_1 (m)	263					263
h_2 (m)	249					249
Δh (m)	14					14
Slope (%)	1.60					1.60
x	2.7					N/A
V (m/s)	0.34					N/A
Tc (min)	42.55					42.55
Tc (hr)	0.71					0.71
Tp (hr)	0.48					0.48

x = Land Cover Coefficient (see below)

0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
2.3	Short grass pasture (overland flow)
2.7	Cultivated Straight row (overland flow)
3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
4.6	Grassed Waterway
6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Node 3 to Node 4-SHIFT

SWMHYMO Shifthyd Modelling Parameters

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	888					888
h_1 (m)	253.00					253
h_2 (m)	249.00					249
Δh (m)	4.00					4
Slope (%)	0.45					0.45
x	4.6					N/A
V (m/s)	0.31					N/A
Tc (min)	47.94					47.94

x = Land Cover Coefficient **(see below)**

x =		
	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Node 4 to Node 5-SHIFT

SWMHYMO Shifthyd Modelling Parameters

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	578					578
h_1 (m)	249.00					249
h_2 (m)	245.00					245
Δh (m)	4.00					4
Slope (%)	0.69					0.69
x	4.6					N/A
V (m/s)	0.38					N/A
Tc (min)	25.17					25.17

x = Land Cover Coefficient **(see below)**

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
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Catchment #1b - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			49.02			
AB						
B						
BC						
C						
CD						
D						

Total area (ha):	49.0	Composite CN(I):	45		
Pervious area (ha):	49.0	Composite CN(II):	66	Composite Ia (mm):	7.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	1352					1352
h_1 (m)	253					253
h_2 (m)	245					245
Δh (m)	8					8
Slope (%)	0.59					0.59
x	2.7					N/A
V (m/s)	0.21					N/A
Tc (min)	108.49					108.49
Tc (hr)	1.81					1.81
Tp (hr)	1.21					1.21

x = Land Cover Coefficient (see below)		
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #5 - Residential Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				3.78
AB				
B				
BC				
C				
CD				
D				

Total area (ha):	6.3	Pervious CN(I):	25
Pervious area (ha):	3.8	Pervious CN(II):	44
Impervious area (ha):	2.5	Pervious CN(III):	64

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	50	Length (m)	534
h_1 (m)	N/A	h_1 (m)	N/A
h_2 (m)	N/A	h_2 (m)	N/A
Δh (m)	N/A	Δh (m)	N/A
Slope (%)	1.0	Slope (%)	0.5
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		30	40
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
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Location:	Creemore, ON
Designer:	T. Lozon
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Catchment #5 - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			94.81			
AB						
B						
BC						
C						
CD						
D						

Total area (ha):	94.8	Composite CN(I):	45		
Pervious area (ha):	94.8	Composite CN(II):	66	Composite Ia (mm):	7.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	1542					1542
h_1 (m)	253					253
h_2 (m)	244					244
Δh (m)	9					9
Slope (%)	0.58					0.58
x	2.7					N/A
V (m/s)	0.21					N/A
Tc (min)	124.59					124.59
Tc (hr)	2.08					2.08
Tp (hr)	1.39					1.39

x =	Land Cover Coefficient (see below)	
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
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Date:	18-Jun-2007
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Catchment 5 Residential-SHIFT

SWMHYMO Shifthyd Modelling Parameters

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	1542					1542
h_1 (m)	253.50					253.5
h_2 (m)	243.20					243.2
Δh (m)	10.30					10.3
Slope (%)	0.67					0.67
x	2.7					N/A
V (m/s)	0.22					N/A
Tc (min)	116.46					116.46

x = Land Cover Coefficient (see below)		
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
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Catchment #6 - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			27.6			
AB						
B						
BC						
C						
CD						
D						

Total area (ha):	27.6	Composite CN(I):	45		
Pervious area (ha):	27.6	Composite CN(II):	66	Composite Ia (mm):	7.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	1040					1040
h_1 (m)	255					255
h_2 (m)	249					249
Δh (m)	6					6
Slope (%)	0.58					0.58
x	1.5					N/A
V (m/s)	0.11					N/A
Tc (min)	152.14					152.14
Tc (hr)	2.54					2.54
Tp (hr)	1.70					1.70

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

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Alternative #4 Hydrology

Project Name: Creemore East Drainage Study
Project No: MCG 10770
Location: Creemore, ON
Designer: T. Lozon
Date: 18-Jun-2007
Date Modified: 20-Jan-2010

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SWMHYMO INPUT TABLE - ALTERNATIVE #4

AREA No.	AREA (ha)	CN/CCN	XIMP	TIMP	Tp (hr)	Iaper	SLPP	LGP	MNP	Iatmp	SLPI	LGI	MNI
Catchment #4 - Agricultural Land Use	116.68	68	N/A	N/A	0.91	8.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #4 - Residential Land Use	2.20	71	0.30	0.50	N/A	5.0	6.00	50	0.250	2.0	1.50	120	0.013
Catchment #4 - Commercial Land Use	1.38	71	0.90	0.90	N/A	5.0	2.00	5	0.250	2.0	2.00	35	0.013
Catchment #3 - Agricultural Land Use	34.92	68	N/A	N/A	0.82	8.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #3 - Jardine Crescent Residential	6.40	71	0.30	0.40	N/A	5.0	6.67	45	0.250	2.0	1.49	370	0.013
Catchment #2E - Agricultural Land Use	9.72	68	N/A	N/A	0.70	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #2W - Commercial Land Use	2.60	44	0.90	0.90	N/A	5.0	0.5	20	0.250	2.0	0.5	245	0.013
Catchment #2W - Residential Land Use	36.91	44	0.00	0.00	N/A	5.0	2.0	20	0.250	2.0	0.6	700	0.013
Alliance Homes External Area #1 Residential	9.12	44	0.30	0.40	N/A	5.0	1.25	40	0.250	2.0	0.75	400	0.013
Catchment #5 - Residential Land Use	3.15	44	0.30	0.50	N/A	5.0	2.0	20	0.250	2.0	0.5	250	0.013
Catchment #6 - Industrial Land Use	4.79	44	0.75	0.75	N/A	5.0	0.5	20	0.250	2.0	0.5	450	0.013
Catchment #7 - Agricultural Land Use	4.75	89	N/A	N/A	0.09	8.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #7 - Residential Land Use	5.05	44	0.30	0.50	N/A	5.0	1.0	20	0.250	2.0	0.5	475	0.013
Catchment #1a - Agricultural Land Use	48.72	68	N/A	N/A	0.74	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #1b - Agricultural Land Use	39.77	66	N/A	N/A	1.21	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #9 - Agricultural Land Use	100.54	68	N/A	N/A	1.36	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Catchment #8 - Agricultural Land Use	27.63	66	N/A	N/A	1.70	7.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

AREA The total catchment area (ha)
CN/CCN The composite SCS Curve Number for NASHYD commands, and the pervious SCS Curve Number for STANDHYD commands
XIMP The ratio of the directly connected impervious area
TIMP The ratio of the total impervious area
Tp The time of peak of the unit hydrograph (hrs)
Iaper The composite initial abstraction for NASHYD commands, and the pervious intial abstraction for STANDHYD commands (mm)
SLPP The average pervious surface slope over which runoff travels (%)
LGP The average lot depth or pervious length over which surface water travels along the longest flow path (m)
MNP The representative roughness coefficient for the pervious surface over which water travels before reaching the street or sewer system
Iatmp The impervious intial abstraction for STANDHYD commands (mm)
SLPI The average impervious surface slope over which runoff travels (%)
LGI The impervious travel length of the longest flow path (m)
MNI The average roughness coefficient for the impervious surface over which water travels

W:\100113 SWMHYMO ALT#4 MCG10770\[091112 ALT#4 CN, IA, Tp CALCS_10770.xls]Summary

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	20-Jan-2010

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SWMHYMO SHIFT INPUT TABLE
ALTERNATIVE #4

Catchment	TLAG (min)
Node 1 to Node 2 - SHIFT	31.7
Catchment #3 Residential to Node 2 - SHI	27.5
Node 2 to Node 2B - SHIFT	12.7
Node 2B to Node 3 - SHIFT	10.4
AllianceEXT to Pond - SHIFT	23.9
Catchment 5 to Node 6 - SHIFT	9.1
Node 6 to Node 7 - SHIFT	23.7
Node 7 - Node 8 SHIFT	38.7
Node 3 to Node 4-SHIFT	47.9
Node 4 to Node 5 SHIFT	27.3
Node 5 - Node 9 SHIFT	38.7

TLAG The Time LAG by which the inflow hydrograph is to be shifted (min)

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Catchment #4 - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		1.5				
AB						
B						
BC		117.18				
C						
CD						
D						

Total area (ha):	118.7	Composite CN(I):	47		
Pervious area (ha):	118.7	Composite CN(II):	68	Composite Ia (mm):	8.0
Impervious area (ha):	0.0	Composite CN(III):	83		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	733	2317				3050
h_1 (m)	420	397				420
h_2 (m)	397	265				265
Δh (m)	23	132				155
Slope (%)	3.14	5.70				5.08
x	1.5	4.6				N/A
V (m/s)	0.27	1.10				N/A
Tc (min)	45.98	35.17				81.16
Tc (hr)	0.77	0.59				1.35
Tp (hr)	0.51	0.39				0.91

x = Land Cover Coefficient (see below)

x = 0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
2.3	Short grass pasture (overland flow)
2.7	Cultivated Straight row (overland flow)
3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
4.6	Grassed Waterway
6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
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Catchment #4 - Commercial Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				
AB				
B				
BC				0.138
C				
CD				
D				

Total area (ha):	1.4	Pervious CN(I):	51
Pervious area (ha):	0.1	Pervious CN(II):	71
Impervious area (ha):	1.2	Pervious CN(III):	85

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	5	Length (m)	35
h_1 (m)	N/A	h_1 (m)	N/A
h_2 (m)	N/A	h_2 (m)	N/A
Δh (m)	N/A	Δh (m)	N/A
Slope (%)	2.0	Slope (%)	2.0
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		90	90
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #4 - Residential Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				
AB				
B				
BC				1.32
C				
CD				
D				

Total area (ha):	2.2	Pervious CN(I):	51
Pervious area (ha):	1.3	Pervious CN(II):	71
Impervious area (ha):	0.9	Pervious CN(III):	85

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	50	Length (m)	120
h_1 (m)	N/A	h_1 (m)	N/A
h_2 (m)	N/A	h_2 (m)	N/A
Δh (m)	N/A	Δh (m)	N/A
Slope (%)	6.0	Slope (%)	1.5
Ia (mm)	5.0	Ia (mm)	2.0
Manninge n	0.25	Manninge n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		30	50
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Node 1 to Node 2 - SHIFT

SWMHYMO Shifthyd Modelling Parameters

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	850					850
h_1 (m)	265.00					265
h_2 (m)	257.00					257
Δh (m)	8.00					8
Slope (%)	0.94					0.94
x	4.6					N/A
V (m/s)	0.45					N/A
Tc (min)	31.74					31.74

x =	Land Cover Coefficient (see below)	
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #3 - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		2.6				
AB						
B						
BC		32.32				
C						
CD						
D						

Total area (ha):	34.9	Composite CN(I):	45		
Pervious area (ha):	34.9	Composite CN(II):	66	Composite Ia (mm):	8.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	930	811				1741
h_1 (m)	342	265				342
h_2 (m)	265	260				260
Δh (m)	77	5				82
Slope (%)	8.28	0.62				4.71
x	1.5	4.6				N/A
V (m/s)	0.43	0.36				N/A
Tc (min)	35.91	37.42				73.33
Tc (hr)	0.60	0.62				1.22
Tp (hr)	0.40	0.42				0.82

x = Land Cover Coefficient (see below)

x = 0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
2.3	Short grass pasture (overland flow)
2.7	Cultivated Straight row (overland flow)
3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
4.6	Grassed Waterway
6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #3 - Jardine Crescent Residential Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				
AB				
B				
BC				3.84
C				
CD				
D				

Total area (ha):	6.4	Pervious CN(I):	51
Pervious area (ha):	3.8	Pervious CN(II):	71
Impervious area (ha):	2.6	Pervious CN(III):	85

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	45	Length (m)	370
h_1 (m)	283	h_1 (m)	285.5
h_2 (m)	280	h_2 (m)	280
Δh (m)	3	Δh (m)	5.5
Slope (%)	6.7	Slope (%)	1.5
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		30	40
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #3 Residential to Node 2 - SHIFT

SWMHYMO Shifthyd Modelling Parameters

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	487					487
h_1 (m)	259.00					259
h_2 (m)	257.00					257
Δh (m)	2.00					2
Slope (%)	0.41					0.41
x	4.6					N/A
V (m/s)	0.29					N/A
Tc (min)	27.53					27.53

x =	Land Cover Coefficient (see below)	
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	25-Jun-2009

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Catchment #2E - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			9.72			
AB						
B						
BC						
C						
CD						
D						

Total area (ha):	9.7	Composite CN(I):	45		
Pervious area (ha):	9.7	Composite CN(II):	66	Composite Ia (mm):	7.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	600					600
h_1 (m)	269					269
h_2 (m)	253					253
Δh (m)	16					16
Slope (%)	2.00					2.00
x	1.5					N/A
V (m/s)	0.21					N/A
Tc (min)	62.85					62.85
Tc (hr)	1.05					1.05
Tp (hr)	0.70					0.70

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
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Catchment #2W - Residential Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				18.455
AB				
B				
BC				
C				
CD				
D				

Total area (ha):	36.9	Pervious CN(I):	25
Pervious area (ha):	18.5	Pervious CN(II):	44
Impervious area (ha):	18.5	Pervious CN(III):	64

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	20	Length (m)	700
h_1 (m)	N/A	h_1 (m)	N/A
h_2 (m)	N/A	h_2 (m)	N/A
Δh (m)	N/A	Δh (m)	N/A
Slope (%)	2.0	Slope (%)	0.6
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway			
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #2W - Commercial Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				2.34
AB				
B				
BC				
C				
CD				
D				

Total area (ha):	2.6	Pervious CN(I):	25
Pervious area (ha):	2.3	Pervious CN(II):	44
Impervious area (ha):	0.3	Pervious CN(III):	64

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	20	Length (m)	245
h_1 (m)	N/A	h_1 (m)	N/A
h_2 (m)	N/A	h_2 (m)	N/A
Δh (m)	N/A	Δh (m)	N/A
Slope (%)	0.5	Slope (%)	0.5
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		90	90
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
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Node 2 to Node 2B - SHIFT

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	350					350
h_1 (m)	257.00					257
h_2 (m)	253.50					253.5
Δh (m)	3.50					3.5
Slope (%)	1.00					1.00
x	4.6					N/A
V (m/s)	0.46					N/A
Tc (min)	12.68					12.68

x = Land Cover Coefficient (see below)		
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	25-Jun-2009

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Node 2B to Node 3 - SHIFT

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	160					160
h_1 (m)	253.50					253.5
h_2 (m)	253.00					253
Δh (m)	0.50					0.5
Slope (%)	0.31					0.31
x	4.6					N/A
V (m/s)	0.26					N/A
Tc (min)	10.37					10.37

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Alliance Homes External Area #1 Residential Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				5.47
AB				
B				
BC				
C				
CD				
D				

Total area (ha):	9.1	Pervious CN(I):	25
Pervious area (ha):	5.5	Pervious CN(II):	44
Impervious area (ha):	3.7	Pervious CN(III):	64

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	40	Length (m)	400
h_1 (m)	258	h_1 (m)	261.5
h_2 (m)	257.5	h_2 (m)	258.5
Δh (m)	0.5	Δh (m)	3
Slope (%)	1.3	Slope (%)	0.8
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		30	40
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	25-Jun-2009

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AllianceEXT to Pond - SHIFT

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	700					700
h_1 (m)	258.00					258
h_2 (m)	253.50					253.5
Δh (m)	4.50					4.5
Slope (%)	0.64					0.64
x	6.1					N/A
V (m/s)	0.49					N/A
Tc (min)	23.85					23.85

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	25-Jun-2009

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Catchment #5 - Residential Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				1.575
AB				
B				
BC				
C				
CD				
D				

Total area (ha):	3.2	Pervious CN(I):	25
Pervious area (ha):	1.6	Pervious CN(II):	44
Impervious area (ha):	1.6	Pervious CN(III):	64

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	20	Length (m)	250
h_1 (m)	256	h_1 (m)	
h_2 (m)	255.6	h_2 (m)	
Δh (m)	0.4	Δh (m)	
Slope (%)	2.0	Slope (%)	0.5
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		30	50
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	25-Jun-2009

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Catchment 5 to Node 6 - SHIFT

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Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	250					250
h_1 (m)	255.50					255.5
h_2 (m)	253.00					253
Δh (m)	2.50					2.5
Slope (%)	1.00					1.00
x	4.6					N/A
V (m/s)	0.46					N/A
Tc (min)	9.06					9.06

x = Land Cover Coefficient **(see below)**

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #6 - Industrial Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				4.79
AB				
B				
BC				
C				
CD				
D				

Total area (ha):	4.8	Pervious CN(I):	25
Pervious area (ha):	4.8	Pervious CN(II):	44
Impervious area (ha):	0.0	Pervious CN(III):	64

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	20	Length (m)	450
h_1 (m)	N/A	h_1 (m)	N/A
h_2 (m)	N/A	h_2 (m)	N/A
Δh (m)	N/A	Δh (m)	N/A
Slope (%)	0.5	Slope (%)	0.5
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		75	75
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
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Node 6 to Node 7 - SHIFT

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	350					350
h_1 (m)	253.00					253
h_2 (m)	252.00					252
Δh (m)	1.00					1
Slope (%)	0.29					0.29
x	4.6					N/A
V (m/s)	0.25					N/A
Tc (min)	23.72					23.72

x = Land Cover Coefficient **(see below)**

x = 0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
2.3	Short grass pasture (overland flow)
2.7	Cultivated Straight row (overland flow)
3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
4.6	Grassed Waterway
6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #7 - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A		4.75				
AB						
B						
BC						
C						
CD						
D						

Total area (ha):	4.8	Composite CN(I):	21		
Pervious area (ha):	4.8	Composite CN(II):	39	Composite Ia (mm):	8.0
Impervious area (ha):	0.0	Composite CN(III):	60		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	400					400
h_1 (m)	255					255
h_2 (m)	252.5					252.5
Δh (m)	2.5					2.5
Slope (%)	0.63					0.63
x	1.5					N/A
V (m/s)	0.12					N/A
Tc (min)	56.22					56.22
Tc (hr)	0.94					0.94
Tp (hr)	0.63					0.63

x =	Land Cover Coefficient (see below)	
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.8	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #7 - Residential Land Use

SWMHYMO Standhyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)			
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass
A				3.03
AB				
B				
BC				
C				
CD				
D				

Total area (ha):	5.1	Pervious CN(I):	25
Pervious area (ha):	3.0	Pervious CN(II):	44
Impervious area (ha):	2.0	Pervious CN(III):	64

Drainage Area Calculations

Table 1

Pervious		*Impervious*	
Length (m)	20	Length (m)	475
h_1 (m)	255	h_1 (m)	256
h_2 (m)	254.8	h_2 (m)	253.5
Δh (m)	0.2	Δh (m)	2.5
Slope (%)	1.0	Slope (%)	0.5
Ia (mm)	5.0	Ia (mm)	2.0
Mannings n	0.25	Mannings n	0.013

Table 2

Land Use	*Area (ha)*	*Ximp (%)*	*Timp (%)*
Roadway		30	50
Driveway			
Sidewalk			
Building			
Other			

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	25-Jun-2009

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Node 7 - Node 8 SHIFT

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	700					700
h_1 (m)	252.00					252
h_2 (m)	249.00					249
Δh (m)	3.00					3
Slope (%)	0.43					0.43
x	4.6					N/A
V (m/s)	0.30					N/A
Tc (min)	38.74					38.74

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #8 - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			27.63			
AB						
B						
BC						
C						
CD						
D						

Total area (ha):	27.6	Composite CN(I):	45		
Pervious area (ha):	27.6	Composite CN(II):	66	Composite Ia (mm):	7.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	1040					1040
h_1 (m)	255					255
h_2 (m)	249					249
Δh (m)	6					6
Slope (%)	0.58					0.58
x	1.5					N/A
V (m/s)	0.11					N/A
Tc (min)	152.14					152.14
Tc (hr)	2.54					2.54
Tp (hr)	1.70					1.70

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Node 3 to Node 4-SHIFT

SWMHYMO Shifthyd Modelling Parameters

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	888					888
h_1 (m)	253.00					253
h_2 (m)	249.00					249
Δh (m)	4.00					4
Slope (%)	0.45					0.45
x	4.6					N/A
V (m/s)	0.31					N/A
Tc (min)	47.94					47.94

x = Land Cover Coefficient (see below)		
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #1a - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			48.72			
AB						
B						
BC						
C						
CD						
D						

Total area (ha):	48.7	Composite CN(I):	45		
Pervious area (ha):	48.7	Composite CN(II):	66	Composite Ia (mm):	7.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	Total
Length (m)	1170					1170
h_1 (m)	263					263
h_2 (m)	249					249
Δh (m)	14					14
Slope (%)	1.20					1.20
x	2.7					N/A
V (m/s)	0.30					N/A
Tc (min)	66.02					66.02
Tc (hr)	1.10					1.10
Tp (hr)	0.74					0.74

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Node 4 to Node 5-SHIFT

SWMHYMO Shifthyd Modelling Parameters

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	578					578
h_1 (m)	248.40					248.4
h_2 (m)	245.00					245
Δh (m)	3.40					3.4
Slope (%)	0.59					0.59
x	4.6					N/A
V (m/s)	0.35					N/A
Tc (min)	27.31					27.31

x = Land Cover Coefficient (see below)		
x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #1b - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			39.77			
AB						
B						
BC						
C						
CD						
D						

Total area (ha):	39.8	Composite CN(I):	45		
Pervious area (ha):	39.8	Composite CN(II):	66	Composite Ia (mm):	7.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	1352					1352
h_1 (m)	253					253
h_2 (m)	245					245
Δh (m)	8					8
Slope (%)	0.59					0.59
x	2.7					N/A
V (m/s)	0.21					N/A
Tc (min)	108.49					108.49
Tc (hr)	1.81					1.81
Tp (hr)	1.21					1.21

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	25-Jun-2009

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Node 5 - Node 9 SHIFT

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	590					590
h_1 (m)	245.00					245
h_2 (m)	243.20					243.2
Δh (m)	1.80					1.8
Slope (%)	0.31					0.31
x	4.6					N/A
V (m/s)	0.25					N/A
Tc (min)	38.70					38.70

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

Project Name:	Creemore East Drainage Study
Project No:	MCG 10770
Location:	Creemore, ON
Designer:	T. Lozon
Date:	18-Jun-2007
Date Modified:	18-Jan-2010

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Catchment #9 - Agricultural Land Use

SWMHYMO Nashyd Modelling Parameters

Hydrologic Soil Group	Total Area per Various Land Use (ha)					
	Forest/Woodlot	Meadow/Field	Crop	Lawn/Grass	Pavement	Water
A			100.54			
AB						
B						
BC						
C						
CD						
D						

Total area (ha):	100.5	Composite CN(I):	45		
Pervious area (ha):	100.5	Composite CN(II):	66	Composite Ia (mm):	7.0
Impervious area (ha):	0.0	Composite CN(III):	82		

Drainage Area Calculations

Table 1

Parameters	x_1	x_2	x_3	x_4	x_5	*Total*
Length (m)	1560					1560
h_1 (m)	253					253
h_2 (m)	243.2					243.2
Δh (m)	9.8					9.8
Slope (%)	0.63					0.63
x	2.7					N/A
V (m/s)	0.21					N/A
Tc (min)	121.50					121.50
Tc (hr)	2.02					2.02
Tp (hr)	1.36					1.36

x = Land Cover Coefficient (see below)

x =	0.6	Forest with Heavy Ground Litter, hay meadow (overland flow)
	1.5	Trash Fallow or Minimum Tillage cultivation, strip cropped woodland(overland flow)
	2.3	Short grass pasture (overland flow)
	2.7	Cultivated Straight row (overland flow)
	3.0	Nearly bare untilled (overland flow) or alluvial fans located in the Western mountain Regions
	4.6	Grassed Waterway
	6.1	Paved Areas (sheet flow); small upland gullies

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Alternative #4 Design Calculations

Date	11-Jun-2010
Updated	11-Jun-2010
Project	MCG10770 Creemore East MDP
Municipality	Clearview Township
Designer	Ivan Chan
Reviewer	Greg Morton

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Concrete Pipe from Alliance Outlet to Edward Street

Mannings' Equation			
Pipe Diameter (mm) =	750		
Area =	0.442	m^2	
Slope (%) =	0.40		
Manning 'n' =	0.013		
Nom'l Pipe Capacity, Q =	0.704	m^3/sec	
Actual Pipe Capacity, Q =	0.735	m^3/sec	

Box Culvert	
Height =	0.00
Width =	0
Q =	0.00

Velocity		
	1.59	m/s
	1.66	m/s
R=	0.1875	
Sf=	0.0040	

NOTE :-

Q5 = 0.496m3/s

Concrete Pipe from Edward Street to Sideroad 6/7

Mannings' Equation			
Pipe Diameter (mm) =	1200		
Area =	1.131	m^2	
Slope (%) =	0.20		
Manning 'n' =	0.013		
Nom'l Pipe Capacity, Q =	1.744	m^3/sec	
Actual Pipe Capacity, Q =	1.819	m^3/sec	

Box Culvert	
Height =	0.00
Width =	0
Q =	0.00

Velocity		
	1.54	m/s
	1.61	m/s
R=	0.3	
Sf=	0.0020	

NOTE :-

Date	: 11-Jun-2010
Updated	: 11-Jun-2010
Project	: MCG10770 Creemore East Drainage
Municipality	: Clearview Township
Designer	: Ivan Chan
Reviewer	: Greg Morton

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EAST CONVEYANCE (<25-YEAR STORM TO AIRPORT ROAD EAST ROW)

Alliance Homes East Property Easement

Mannings' Equation			TRAPEZOIDAL CHANNEL	
Flow Depth (m) =	1.200			
Side Slope Ratio (H:V) =	2.0	/1	Top width	6.05
Bed Width (m)=	1.25		Hyd. Rad, 'R'	
Area (m^2)=	4.380		0.661975	m
Wetted Perimeter (m)=	6.617	m	Friction Slope Sf	
Slope (%) =	0.53		0.0053	m/m
Manning 'n' =	0.050		Velocity	
Channel Capacity, Q =	4.841	m3/sec	1.105	m/s

Node 2b Q100 = 4.804m3/s

Ditch along Concession 3 from Elizabeth St to Edward St

Mannings' Equation			TRAPEZOIDAL CHANNEL	
Flow Depth (m) =	1.200			
Side Slope Ratio (H:V) =	2.0	/1	Top width	6.05
Bed Width (m)=	1.25		Hyd. Rad, 'R'	
Area (m^2)=	4.380		0.661975	m
Wetted Perimeter (m)=	6.617	m	Friction Slope Sf	
Slope (%) =	0.56		0.0056	m/m
Manning 'n' =	0.050		Velocity	
Channel Capacity, Q =	4.990	m3/sec	1.139	m/s

Node 2b Q100 = 4.804m3/s

Ditch along Edward Street to Node 4

Mannings' Equation			TRAPEZOIDAL CHANNEL		
Flow Depth (m) =	1.200				
Side Slope Ratio (H:V) =	2.0	/1	Top width	5.8	
Bed Width (m)=	1.00		Hyd. Rad, 'R'		
Area (m^2)=	4.080		0.640848	m	
Wetted Perimeter (m)=	6.367	m	Friction Slope Sf		
Slope (%) =	0.51		0.0051	m/m	
Manning 'n' =	0.050		Velocity		
Channel Capacity, Q =	4.318	m3/sec	1.058	m/s	

Node 4 Q100 = 4.317m3/s

Node 4 to Node 5 Airport Road Culvert Crossing

Mannings' Equation			TRAPEZOIDAL CHANNEL		
Flow Depth (m) =	1.200				
Side Slope Ratio (H:V) =	2.0	/1	Top width	6.6	
Bed Width (m)=	1.80		Hyd. Rad, 'R'		
Area (m^2)=	5.040		0.703266	m	
Wetted Perimeter (m)=	7.167	m	Friction Slope Sf		
Slope (%) =	0.42		0.0042	m/m	
Manning 'n' =	0.050		Velocity		
Channel Capacity, Q =	5.137	m3/sec	1.019	m/s	

Node 5 Q100 = 5.131m3/s

Airport Road East ROW

Mannings' Equation			TRAPEZOIDAL CHANNEL		
Flow Depth (m) =	1.200				
Side Slope Ratio (H:V) =	2.0	/1	Top width	5.2	
Bed Width (m)=	0.40		Hyd. Rad, 'R'		
Area (m^2)=	3.360		0.582669	m	
Wetted Perimeter (m)=	5.767	m	Friction Slope Sf		
Slope (%) =	0.20		0.0020	m/m	
Manning 'n' =	0.050		Velocity		
Channel Capacity, Q =	2.114	m3/sec	0.629	m/s	

Q100 = 3.341 - 1.27 (ex. watercourse capacity) = 2.071m3/s

CONVEYANCE 2 (SOUTH OF ALLIANCE + >25-YEAR STORM ALONG CONCESSION 3)

SWM Outlet to Node 6 (Edward Street)

Mannings' Equation			TRAPEZOIDAL CHANNEL	
Flow Depth (m) =	0.850			
Side Slope Ratio (H:V) =	2.0	/1	Top width	4.3
Bed Width (m)=	0.90		Hyd. Rad, 'R'	
Area (m^2)=	2.210		0.470081	m
Wetted Perimeter (m)=	4.701	m	Friction Slope Sf	
Slope (%) =	0.40		0.0040	m/m
Manning 'n' =	0.050		Velocity	
Channel Capacity, Q =	1.690	m3/sec	0.765	m/s

Q100 = 2.582 - 0.932(pond outflow) = 1.650m3/s

Node 6 to Node 7 (George Street)

Mannings' Equation			TRAPEZOIDAL CHANNEL	
Flow Depth (m) =	0.850			
Side Slope Ratio (H:V) =	2.0	/1	Top width	3.6
Bed Width (m)=	0.20		Hyd. Rad, 'R'	
Area (m^2)=	1.615		0.403617	m
Wetted Perimeter (m)=	4.001	m	Friction Slope Sf	
Slope (%) =	0.29		0.0029	m/m
Manning 'n' =	0.050		Velocity	
Channel Capacity, Q =	0.943	m3/sec	0.584	m/s

Q100 = 2.659 - 1.744(pipe) = 0.915m3/s

Node 7 to Node 8 (Sideroad (6/7)

Mannings' Equation			TRAPEZOIDAL CHANNEL	
Flow Depth (m) =	0.850			
Side Slope Ratio (H:V) =	2.0	/1	Top width	3.9
Bed Width (m)=	0.50		Hyd. Rad, 'R'	
Area (m^2)=	1.870		0.434751	m
Wetted Perimeter (m)=	4.301	m	Friction Slope Sf	
Slope (%) =	0.43		0.0043	m/m
Manning 'n' =	0.050		Velocity	
Channel Capacity, Q =	1.405	m3/sec	0.751	m/s

"ND8-" Q100 = 1.393m3/s

Node 8 to Mad River

Mannings' Equation			TRAPEZOIDAL CHANNEL	
Flow Depth (m) =	1.000			
Side Slope Ratio (H:V) =	2.0	/1	Top width	4.85
Bed Width (m)=	0.85		Hyd. Rad, 'R'	
Area (m^2)=	2.850		0.535499	m
Wetted Perimeter (m)=	5.322	m	Friction Slope Sf	
Slope (%) =	0.67		0.0067	m/m
Manning 'n' =	0.050		Velocity	
Channel Capacity, Q =	3.069	m3/sec	1.077	m/s

"ND8+" Q100 = 3.041m3/s

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Appendix A2 – Hydrologic Model Output (SWMHYMO)

- Existing Conditions
- Alternative #4

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Existing Conditions

```
2     Metric units
*#*************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 09-19-2006
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   :  3846413
*#*************************************************************************
*%
* PRE-DEVELOPMENT/ EXISTING CONDITION
*%
*%
*%
*% 2-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["2SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-------------------------------------------------------|
*%
*%
* CATCHMENT #4
*%
*%
*%-----------------|-------------------------------------------------------|
* CATCHMENT #4- AGRICULTURAL LAND USE
CALIB NASHYD        ID=[1], NHYD=["C4-AGR"], DT=[2]min, AREA=[118.68](ha),
                    DWF=[0](cms),  CN/C=[68], IA=[8.0](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT #4- RESIDENTIAL LAND USE
CALIB STANDHYD      ID=[2], NHYD=["C4-RES"], DT=[2.0](min), AREA=[2.20](ha),
                    XIMP=[0.3], TIMP=[0.5], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[71],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[6.0](%),
                                         LGP=[50](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[1.5](%),
                                         LGI=[120](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT #4- COMMERCIAL LAND USE
CALIB STANDHYD      ID=[3], NHYD=["C4-COM"], DT=[2.0](min), AREA=[1.38](ha),
                    XIMP=[0.9], TIMP=[0.9], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[71],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[2.0](%),
                                         LGP=[5](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[2.0](%),
                                         LGI=[35](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
* TOTAL FLOW FROM CATCHMENT 4 AGRICULTURAL AND RESIDENTIAL AREAS
ADD HYD             IDsum=[4], NHYD=["TAGRE"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------|
* TOTAL FLOW FROM CATCHMENT 4 (AGRICULTURAL, RESIDENTIAL AND COMMERCIAL)
ADD HYD             IDsum=[5], NHYD=["TOT4"], IDs to add=[4+3]
*%-----------------|-------------------------------------------------------|
*************************************************************************
*TOTAL FLOW, CATCHMENT 4 (NORTH CATCHMENT) SHIFT TO FLOW NODE 2
*%-----------------|-------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["TOTSH4"], IDin=[5], TLAG=[31.7](min)
*%-----------------|-------------------------------------------------------|
*************************************************************************
```



```
*%
* CATCHMENT #3
*%
* CATCHMENT #3- AGRICULTURAL LAND USE
CALIB NASHYD        ID=[1], NHYD=["C3-AGR"], DT=[2]min, AREA=[34.92](ha),
                    DWF=[0](cms),  CN/C=[66], IA=[8.0](mm),
                    N=[3], TP=[0.82]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT #3- JARDINE CRESCENT RESIDENTIAL AREA
CALIB STANDHYD      ID=[2], NHYD=["C3-RES"], DT=[2](min), AREA=[6.4](ha),
                    XIMP=[0.3], TIMP=[0.4], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[71],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[6.7](%),
                                         LGP=[45](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[1.5](%),
                                         LGI=[370](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
* SHIFT RESIDENTIAL TO NODE 3
SHIFT HYD           IDout=[3], NHYD=["3SHRES"], IDin=[2], TLAG=[27.53](min)
*%-----------------|-------------------------------------------------------|
*************************************************************************
* TOTAL PRE-DEVELOPMENT FLOW CATCHMENT #3
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["TOT3"], IDs to add=[3+1]
*%-----------------|-------------------------------------------------------|
*************************************************************************
* TOTAL PRE-DEVELOPMENT FLOW TO FLOW NODE 2
* INCLUDES CATCHMENTS 3 AND 4
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=["TOTND2"], IDs to add=[6+4]
*%-----------------|-------------------------------------------------------|
*%
* SHIFT TOTAL FLOW FROM NODE 2 TO NODE 3
*%-----------------|-------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["ND2ND3"], IDin=[8], TLAG=[42.54](min)
*%-----------------|-------------------------------------------------------|
*************************************************************************
*%
* CATCHMENT #2
*%
* CATCHMENT #2- AGRICULTURAL LAND USE
CALIB NASHYD        ID=[9], NHYD=["C2-AGR"], DT=[2]min, AREA=[49.56](ha),
                    DWF=[0](cms),  CN/C=[66], IA=[8.0](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT #2- COMMERCIAL LAND USE
CALIB STANDHYD      ID=[1], NHYD=["C2-COM"}, DT=[2](min), AREA=[2.75](ha),
                    XIMP=[0.9], TIMP=[0.9], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[44],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[0.5](%),
                                         LGP=[20](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[0.5](%),
                                         LGI=[245](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT #2- INDUSTRIAL LAND USE
CALIB STANDHYD      ID=[2], NHYD=["C2-IND"], DT=[2](min), AREA=[4.86](ha),
                    XIMP=[0.75], TIMP=[0.75], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[44],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[0.5](%),
```

```
                                LGP=[20](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[0.5](%),
                                LGI=[70](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[3], NHYD=["T2"], IDs to add=[9+1]
*%-----------------|-------------------------------------------------------------|
*%
*%
*******************************************************************************
* TOTAL POST DEVELOPMENT FLOW, CATCHMENT 2 (ALLIANCE HOMES)
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["TOT2"], IDs to add=[2+3]
*%-----------------|-------------------------------------------------------------|
*******************************************************************************
* ALLIANCE HOMES EXTERNAL AREA #1
CALIB STANDHYD      ID=[3], NHYD=["AHEXT1"], DT=[2](min), AREA=[9.12](ha),
                    XIMP=[0.30], TIMP=[0.40], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[44],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[1.3](%),
                                LGP=[40](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[0.8](%),
                                LGI=[400](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
* SHIFT FLOW FROM ALLIANCE HOMES EXTERNAL AREAS TO FLOW NODE 3
SHIFT HYD           IDout=[7], NHYD=["EXTND3"], IDin=[3], TLAG=[84.04](min)
*%-----------------|-------------------------------------------------------------|
*%
*******************************************************************************
* TOTAL FLOW FROM CATCHMENT 2 AND ALLIANCE HOMES EXTERNAL AREAS
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[1], NHYD=["TC2EXT"], IDs to add=[4+7]
*%-----------------|-------------------------------------------------------------|
* TOTAL POST DEVELOPMENT FLOW TO NODE 3
*% INCLUDES CATCHMENTS 4, 3 AND 2
ADD HYD             IDsum=[6], NHYD=["TOTND3"], IDs to add=[1+5]
*******************************************************************************
*%
* CATCHMENT #1a - AGRICULTURAL LAND USE
*%
CALIB NASHYD        ID=[7], NHYD=["T1a"], DT=[2]min, AREA=[48.72](ha),
                    DWF=[0](cms),  CN/C=[66], IA=[7.0](mm),
                    N=[3], TP=[0.48]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
* SHIFT FLOW FROM FLOW NODE 3 TO FLOW NODE 4
* INCLUDES CATCHMENTS 4,3,2
SHIFT HYD           IDout=[8], NHYD=["ND3ND4"], IDin=[6], TLAG=[47.94](min)
*%-----------------|-------------------------------------------------------------|
*******************************************************************************
* TOTAL PRE-DEVLOPMENT FLOW FROM FLOW NODE 4
* INCLUDES CATCHMENTS 2,3,4 AND 1a
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["TOTND4"], IDs to add=[8+7]
*%-----------------|-------------------------------------------------------------|
*******************************************************************************
* SHIFT FLOW FROM FLOW NODE 4 TO FLOW NODE 5
* INCLUDDES CATCHMENTS 4,3,2
SHIFT HYD           IDout=[1], NHYD=["T4321a"], IDin=[9], TLAG=[25.17](min)
*%-----------------|-------------------------------------------------------------|
* CATCHMENT #1b- AGRICULTURAL LAND USE
```



```
CALIB NASHYD        ID=[2], NHYD=["T1b"], DT=[2]min, AREA=[49.02](ha),
                    DWF=[0](cms),  CN/C=[66], IA=[7.0](mm),
                    N=[3], TP=[1.21]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*******************************************************************************
* TOTAL PRE-DEVLOPMENT FLOW NODE 5
* INCLUDES CATCHMENTS 2,3,4, 1a AND 1b
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[6], NHYD=["ND5+25"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------------|
*******************************************************************************
*% 2-Year capacity of existing culvert to Node 5 outlet, otherwise spill south
COMPUTE DUALHYD     IDin=[6], CINLET=[1.25](cms), NINLET=[1],
                    MAJID=[1], MajNHYD=[">2ND9"],
                    MINID=[3], MinNHYD=["<ND5-25"],
                    TMJSTO=[0](cu-m)
*%-----------------|-------------------------------------------------------------|
*******************************************************************************
*%
* CATCHMENT #5
*%
*%-----------------|-------------------------------------------------------------|
* CATCHMENT #5- RESIDENTIAL LAND USE
CALIB STANDHYD      ID=[6], NHYD=["C5-RES"], DT=[2](min), AREA=[6.3](ha),
                    XIMP=[0.3], TIMP=[0.4], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[44],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[1.0](%),
                                LGP=[50](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[0.5](%),
                                LGI=[534](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------------|
SHIFT HYD           IDout=[7], NHYD=["TSR5"], IDin=[6], TLAG=[116.46](min)
*%-----------------|-------------------------------------------------------------|
* CATCHMENT #5- AGRICULTURAL LAND USE
CALIB NASHYD        ID=[8], NHYD=["C5-AGR"], DT=[2]min, AREA=[94.8](ha),
                    DWF=[0.0](cms),  CN/C=[66], IA=[7.0](mm),
                    N=[3], TP=[1.39]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*******************************************************************************
* TOTAL PRE-DEVLOPMENT FLOW TO FLOW NODE 9
* INCLUDES CATCHMENT 5
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[6], NHYD=["ND9-2"], IDs to add=[7+8]
*%-----------------|-------------------------------------------------------------|
ADD HYD             IDsum=[9], NHYD=["ND9+2"], IDs to add=[1+6]
*%-----------------|-------------------------------------------------------------|
*******************************************************************************
*%
*%
* CATCHMENT #6
* TOTAL PRE-DEVELOPMENT FLOW TO FLOW NODE 8
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[1], NHYD=["TOTND8"], DT=[2]min, AREA=[27.63](ha),
                    DWF=[0](cms),  CN/C=[66], IA=[7.0](mm),
                    N=[3], TP=[1.70]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------------|
*% 5-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[2]
*%                   ["5SCS6.stm"] <--storm filename
```

2-CYRSCS.DAT

```
*%-----------------|-------------------------------------------------------------|
*% 10-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[3]
*%                   ["10SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------------|
*% 25-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[4]
*%                   ["25SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------------|
*% 50-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[5]
*%                   ["50SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------------|
*% 100-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[6]
*%                   ["100SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------------|
*% Timmins Regional Storm (12-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[7]
*%                   ["12Regtim.o89"] <--storm filename
*%-----------------|-------------------------------------------------------------|
FINISH
```

```
SSSSS  W   W  M   M  H   H  Y   Y  M   M    OOO       999   55555 ======
S      W W W  MM MM  H   H   Y Y   MM MM   O   O     9   9  5     ======
SSSSS  W W W  M M M  HHHHH    Y    M M M   O   O ##  9   9  5     Ver. 3.1
    S   W W   M   M  H   H    Y    M   M   O   O      9999  5555  Oct. 1997
SSSSS   W W   M   M  H   H    Y    M   M    OOO           9      5 ======
                                                      9   9      5 # 3846413
     StormWater Management HYdrologic Model            999   5555 ======
```

```
********************************************************************************
************************** SWMHYMO-95w Ver/3.1 *********************************
*******  A single event and continuous hydrologic simulation model  ********
*******     based on the principles of HYMO and its successors      ********
*******                 OTTHYMO-83 and OTTHYMO-89.                  ********
********************************************************************************
******* Distributed by:  J.F. Sabourin and Associates Inc.           ********
*******                  Ottawa,  Ontario: (613) 727-5199           ********
*******                  Gatineau, Quebec: (819) 243-6858           ********
*******                  E-Mail: swmhymo@jfsa.Com                   ********
********************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++ Licensed user: R.J. Burnside and Associates                  +++++++
+++++++                Stayner                SERIAL#:3846413       +++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

********************************************************************************
*******          ++++++ PROGRAM ARRAY DIMENSIONS ++++++              ********
*******          Maximum value for ID numbers  :    10              ********
*******          Max. number of rainfall points:  5000              ********
*******          Max. number of flow points    :  5000              ********
********************************************************************************

*** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) ***
*** ------------------------------------------------------------------- ***
***     ID:  Hydrograph IDentification numbers, (1-10).                  ***
***   NHYD:  Hydrograph reference numbers, (6 digits or characters).     ***
***   AREA:  Drainage area associated with hydrograph, (ac.) or (ha.).   ***
*** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).     ***
*** TpeakDate_hh:mm is the date and time of the peak flow.              ***
***  R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).        ***
***  R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).        ***
***     *:  see WARNING or NOTE message printed at end of run.          ***
***    **:  see  ERROR  message printed at end of run.                  ***
********************************************************************************
********************************************************************************

::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

********************************************************************************

*********************   S U M M A R Y   O U T P U T   **********************
********************************************************************************
*       DATE: 2010-01-18      TIME: 12:58:37      RUN COUNTER: 002150       *
********************************************************************************
* Input   filename: W:\100113~1\EX-SWM~1\6-HOUR~1\2-CYRSCS.DAT                  *
* Output  filename: W:\100113~1\EX-SWM~1\6-HOUR~1\2-CYRSCS.out                  *
* Summary filename: W:\100113~1\EX-SWM~1\6-HOUR~1\2-CYRSCS.sum                  *
* User comments:                                                               *
* 1:_____________________________________________________________________      *
* 2:_____________________________________________________________________      *
* 3:_____________________________________________________________________      *
```



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********************************************************************************

*#******************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 09-19-2006
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   :  3846413
*#******************************************************************************
RUN:COMMAND#
001:0001----------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   1 ]
001:0002----------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  = 2-Year SCS Type-II Storm Distribution (6-hour) Owen Sound, O
     [SDT=30.00:SDUR=   6.50:PTOT= 37.20]
001:0003--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C4-AGR   118.68      .724 No_date     4:38     5.73 .154
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
001:0004--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C4-RES     2.20      .102 No_date     3:30    17.91 .481
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=    .0]
001:0005--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
 *  CALIB STANDHYD     03:C4-COM     1.38      .134 No_date     3:30    32.44 .872
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=    .0]
001:0006--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:C4-AGR   118.68      .724 No_date     4:38     5.73  n/a
                     + 02:C4-RES     2.20      .102 No_date     3:30    17.91  n/a
     [DT= 2.00]  SUM=  04:TAGRE    120.88      .741 No_date     4:36     5.95  n/a
001:0007--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TAGRE    120.88      .741 No_date     4:36     5.95  n/a
                     + 03:C4-COM     1.38      .134 No_date     3:30    32.44  n/a
     [DT= 2.00]  SUM=  05:TOT4     122.26      .753 No_date     4:30     6.25  n/a
001:0008--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 05:TOT4     122.26      .753 No_date     4:30     6.25  n/a
     [LAG= 31.7 min]<- 06:TOTSH4    122.26      .753 No_date     5:00     6.25  n/a
001:0009--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C3-AGR    34.92      .211 No_date     4:30     5.33 .143
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
001:0010--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C3-RES     6.40      .257 No_date     3:32    16.78 .451
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=    .0]
001:0011--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:C3-RES     6.40      .257 No_date     3:32    16.78  n/a
     [LAG= 27.5 min]<- 03:3SHRES      6.40      .257 No_date     3:58    16.78  n/a
001:0012--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            03:3SHRES     6.40      .257 No_date     3:58    16.78  n/a
                    +  01:C3-AGR    34.92      .211 No_date     4:30     5.33  n/a
     [DT= 2.00]  SUM=  04:TOT3      41.32      .413 No_date     3:58     7.10  n/a
001:0013--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTSH4   122.26      .753 No_date     5:00     6.25  n/a
                    +  04:TOT3      41.32      .413 No_date     3:58     7.10  n/a
     [DT= 2.00]  SUM=  08:TOTND2   163.58      .997 No_date     4:58     6.47  n/a
001:0014--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2   163.58      .997 No_date     4:58     6.47  n/a
     [LAG= 42.5 min]<- 05:ND2ND3   163.58      .997 No_date     5:40     6.47  n/a
001:0015--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       09:C2-AGR    49.56      .281 No_date     4:38     5.33 .143
     [CN= 66.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
001:0016--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     01:C2-COM     2.75      .253 No_date     3:30    31.97 .859
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=    .0]
001:0017--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C2-IND     4.86      .386 No_date     3:30    27.13 .729
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI=  70.:MNI=.013:SCI=    .0]
001:0018--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:C2-AGR    49.56      .281 No_date     4:38     5.33  n/a
                    +  01:C2-COM     2.75      .253 No_date     3:30    31.97  n/a
     [DT= 2.00]  SUM=  03:T2        52.31      .311 No_date     4:32     6.73  n/a
001:0019--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:C2-IND     4.86      .386 No_date     3:30    27.13  n/a
                    +  03:T2        52.31      .311 No_date     4:32     6.73  n/a
     [DT= 2.00]  SUM=  04:TOT2      57.17      .677 No_date     3:30     8.46  n/a
001:0020--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     03:AHEXT1     9.12      .280 No_date     3:30    13.01 .350
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=    .0]
001:0021--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:AHEXT1     9.12      .280 No_date     3:30    13.01  n/a
     [LAG= 84.0 min]<- 07:EXTND3     9.12      .280 No_date     4:54    13.01  n/a
001:0022--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TOT2      57.17      .677 No_date     3:30     8.46  n/a
                    +  07:EXTND3     9.12      .280 No_date     4:54    13.01  n/a
     [DT= 2.00]  SUM=  01:TC2EXT    66.29      .697 No_date     3:30     9.09  n/a
001:0023--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:TC2EXT    66.29      .697 No_date     3:30     9.09  n/a
                    +  05:ND2ND3   163.58      .997 No_date     5:40     6.47  n/a
     [DT= 2.00]  SUM=  06:TOTND3   229.87     1.350 No_date     5:00     7.22  n/a
001:0024--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:T1a       48.72      .436 No_date     4:02     5.66 .152
     [CN= 66.0: N= 3.00]
     [Tp=  .48:DT= 2.00]
001:0025--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:TOTND3   229.87     1.350 No_date     5:00     7.22  n/a
     [LAG= 47.9 min]<- 08:ND3ND4   229.87     1.350 No_date     5:46     7.22  n/a
001:0026--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            08:ND3ND4   229.87     1.350 No_date     5:46     7.22  n/a
                    +  07:T1a       48.72      .436 No_date     4:02     5.66  n/a
     [DT= 2.00]  SUM=  09:TOTND4   278.59     1.465 No_date     5:46     6.95  n/a
001:0027--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    SHIFT HYD       -> 09:TOTND4   278.59     1.465 No_date     5:46     6.95  n/a
     [LAG= 25.2 min]<- 01:T4321a   278.59     1.465 No_date     6:10     6.95  n/a
001:0028--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:T1b       49.02      .246 No_date     5:00     5.66 .152
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
001:0029--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:T4321a   278.59     1.465 No_date     6:10     6.95  n/a
                    +  02:T1b       49.02      .246 No_date     5:00     5.66  n/a
     [DT= 2.00]  SUM=  06:ND5+25   327.61     1.665 No_date     5:52     6.76  n/a
001:0030--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD    06:ND5+25   327.61     1.665 No_date     5:52     6.76  n/a
       Major System <  01:>2ND9     26.44      .415 No_date     5:52     6.76  n/a
       Minor System >  03:<ND5-2   301.17     1.250 No_date     4:24     6.76  n/a
001:0031--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:C5-RES     6.30      .178 No_date     3:32    13.01 .350
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  50.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 534.:MNI=.013:SCI=    .0]
001:0032--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:C5-RES     6.30      .178 No_date     3:32    13.01  n/a
     [LAG=116.5 min]<- 07:TSR5       6.30      .178 No_date     5:28    13.01  n/a
001:0033--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:C5-AGR    94.80      .432 No_date     5:16     5.66 .152
     [CN= 66.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
001:0034--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:TSR5       6.30      .178 No_date     5:28    13.01  n/a
                    +  08:C5-AGR    94.80      .432 No_date     5:16     5.66  n/a
     [DT= 2.00]  SUM=  06:ND9-2    101.10      .605 No_date     5:28     6.12  n/a
001:0035--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:>2ND9     26.44      .415 No_date     5:52     6.76  n/a
                    +  06:ND9-2    101.10      .605 No_date     5:28     6.12  n/a
     [DT= 2.00]  SUM=  09:ND9+2    127.54      .902 No_date     5:52     6.25  n/a
001:0036--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:TOTND8    27.63      .109 No_date     5:40     5.66 .152
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
  ** END OF RUN :   1
```

****

```
RUN:COMMAND#
002:0037--------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2     (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   2 ]
*#*************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 09-19-2006
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   :  3846413
*#*************************************************************************
 002:0039--------------------------------------------------------------------------
    READ STORM
```

```
    Filename = STORM.001
    Comment  = 5-Year SCS Type-II Storm Distribution (6-hour) Owen Sound, O
    [SDT=30.00:SDUR=   6.50:PTOT= 48.30]
002:0040--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      01:C4-AGR   118.68     1.311 No_date     4:34    10.16 .210
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
002:0041--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    02:C4-RES     2.20      .154 No_date     3:30    25.68 .532
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
002:0042--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
 *  CALIB STANDHYD    03:C4-COM     1.38      .176 No_date     3:30    42.95 .889
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
002:0043--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:C4-AGR   118.68     1.311 No_date     4:34    10.16  n/a
                    + 02:C4-RES     2.20      .154 No_date     3:30    25.68  n/a
     [DT= 2.00]  SUM= 04:TAGRE    120.88     1.336 No_date     4:32    10.44  n/a
002:0044--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           04:TAGRE    120.88     1.336 No_date     4:32    10.44  n/a
                    + 03:C4-COM     1.38      .176 No_date     3:30    42.95  n/a
     [DT= 2.00]  SUM= 05:TOT4     122.26     1.355 No_date     4:30    10.81  n/a
002:0045--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:TOT4     122.26     1.355 No_date     4:30    10.81  n/a
     [LAG= 31.7 min]<- 06:TOTSH4   122.26     1.355 No_date     5:00    10.81  n/a
002:0046--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      01:C3-AGR    34.92      .385 No_date     4:28     9.49 .196
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
002:0047--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    02:C3-RES     6.40      .386 No_date     3:30    24.09 .499
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
002:0048--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES     6.40      .386 No_date     3:30    24.09  n/a
     [LAG= 27.5 min]<- 03:3SHRES     6.40      .386 No_date     3:56    24.09  n/a
002:0049--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           03:3SHRES     6.40      .386 No_date     3:56    24.09  n/a
                    + 01:C3-AGR    34.92      .385 No_date     4:28     9.49  n/a
     [DT= 2.00]  SUM= 04:TOT3      41.32      .682 No_date     3:58    11.75  n/a
002:0050--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:TOTSH4   122.26     1.355 No_date     5:00    10.81  n/a
                    + 04:TOT3      41.32      .682 No_date     3:58    11.75  n/a
     [DT= 2.00]  SUM= 08:TOTND2   163.58     1.765 No_date     4:56    11.05  n/a
002:0051--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2   163.58     1.765 No_date     4:56    11.05  n/a
     [LAG= 42.5 min]<- 05:ND2ND3   163.58     1.765 No_date     5:38    11.05  n/a
002:0052--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      09:C2-AGR    49.56      .510 No_date     4:34     9.49 .196
     [CN= 66.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
002:0053--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    01:C2-COM     2.75      .332 No_date     3:30    42.18 .873
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
```



```
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
002:0054--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    02:C2-IND     4.86      .504 No_date     3:30    36.00 .745
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI=  70.:MNI=.013:SCI=   .0]
002:0055--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           09:C2-AGR    49.56      .510 No_date     4:34     9.49  n/a
                    + 01:C2-COM     2.75      .332 No_date     3:30    42.18  n/a
     [DT= 2.00]  SUM= 03:T2        52.31      .551 No_date     4:32    11.21  n/a
002:0056--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           02:C2-IND     4.86      .504 No_date     3:30    36.00  n/a
                    + 03:T2        52.31      .551 No_date     4:32    11.21  n/a
     [DT= 2.00]  SUM= 04:TOT2      57.17      .923 No_date     3:30    13.32  n/a
002:0057--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    03:AHEXT1     9.12      .386 No_date     3:30    18.11 .375
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
002:0058--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:AHEXT1     9.12      .386 No_date     3:30    18.11  n/a
     [LAG= 84.0 min]<- 07:EXTND3     9.12      .386 No_date     4:54    18.11  n/a
002:0059--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           04:TOT2      57.17      .923 No_date     3:30    13.32  n/a
                    + 07:EXTND3     9.12      .386 No_date     4:54    18.11  n/a
     [DT= 2.00]  SUM= 01:TC2EXT    66.29      .951 No_date     3:30    13.98  n/a
002:0060--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:TC2EXT    66.29      .951 No_date     3:30    13.98  n/a
                    + 05:ND2ND3   163.58     1.765 No_date     5:38    11.05  n/a
     [DT= 2.00]  SUM= 06:TOTND3   229.87     2.322 No_date     5:26    11.89  n/a
002:0061--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      07:T1a       48.72      .781 No_date     4:00     9.91 .205
     [CN= 66.0: N= 3.00]
     [Tp=  .48:DT= 2.00]
002:0062--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:TOTND3   229.87     2.322 No_date     5:26    11.89  n/a
     [LAG= 47.9 min]<- 08:ND3ND4   229.87     2.322 No_date     6:12    11.89  n/a
002:0063--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           08:ND3ND4    229.87     2.322 No_date     6:12    11.89  n/a
                    + 07:T1a       48.72      .781 No_date     4:00     9.91  n/a
     [DT= 2.00]  SUM= 09:TOTND4    278.59     2.463 No_date     6:10    11.55  n/a
002:0064--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOTND4   278.59     2.463 No_date     6:10    11.55  n/a
     [LAG= 25.2 min]<- 01:T4321a   278.59     2.463 No_date     6:34    11.55  n/a
002:0065--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      02:T1b       49.02      .436 No_date     4:58     9.91 .205
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
002:0066--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:T4321a    278.59     2.463 No_date     6:34    11.55  n/a
                    + 02:T1b       49.02      .436 No_date     4:58     9.91  n/a
     [DT= 2.00]  SUM= 06:ND5+25    327.61     2.751 No_date     6:08    11.30  n/a
002:0067--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   06:ND5+25    327.61     2.751 No_date     6:08    11.30  n/a
      Major System /  01:>2ND9     109.34     1.501 No_date     6:08    11.30  n/a
      Minor System \  03:<ND5-2    218.27     1.250 No_date     4:12    11.30  n/a
002:0068--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    06:C5-RES     6.30      .243 No_date     3:32    18.11 .375
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  50.:MNP=.250:SCP=   .0]
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     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 534.:MNI=.013:SCI=   .0]
002:0069--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 06:C5-RES      6.30      .243 No_date     3:32   18.11  n/a
      [LAG=116.5 min]<- 07:TSR5        6.30      .243 No_date     5:28   18.11  n/a
002:0070--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD      08:C5-AGR     94.80      .764 No_date     5:12    9.91 .205
      [CN= 66.0: N= 3.00]
      [Tp= 1.39:DT= 2.00]
002:0071--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD           07:TSR5        6.30      .243 No_date     5:28   18.11  n/a
                     + 08:C5-AGR     94.80      .764 No_date     5:12    9.91  n/a
      [DT= 2.00]  SUM= 06:ND9-2     101.10      .994 No_date     5:26   10.42  n/a
002:0072--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD           01:>2ND9     109.34    1.501 No_date     6:08   11.30  n/a
                     + 06:ND9-2     101.10      .994 No_date     5:26   10.42  n/a
      [DT= 2.00]  SUM= 09:ND9+2     210.44    2.289 No_date     5:52   10.88  n/a
002:0073--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD      01:TOTND8     27.63      .193 No_date     5:36    9.91 .205
      [CN= 66.0: N= 3.00]
      [Tp= 1.70:DT= 2.00]
  ** END OF RUN :   2

**********************************************************************************




 RUN:COMMAND#
 003:0075-------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   3 ]
*#**********************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 09-19-2006
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   :  3846413
*#**********************************************************************************
 003:0077-------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  = 10-Year SCS Type-II Storm Distribution (6-hour) Owen Sound,
      [SDT=30.00:SDUR=   6.50:PTOT= 55.70]
003:0078--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD      01:C4-AGR    118.68    1.772 No_date     4:34   13.61 .244
      [CN= 68.0: N= 3.00]
      [Tp=  .91:DT= 2.00]
003:0079--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB STANDHYD    02:C4-RES      2.20      .190 No_date     3:30   31.18 .560
      [XIMP=.30:TIMP=.50]
      [LOSS= 2 :CN= 71.0]
      [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
003:0080--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
  *  CALIB STANDHYD    03:C4-COM      1.38      .204 No_date     3:30   49.99 .898
      [XIMP=.90:TIMP=.90]
      [LOSS= 2 :CN= 71.0]
      [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
```



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003:0081--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD           01:C4-AGR    118.68    1.772 No_date     4:34   13.61  n/a
                     + 02:C4-RES      2.20      .190 No_date     3:30   31.18  n/a
      [DT= 2.00]  SUM= 04:TAGRE     120.88    1.803 No_date     4:32   13.93  n/a
003:0082--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD           04:TAGRE     120.88    1.803 No_date     4:32   13.93  n/a
                     + 03:C4-COM      1.38      .204 No_date     3:30   49.99  n/a
      [DT= 2.00]  SUM= 05:TOT4      122.26    1.827 No_date     4:30   14.33  n/a
003:0083--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 05:TOT4     122.26    1.827 No_date     4:30   14.33  n/a
      [LAG= 31.7 min]<- 06:TOTSH4   122.26    1.827 No_date     5:00   14.33  n/a
003:0084--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD      01:C3-AGR     34.92      .522 No_date     4:26   12.74 .229
      [CN= 66.0: N= 3.00]
      [Tp=  .82:DT= 2.00]
003:0085--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB STANDHYD    02:C3-RES      6.40      .474 No_date     3:30   29.30 .526
      [XIMP=.30:TIMP=.40]
      [LOSS= 2 :CN= 71.0]
      [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
003:0086--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 02:C3-RES      6.40      .474 No_date     3:30   29.30  n/a
      [LAG= 27.5 min]<- 03:3SHRES      6.40      .474 No_date     3:56   29.30  n/a
003:0087--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD           03:3SHRES      6.40      .474 No_date     3:56   29.30  n/a
                     + 01:C3-AGR     34.92      .522 No_date     4:26   12.74  n/a
      [DT= 2.00]  SUM= 04:TOT3       41.32      .885 No_date     3:58   15.31  n/a
003:0088--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD           06:TOTSH4    122.26    1.827 No_date     5:00   14.33  n/a
                     + 04:TOT3       41.32      .885 No_date     3:58   15.31  n/a
      [DT= 2.00]  SUM= 08:TOTND2    163.58    2.367 No_date     4:56   14.58  n/a
003:0089--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 08:TOTND2   163.58    2.367 No_date     4:56   14.58  n/a
      [LAG= 42.5 min]<- 05:ND2ND3   163.58    2.367 No_date     5:38   14.58  n/a
003:0090--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD      09:C2-AGR     49.56      .691 No_date     4:34   12.74 .229
      [CN= 66.0: N= 3.00]
      [Tp=  .91:DT= 2.00]
003:0091--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB STANDHYD    01:C2-COM      2.75      .387 No_date     3:30   49.02 .880
      [XIMP=.90:TIMP=.90]
      [LOSS= 2 :CN= 44.0]
      [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
003:0092--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB STANDHYD    02:C2-IND      4.86      .584 No_date     3:30   41.99 .754
      [XIMP=.75:TIMP=.75]
      [LOSS= 2 :CN= 44.0]
      [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp=2.00:SLPI= .50:LGI=  70.:MNI=.013:SCI=   .0]
003:0093--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD           09:C2-AGR     49.56      .691 No_date     4:34   12.74  n/a
                     + 01:C2-COM      2.75      .387 No_date     3:30   49.02  n/a
      [DT= 2.00]  SUM= 03:T2         52.31      .739 No_date     4:30   14.65  n/a
003:0094--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD           02:C2-IND      4.86      .584 No_date     3:30   41.99  n/a
                     + 03:T2         52.31      .739 No_date     4:30   14.65  n/a
      [DT= 2.00]  SUM= 04:TOT2       57.17    1.098 No_date     3:30   16.97  n/a
003:0095--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB STANDHYD    03:AHEXT1      9.12      .459 No_date     3:30   21.74 .390
      [XIMP=.30:TIMP=.40]
      [LOSS= 2 :CN= 44.0]
```

```
    [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
    [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
003:0096--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:AHEXT1     9.12      .459 No_date    3:30   21.74  n/a
    [LAG= 84.0 min]<- 07:EXTND3      9.12      .459 No_date    4:54   21.74  n/a
003:0097--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           04:TOT2       57.17    1.098 No_date    3:30   16.97  n/a
                    + 07:EXTND3      9.12      .459 No_date    4:54   21.74  n/a
    [DT= 2.00]  SUM=  01:TC2EXT     66.29    1.193 No_date    4:54   17.63  n/a
003:0098--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:TC2EXT     66.29    1.193 No_date    4:54   17.63  n/a
                    + 05:ND2ND3    163.58    2.367 No_date    5:38   14.58  n/a
    [DT= 2.00]  SUM=  06:TOTND3    229.87    3.091 No_date    5:26   15.46  n/a
003:0099--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      07:T1a        48.72    1.054 No_date    3:58   13.21 .237
     [CN= 66.0: N= 3.00]
     [Tp=  .48:DT= 2.00]
003:0100--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:TOTND3    229.87    3.091 No_date    5:26   15.46  n/a
    [LAG= 47.9 min]<- 08:ND3ND4     229.87    3.091 No_date    6:12   15.46  n/a
003:0101--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           08:ND3ND4     229.87    3.091 No_date    6:12   15.46  n/a
                    + 07:T1a        48.72    1.054 No_date    3:58   13.21  n/a
    [DT= 2.00]  SUM=  09:TOTND4     278.59    3.272 No_date    6:10   15.07  n/a
003:0102--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOTND4    278.59    3.272 No_date    6:10   15.07  n/a
    [LAG= 25.2 min]<- 01:T4321a     278.59    3.272 No_date    6:34   15.07  n/a
003:0103--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      02:T1b        49.02     .584 No_date    4:56   13.21 .237
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
003:0104--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:T4321a     278.59    3.272 No_date    6:34   15.07  n/a
                    + 02:T1b        49.02     .584 No_date    4:56   13.21  n/a
    [DT= 2.00]  SUM=  06:ND5+2S     327.61    3.638 No_date    6:22   14.79  n/a
003:0105--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   06:ND5+2S     327.61    3.638 No_date    6:22   14.79  n/a
      Major System <  01:>2ND9      149.32    2.388 No_date    6:22   14.79  n/a
      Minor System >  03:<ND5-2     178.29    1.250 No_date    4:02   14.79  n/a
003:0106--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    06:C5-RES      6.30     .292 No_date    3:32   21.74 .390
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 534.:MNI=.013:SCI=   .0]
003:0107--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:C5-RES      6.30     .292 No_date    3:32   21.74  n/a
    [LAG=116.5 min]<- 07:TSR5         6.30     .292 No_date    5:28   21.74  n/a
003:0108--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      08:C5-AGR     94.80    1.024 No_date    5:10   13.21 .237
     [CN= 66.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
003:0109--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           07:TSR5        6.30     .292 No_date    5:28   21.74  n/a
                    + 08:C5-AGR     94.80    1.024 No_date    5:10   13.21  n/a
    [DT= 2.00]  SUM=  06:ND9-2     101.10    1.296 No_date    5:26   13.74  n/a
003:0110--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:>2ND9     149.32    2.388 No_date    6:22   14.79  n/a
                    + 06:ND9-2     101.10    1.296 No_date    5:26   13.74  n/a
    [DT= 2.00]  SUM=  09:ND9+2     250.42    3.346 No_date    5:52   14.37  n/a
003:0111--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      01:TOTND8     27.63     .258 No_date    5:34   13.21 .237
     [CN= 66.0: N= 3.00]
```



```
     [Tp= 1.70:DT= 2.00]
  ** END OF RUN :   3

**********************************************************************************



 RUN:COMMAND#
 004:0114-------------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2     (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   4 ]
 *#*****************************************************************************
 *#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
 *#  Date        : 09-19-2006
 *#  Modeller    : [I.Chan]
 *#  Company     : R.J. Burnside and Associates
 *#  License #   :  3846413
 *#*****************************************************************************
 004:0116-------------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  = 25-Year SCS Type-II Storm Distribution (6-hour) Owen Sound,
      [SDT=30.00:SDUR=   6.50:PTOT= 65.00]
 004:0117--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD      01:C4-AGR    118.68    2.420 No_date    4:32   18.40 .283
      [CN= 68.0: N= 3.00]
      [Tp=  .91:DT= 2.00]
 004:0118--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB STANDHYD    02:C4-RES      2.20     .242 No_date    3:30   38.39 .591
      [XIMP=.30:TIMP=.50]
      [LOSS= 2 :CN= 71.0]
      [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
 004:0119--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
  *  CALIB STANDHYD    03:C4-COM      1.38     .240 No_date    3:30   58.90 .906
      [XIMP=.90:TIMP=.90]
      [LOSS= 2 :CN= 71.0]
      [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
 004:0120--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD           01:C4-AGR    118.68    2.420 No_date    4:32   18.40  n/a
                     + 02:C4-RES      2.20     .242 No_date    3:30   38.39  n/a
     [DT= 2.00]  SUM=  04:TAGRE     120.88    2.458 No_date    4:30   18.77  n/a
 004:0121--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD           04:TAGRE     120.88    2.458 No_date    4:30   18.77  n/a
                     + 03:C4-COM      1.38     .240 No_date    3:30   58.90  n/a
     [DT= 2.00]  SUM=  05:TOT4      122.26    2.486 No_date    4:30   19.22  n/a
 004:0122--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 05:TOT4     122.26    2.486 No_date    4:30   19.22  n/a
     [LAG= 31.7 min]<- 06:TOTSH4    122.26    2.486 No_date    5:00   19.22  n/a
 004:0123--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD      01:C3-AGR     34.92     .716 No_date    4:24   17.30 .266
      [CN= 66.0: N= 3.00]
      [Tp=  .82:DT= 2.00]
 004:0124--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB STANDHYD    02:C3-RES      6.40     .605 No_date    3:30   36.14 .556
      [XIMP=.30:TIMP=.40]
      [LOSS= 2 :CN= 71.0]
```

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     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
004:0125--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES      6.40      .605 No_date     3:30    36.14  n/a
     [LAG= 27.5 min]<- 03:3SHRES      6.40      .605 No_date     3:56    36.14  n/a
004:0126--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           03:3SHRES      6.40      .605 No_date     3:56    36.14  n/a
                    + 01:C3-AGR     34.92      .716 No_date     4:24    17.30  n/a
     [DT= 2.00]  SUM= 04:TOT3        41.32     1.180 No_date     3:58    20.22  n/a
004:0127--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:TOTSH4     122.26     2.486 No_date     5:00    19.22  n/a
                    + 04:TOT3        41.32     1.180 No_date     3:58    20.22  n/a
     [DT= 2.00]  SUM= 08:TOTND2     163.58     3.207 No_date     4:54    19.47  n/a
004:0128--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2     163.58     3.207 No_date     4:54    19.47  n/a
     [LAG= 42.5 min]<- 05:ND2ND3     163.58     3.207 No_date     5:36    19.47  n/a
004:0129--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      09:C2-AGR      49.56      .947 No_date     4:32    17.30 .266
     [CN= 66.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
004:0130--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    01:C2-COM       2.75      .454 No_date     3:30    57.64 .887
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
004:0131--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    02:C2-IND       4.86      .688 No_date     3:30    49.60 .763
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI=  70.:MNI=.013:SCI=   .0]
004:0132--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           09:C2-AGR      49.56      .947 No_date     4:32    17.30  n/a
                    + 01:C2-COM       2.75      .454 No_date     3:30    57.64  n/a
     [DT= 2.00]  SUM= 03:T2          52.31     1.003 No_date     4:30    19.42  n/a
004:0133--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           02:C2-IND       4.86      .688 No_date     3:30    49.60  n/a
                    + 03:T2          52.31     1.003 No_date     4:30    19.42  n/a
     [DT= 2.00]  SUM= 04:TOT2        57.17     1.331 No_date     3:30    21.98  n/a
004:0134--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    03:AHEXT1       9.12      .563 No_date     3:30    26.54 .408
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
004:0135--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:AHEXT1      9.12      .563 No_date     3:30    26.54  n/a
     [LAG= 84.0 min]<- 07:EXTND3      9.12      .563 No_date     4:54    26.54  n/a
004:0136--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           04:TOT2        57.17     1.331 No_date     3:30    21.98  n/a
                    + 07:EXTND3       9.12      .563 No_date     4:54    26.54  n/a
     [DT= 2.00]  SUM= 01:TC2EXT      66.29     1.543 No_date     4:54    22.61  n/a
004:0137--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:TC2EXT      66.29     1.543 No_date     4:54    22.61  n/a
                    + 05:ND2ND3     163.58     3.207 No_date     5:36    19.47  n/a
     [DT= 2.00]  SUM= 06:TOTND3     229.87     4.155 No_date     5:26    20.38  n/a
004:0138--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      07:T1a         48.72     1.437 No_date     3:58    17.81 .274
     [CN= 66.0: N= 3.00]
     [Tp=  .48:DT= 2.00]
004:0139--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:TOTND3     229.87     4.155 No_date     5:26    20.38  n/a
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     [LAG= 47.9 min]<- 08:ND3ND4     229.87     4.155 No_date     6:12    20.38  n/a
004:0140--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           08:ND3ND4     229.87     4.155 No_date     6:12    20.38  n/a
                    + 07:T1a         48.72     1.437 No_date     3:58    17.81  n/a
     [DT= 2.00]  SUM= 09:TOTND4     278.59     4.391 No_date     6:10    19.93  n/a
004:0141--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOTND4     278.59     4.391 No_date     6:10    19.93  n/a
     [LAG= 25.2 min]<- 01:T4321a     278.59     4.391 No_date     6:34    19.93  n/a
004:0142--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      02:T1b         49.02      .793 No_date     4:54    17.81 .274
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
004:0143--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:T4321a     278.59     4.391 No_date     6:34    19.93  n/a
                    + 02:T1b         49.02      .793 No_date     4:54    17.81  n/a
     [DT= 2.00]  SUM= 06:ND5+25     327.61     4.882 No_date     6:22    19.61  n/a
004:0144--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   06:ND5+25     327.61     4.882 No_date     6:22    19.61  n/a
      Major System  / 01:>2ND9      185.32     3.632 No_date     6:22    19.61  n/a
      Minor System  \ 03:<ND5-2     142.29     1.250 No_date     3:54    19.61  n/a
004:0145--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    06:C5-RES       6.30      .355 No_date     3:32    26.54 .408
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 534.:MNI=.013:SCI=   .0]
004:0146--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:C5-RES       6.30      .355 No_date     3:32    26.54  n/a
     [LAG=116.5 min]<- 07:TSR5         6.30      .355 No_date     5:28    26.54  n/a
004:0147--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      08:C5-AGR      94.80     1.389 No_date     5:08    17.81 .274
     [CN= 66.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
004:0148--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           07:TSR5         6.30      .355 No_date     5:28    26.54  n/a
                    + 08:C5-AGR      94.80     1.389 No_date     5:08    17.81  n/a
     [DT= 2.00]  SUM= 06:ND9-2      101.10     1.710 No_date     5:26    18.36  n/a
004:0149--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:>2ND9      185.32     3.632 No_date     6:22    19.61  n/a
                    + 06:ND9-2      101.10     1.710 No_date     5:26    18.36  n/a
     [DT= 2.00]  SUM= 09:ND9+2      286.42     4.835 No_date     6:08    19.17  n/a
004:0150--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      01:TOTND8      27.63      .349 No_date     5:32    17.81 .274
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
  ** END OF RUN :   4
```

****

```
 RUN:COMMAND#
 005:0154--------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2     (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   5 ]
*#*************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 09-19-2006
```

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*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   :  3846413
*#*************************************************************************
005:0156----------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  = 50-Year SCS Type-II Storm Distribution (6-hour) Owen Sound,
     [SDT=30.00:SDUR=   6.50:PTOT= 71.90]
005:0157--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C4-AGR   118.68     2.943 No_date    4:30   22.26 .310
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
005:0158--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C4-RES     2.20      .279 No_date    3:30   43.92 .611
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
005:0159--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
  * CALIB STANDHYD     03:C4-COM     1.38      .266 No_date    3:30   65.53 .911
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
005:0160--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:C4-AGR   118.68     2.943 No_date    4:30   22.26  n/a
                     + 02:C4-RES     2.20      .279 No_date    3:30   43.92  n/a
     [DT= 2.00]  SUM=  04:TAGRE    120.88     2.987 No_date    4:30   22.65  n/a
005:0161--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TAGRE    120.88     2.987 No_date    4:30   22.65  n/a
                     + 03:C4-COM     1.38      .266 No_date    3:30   65.53  n/a
     [DT= 2.00]  SUM=  05:TOT4     122.26     3.018 No_date    4:30   23.14  n/a
005:0162--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:TOT4     122.26     3.018 No_date    4:30   23.14  n/a
     [LAG= 31.7 min]<- 06:TOTSH4   122.26     3.018 No_date    5:00   23.14  n/a
005:0163--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C3-AGR    34.92      .873 No_date    4:24   20.97 .292
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
005:0164--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C3-RES     6.40      .715 No_date    3:30   41.41 .576
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
005:0165--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES     6.40      .715 No_date    3:30   41.41  n/a
     [LAG= 27.5 min]<- 03:3SHRES     6.40      .715 No_date    3:56   41.41  n/a
005:0166--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:3SHRES    6.40      .715 No_date    3:56   41.41  n/a
                     + 01:C3-AGR    34.92     .873 No_date    4:24   20.97  n/a
     [DT= 2.00]  SUM=  04:TOT3      41.32    1.422 No_date    3:58   24.13  n/a
005:0167--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTSH4   122.26    3.018 No_date    5:00   23.14  n/a
                     + 04:TOT3      41.32    1.422 No_date    3:58   24.13  n/a
     [DT= 2.00]  SUM=  08:TOTND2   163.58    3.883 No_date    4:54   23.39  n/a
005:0168--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2   163.58    3.883 No_date    4:54   23.39  n/a
     [LAG= 42.5 min]<- 05:ND2ND3   163.58    3.883 No_date    5:36   23.39  n/a
005:0169--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       09:C2-AGR    49.56    1.154 No_date    4:32   20.97 .292
     [CN= 66.0: N= 3.00]
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     [Tp=  .91:DT= 2.00]
005:0170--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     01:C2-COM     2.75      .503 No_date    3:30   64.06 .891
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
005:0171--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C2-IND     4.86      .765 No_date    3:30   55.29 .769
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI=  70.:MNI=.013:SCI=   .0]
005:0172--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:C2-AGR    49.56    1.154 No_date    4:32   20.97  n/a
                     + 01:C2-COM     2.75     .503 No_date    3:30   64.06  n/a
     [DT= 2.00]  SUM=  03:T2        52.31    1.217 No_date    4:30   23.23  n/a
005:0173--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:C2-IND     4.86     .765 No_date    3:30   55.29  n/a
                     + 03:T2        52.31    1.217 No_date    4:30   23.23  n/a
     [DT= 2.00]  SUM=  04:TOT2      57.17    1.512 No_date    3:30   25.96  n/a
005:0174--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     03:AHEXT1     9.12      .645 No_date    3:30   30.25 .421
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
005:0175--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:AHEXT1     9.12      .645 No_date    3:30   30.25  n/a
     [LAG= 84.0 min]<- 07:EXTND3     9.12      .645 No_date    4:54   30.25  n/a
005:0176--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TOT2      57.17    1.512 No_date    3:30   25.96  n/a
                     + 07:EXTND3     9.12     .645 No_date    4:54   30.25  n/a
     [DT= 2.00]  SUM=  01:TC2EXT    66.29    1.823 No_date    4:54   26.55  n/a
005:0177--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:TC2EXT    66.29    1.823 No_date    4:54   26.55  n/a
                     + 05:ND2ND3   163.58    3.883 No_date    5:36   23.39  n/a
     [DT= 2.00]  SUM=  06:TOTND3   229.87    5.010 No_date    5:26   24.30  n/a
005:0178--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:T1a       48.72    1.748 No_date    3:56   21.52 .299
     [CN= 66.0: N= 3.00]
     [Tp=  .48:DT= 2.00]
005:0179--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:TOTND3   229.87    5.010 No_date    5:26   24.30  n/a
     [LAG= 47.9 min]<- 08:ND3ND4   229.87    5.010 No_date    6:12   24.30  n/a
005:0180--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            08:ND3ND4    229.87   5.010 No_date    6:12   24.30  n/a
                     + 07:T1a       48.72    1.748 No_date    3:56   21.52  n/a
     [DT= 2.00]  SUM=  09:TOTND4   278.59    5.289 No_date    6:10   23.81  n/a
005:0181--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOTND4   278.59    5.289 No_date    6:10   23.81  n/a
     [LAG= 25.2 min]<- 01:T4321a   278.59    5.289 No_date    6:34   23.81  n/a
005:0182--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:T1b       49.02     .962 No_date    4:54   21.52 .299
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
005:0183--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:T4321a    278.59   5.289 No_date    6:34   23.81  n/a
                     + 02:T1b       49.02     .962 No_date    4:54   21.52  n/a
     [DT= 2.00]  SUM=  06:ND5+25   327.61    5.881 No_date    6:22   23.47  n/a
005:0184--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD    06:ND5+25    327.61   5.881 No_date    6:22   23.47  n/a
      Major System /   01:>2ND9     204.84    4.631 No_date    6:22   23.47  n/a
```

```
     Minor System \  03:<ND5-2    122.77     1.250 No_date    3:50   23.47  n/a
005:0185--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:C5-RES      6.30      .405 No_date    3:32   30.25 .421
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 534.:MNI=.013:SCI=   .0]
005:0186--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:C5-RES      6.30      .405 No_date    3:32   30.25  n/a
     [LAG=116.5 min]<- 07:TSR5        6.30      .405 No_date    5:28   30.25  n/a
005:0187--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:C5-AGR     94.80     1.683 No_date    5:08   21.52 .299
     [CN= 66.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
005:0188--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:TSR5       6.30      .405 No_date    5:28   30.25  n/a
                     + 08:C5-AGR     94.80     1.683 No_date    5:08   21.52  n/a
     [DT= 2.00]  SUM=  06:ND9-2     101.10     2.043 No_date    5:26   22.06  n/a
005:0189--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:>2ND9     204.84     4.631 No_date    6:22   23.47  n/a
                     + 06:ND9-2     101.10     2.043 No_date    5:26   22.06  n/a
     [DT= 2.00]  SUM=  09:ND9+2     305.94     6.050 No_date    6:08   23.00  n/a
005:0190--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:TOTND8     27.63      .423 No_date    5:30   21.52 .299
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
  ** END OF RUN :   5

**********************************************************************************



RUN:COMMAND#
006:0195--------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2     (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   6 ]
*#*********************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 09-19-2006
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   :  3846413
*#*********************************************************************************
006:0197--------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  = 100-Year SCS Type-II Storm Distribution (6-hour) Owen Sound,
     [SDT=30.00:SDUR=   6.50:PTOT= 78.70]
006:0198--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C4-AGR    118.68     3.490 No_date    4:30   26.28 .334
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
006:0199--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C4-RES      2.20      .317 No_date    3:30   49.49 .629
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
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006:0200--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
  * CALIB STANDHYD     03:C4-COM      1.38      .292 No_date    3:30   72.09 .916
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
006:0201--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:C4-AGR    118.68     3.490 No_date    4:30   26.28  n/a
                     + 02:C4-RES      2.20      .317 No_date    3:30   49.49  n/a
     [DT= 2.00]  SUM=  04:TAGRE     120.88     3.539 No_date    4:30   26.70  n/a
006:0202--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TAGRE     120.88     3.539 No_date    4:30   26.70  n/a
                     + 03:C4-COM      1.38      .292 No_date    3:30   72.09  n/a
     [DT= 2.00]  SUM=  05:TOT4      122.26     3.574 No_date    4:30   27.21  n/a
006:0203--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:TOT4     122.26     3.574 No_date    4:30   27.21  n/a
     [LAG= 31.7 min]<- 06:TOTSH4   122.26     3.574 No_date    5:00   27.21  n/a
006:0204--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C3-AGR     34.92     1.037 No_date    4:24   24.80 .315
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
006:0205--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C3-RES      6.40      .815 No_date    3:30   46.74 .594
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
006:0206--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES      6.40      .815 No_date    3:30   46.74  n/a
     [LAG= 27.5 min]<- 03:3SHRES      6.40      .815 No_date    3:56   46.74  n/a
006:0207--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:3SHRES     6.40      .815 No_date    3:56   46.74  n/a
                     + 01:C3-AGR     34.92     1.037 No_date    4:24   24.80  n/a
     [DT= 2.00]  SUM=  04:TOT3       41.32     1.663 No_date    3:58   28.20  n/a
006:0208--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTSH4    122.26     3.574 No_date    5:00   27.21  n/a
                     + 04:TOT3       41.32     1.663 No_date    3:58   28.20  n/a
     [DT= 2.00]  SUM=  08:TOTND2    163.58     4.590 No_date    4:52   27.46  n/a
006:0209--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2   163.58     4.590 No_date    4:52   27.46  n/a
     [LAG= 42.5 min]<- 05:ND2ND3    163.58     4.590 No_date    5:34   27.46  n/a
006:0210--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       09:C2-AGR     49.56     1.371 No_date    4:30   24.80 .315
     [CN= 66.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
006:0211--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     01:C2-COM      2.75      .553 No_date    3:30   70.40 .895
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
006:0212--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C2-IND      4.86      .841 No_date    3:30   60.95 .774
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI=  70.:MNI=.013:SCI=   .0]
006:0213--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:C2-AGR     49.56     1.371 No_date    4:30   24.80  n/a
                     + 01:C2-COM      2.75      .553 No_date    3:30   70.40  n/a
     [DT= 2.00]  SUM=  03:T2         52.31     1.440 No_date    4:30   27.20  n/a
006:0214--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:C2-IND      4.86      .841 No_date    3:30   60.95  n/a
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                  +  03:T2          52.31     1.440 No_date    4:30   27.20  n/a
    [DT= 2.00]  SUM=  04:TOT2        57.17     1.695 No_date    3:30   30.07  n/a
006:0215--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     03:AHEXT1      9.12      .734 No_date    3:30   34.04 .432
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
006:0216--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 03:AHEXT1      9.12      .734 No_date    3:30   34.04  n/a
     [LAG= 84.0 min]<- 07:EXTND3      9.12      .734 No_date    4:54   34.04  n/a
006:0217--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TOT2       57.17     1.695 No_date    3:30   30.07  n/a
                  +  07:EXTND3      9.12      .734 No_date    4:54   34.04  n/a
    [DT= 2.00]  SUM=  01:TC2EXT     66.29     2.118 No_date    4:54   30.61  n/a
006:0218--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:TC2EXT     66.29     2.118 No_date    4:54   30.61  n/a
                  +  05:ND2ND3    163.58     4.590 No_date    5:34   27.46  n/a
    [DT= 2.00]  SUM=  06:TOTND3    229.87     5.904 No_date    5:24   28.37  n/a
006:0219--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:T1a        48.72     2.074 No_date    3:56   25.38 .323
     [CN= 66.0: N= 3.00]
     [Tp=  .48:DT= 2.00]
006:0220--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:TOTND3    229.87     5.904 No_date    5:24   28.37  n/a
     [LAG= 47.9 min]<- 08:ND3ND4    229.87     5.904 No_date    6:10   28.37  n/a
006:0221--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            08:ND3ND4    229.87     5.904 No_date    6:10   28.37  n/a
                  +  07:T1a        48.72     2.074 No_date    3:56   25.38  n/a
    [DT= 2.00]  SUM=  09:TOTND4    278.59     6.226 No_date    6:10   27.85  n/a
006:0222--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 09:TOTND4    278.59     6.226 No_date    6:10   27.85  n/a
     [LAG= 25.2 min]<- 01:T4321a    278.59     6.226 No_date    6:34   27.85  n/a
006:0223--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:T1b        49.02     1.138 No_date    4:52   25.38 .323
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
006:0224--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:T4321a    278.59     6.226 No_date    6:34   27.85  n/a
                  +  02:T1b        49.02     1.138 No_date    4:52   25.38  n/a
    [DT= 2.00]  SUM=  06:ND5+25    327.61     6.915 No_date    6:22   27.48  n/a
006:0225--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD    06:ND5+25    327.61     6.915 No_date    6:22   27.48  n/a
       Major System /  01:>2ND9     219.97     5.665 No_date    6:22   27.48  n/a
       Minor System \  03:<ND5-2    107.64     1.250 No_date    3:48   27.48  n/a
006:0226--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:C5-RES      6.30      .458 No_date    3:32   34.04 .432
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 534.:MNI=.013:SCI=   .0]
006:0227--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:C5-RES      6.30      .458 No_date    3:32   34.04  n/a
     [LAG=116.5 min]<- 07:TSR5        6.30      .458 No_date    5:28   34.04  n/a
006:0228--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       08:C5-AGR     94.80     1.990 No_date    5:06   25.38 .323
     [CN= 66.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
006:0229--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:TSR5       6.30      .458 No_date    5:28   34.04  n/a
                  +  08:C5-AGR     94.80     1.990 No_date    5:06   25.38  n/a
    [DT= 2.00]  SUM=  06:ND9-2     101.10     2.390 No_date    5:26   25.92  n/a
006:0230--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD            01:>2ND9     219.97     5.665 No_date    6:22   27.48  n/a
                  +  06:ND9-2     101.10     2.390 No_date    5:26   25.92  n/a
    [DT= 2.00]  SUM=  09:ND9+2     321.07     7.297 No_date    6:06   26.99  n/a
006:0231--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:TOTND8     27.63      .500 No_date    5:30   25.38 .323
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
  ** END OF RUN :   6

**********************************************************************************



 RUN:COMMAND#
 007:0237--------------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2     (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   7 ]
 *#*****************************************************************************
 *#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
 *#  Date        : 09-19-2006
 *#  Modeller    : [I.Chan]
 *#  Company     : R.J. Burnside and Associates
 *#  License #   :  3846413
 *#*****************************************************************************
 007:0239--------------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  = TIMMINS REGIONAL STORM (12-hour)
      [SDT=60.00:SDUR=  12.00:PTOT=193.00]
 007:0240--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:C4-AGR    118.68     6.693 No_date    7:42  112.39 .582
      [CN= 68.0: N= 3.00]
      [Tp=  .91:DT= 2.00]
 007:0241--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB STANDHYD     02:C4-RES      2.20      .229 No_date    7:00  152.61 .791
      [XIMP=.30:TIMP=.50]
      [LOSS= 2 :CN= 71.0]
      [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
 007:0242--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
   *  CALIB STANDHYD     03:C4-COM      1.38      .161 No_date    7:00  184.01 .953
      [XIMP=.90:TIMP=.90]
      [LOSS= 2 :CN= 71.0]
      [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
      [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
 007:0243--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            01:C4-AGR    118.68     6.693 No_date    7:42  112.39  n/a
                   +  02:C4-RES      2.20      .229 No_date    7:00  152.61  n/a
     [DT= 2.00]  SUM=  04:TAGRE     120.88     6.806 No_date    7:42  113.12  n/a
 007:0244--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     ADD HYD            04:TAGRE     120.88     6.806 No_date    7:42  113.12  n/a
                   +  03:C4-COM      1.38      .161 No_date    7:00  184.01  n/a
     [DT= 2.00]  SUM=  05:TOT4      122.26     6.881 No_date    7:42  113.92  n/a
 007:0245--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     SHIFT HYD       -> 05:TOT4      122.26     6.881 No_date    7:42  113.92  n/a
      [LAG= 31.7 min]<- 06:TOTSH4    122.26     6.881 No_date    8:12  113.92  n/a
 007:0246--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
     CALIB NASHYD       01:C3-AGR     34.92     1.977 No_date    7:34  108.36 .561
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     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
007:0247--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      02:C3-RES      6.40      .635 No_date     7:00  147.09 .762
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
007:0248--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 02:C3-RES      6.40      .635 No_date     7:00  147.09  n/a
     [LAG= 27.5 min]<- 03:3SHRES      6.40      .635 No_date     7:26  147.09  n/a
007:0249--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:3SHRES      6.40      .635 No_date     7:26  147.09  n/a
                   +    01:C3-AGR     34.92     1.977 No_date     7:34  108.36  n/a
     [DT= 2.00]  SUM=   04:TOT3       41.32     2.595 No_date     7:26  114.36  n/a
007:0250--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             06:TOTSH4    122.26     6.881 No_date     8:12  113.92  n/a
                   +    04:TOT3       41.32     2.595 No_date     7:26  114.36  n/a
     [DT= 2.00]  SUM=   08:TOTND2    163.58     9.027 No_date     8:06  114.03  n/a
007:0251--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 08:TOTND2    163.58     9.027 No_date     8:06  114.03  n/a
     [LAG= 42.5 min]<- 05:ND2ND3     163.58     9.027 No_date     8:48  114.03  n/a
007:0252--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        09:C2-AGR     49.56     2.686 No_date     7:42  108.36 .561
     [CN= 66.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
007:0253--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      01:C2-COM      2.75      .307 No_date     7:00  178.81 .926
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
007:0254--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      02:C2-IND      4.86      .491 No_date     7:00  160.53 .832
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI=  70.:MNI=.013:SCI=   .0]
007:0255--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             09:C2-AGR     49.56     2.686 No_date     7:42  108.36  n/a
                   +    01:C2-COM      2.75      .307 No_date     7:00  178.81  n/a
     [DT= 2.00]  SUM=   03:T2         52.31     2.833 No_date     7:42  112.06  n/a
007:0256--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:C2-IND      4.86      .491 No_date     7:00  160.53  n/a
                   +    03:T2         52.31     2.833 No_date     7:42  112.06  n/a
     [DT= 2.00]  SUM=   04:TOT2       57.17     3.071 No_date     7:42  116.18  n/a
007:0257--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      03:AHEXT1      9.12      .628 No_date     7:00  110.82 .574
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
007:0258--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 03:AHEXT1      9.12      .628 No_date     7:00  110.82  n/a
     [LAG= 84.0 min]<- 07:EXTND3      9.12      .628 No_date     8:24  110.82  n/a
007:0259--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:TOT2       57.17     3.071 No_date     7:42  116.18  n/a
                   +    07:EXTND3      9.12      .628 No_date     8:24  110.82  n/a
     [DT= 2.00]  SUM=   01:TC2EXT     66.29     3.576 No_date     8:08  115.44  n/a
007:0260--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:TC2EXT     66.29     3.576 No_date     8:08  115.44  n/a
                   +    05:ND2ND3    163.58     9.027 No_date     8:48  114.03  n/a
     [DT= 2.00]  SUM=   06:TOTND3    229.87    12.346 No_date     8:40  114.44  n/a
```



```
007:0261--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        07:T1a        48.72     3.375 No_date     7:10  109.19 .566
     [CN= 66.0: N= 3.00]
     [Tp=  .48:DT= 2.00]
007:0262--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 06:TOTND3    229.87    12.346 No_date     8:40  114.44  n/a
     [LAG= 47.9 min]<- 08:ND3ND4     229.87    12.346 No_date     9:26  114.44  n/a
007:0263--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             08:ND3ND4    229.87    12.346 No_date     9:26  114.44  n/a
                   +    07:T1a        48.72     3.375 No_date     7:10  109.19  n/a
     [DT= 2.00]  SUM=   09:TOTND4    278.59    14.529 No_date     9:16  113.52  n/a
007:0264--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 09:TOTND4    278.59    14.529 No_date     9:16  113.52  n/a
     [LAG= 25.2 min]<- 01:T4321a     278.59    14.529 No_date     9:40  113.52  n/a
007:0265--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:T1b        49.02     2.387 No_date     8:22  109.19 .566
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
007:0266--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:T4321a    278.59    14.529 No_date     9:40  113.52  n/a
                   +    02:T1b        49.02     2.387 No_date     8:22  109.19  n/a
     [DT= 2.00]  SUM=   06:ND5+25    327.61    16.803 No_date     9:38  112.87  n/a
007:0267--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD     06:ND5+25    327.61    16.803 No_date     9:38  112.87  n/a
      Major System  /   01:>2ND9     269.66    15.553 No_date     9:38  112.87  n/a
      Minor System  \   03:<ND5-2     57.95     1.250 No_date     2:32  112.87  n/a
007:0268--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      06:C5-RES      6.30      .414 No_date     7:02  110.82 .574
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 534.:MNI=.013:SCI=   .0]
007:0269--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD        -> 06:C5-RES      6.30      .414 No_date     7:02  110.82  n/a
     [LAG=116.5 min]<- 07:TSR5        6.30      .414 No_date     8:58  110.82  n/a
007:0270--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        08:C5-AGR     94.80     4.500 No_date     9:12  109.19 .566
     [CN= 66.0: N= 3.00]
     [Tp= 1.39:DT= 2.00]
007:0271--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             07:TSR5        6.30      .414 No_date     8:58  110.82  n/a
                   +    08:C5-AGR     94.80     4.500 No_date     9:12  109.19  n/a
     [DT= 2.00]  SUM=   06:ND9-2     101.10     4.897 No_date     9:00  109.29  n/a
007:0272--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:>2ND9     269.66    15.553 No_date     9:38  112.87  n/a
                   +    06:ND9-2     101.10     4.897 No_date     9:00  109.29  n/a
     [DT= 2.00]  SUM=   09:ND9+2     370.76    20.244 No_date     9:36  111.89  n/a
007:0273--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        01:TOTND8     27.63     1.248 No_date     9:32  109.19 .566
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
007:0280-------------------------------------------------------------------------
     FINISH
-------------------------------------------------------------------------------
*******************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
0005 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
0042 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
```

```
0080 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
0119 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
0159 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
0200 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
0242 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
  Simulation ended on 2010-01-18     at 12:58:39
```

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Alternative #4

```
2     Metric units
*#************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 11/11/2009
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#************************************************************************
*%
* ALTERNATIVE #4
*%
*%
*%
*% 2-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[1]
*%                   ["2SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-------------------------------------------------------|
*%
*%-----------------|-------------------------------------------------------|
* CATCHMENT #4- AGRICULTURAL LAND USE
CALIB NASHYD        ID=[1], NHYD=["C4-AGR"], DT=[2]min, AREA=[118.68](ha),
                    DWF=[0](cms),  CN/C=[68], IA=[8.0](mm),
                    N=[3], TP=[0.91]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT #4- RESIDENTIAL LAND USE
CALIB STANDHYD      ID=[2], NHYD=["C4-RES"], DT=[2](min), AREA=[2.20](ha),
                    XIMP=[0.3], TIMP=[0.5], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[71],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[6.0](%),
                                         LGP=[50](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[1.5](%),
                                         LGI=[120](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT #4- COMMERCIAL LAND USE
CALIB STANDHYD      ID=[3], NHYD=["C4-COM"], DT=[2](min), AREA=[1.38](ha),
                    XIMP=[0.9], TIMP=[0.9], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[71],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[2.0](%),
                                         LGP=[5](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[2.0](%),
                                         LGI=[35](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
* TOTAL FLOW FROM CATCHMENT 4 AGRICULTURAL AND RESIDENTIAL AREAS
ADD HYD             IDsum=[4], NHYD=["TAGRE"], IDs to add=[1+2]
*%-----------------|-------------------------------------------------------|
* TOTAL FLOW FROM CATCHMENT 4 (AGRICULTURAL, RESIDENTIAL AND COMMERCIAL)
ADD HYD             IDsum=[5], NHYD=["TOT4"], IDs to add=[4+3]
*%-----------------|-------------------------------------------------------|
*TOTAL FLOW, CATCHMENT 4 (NORTH CATCHMENT) SHIFT TO FLOW NODE 2
*%-----------------|-------------------------------------------------------|
SHIFT HYD           IDout=[6], NHYD=["TOTSH4"], IDin=[5], TLAG=[31.74](min)
*%-----------------|-------------------------------------------------------|
*************************************************************************
*%
* CATCHMENT #3- AGRICULTURAL LAND USE
CALIB NASHYD        ID=[1], NHYD=["C3-AGR"], DT=[2]min, AREA=[34.92](ha),
                    DWF=[0](cms),  CN/C=[66], IA=[8.0](mm),
                    N=[3], TP=[0.82]hrs,
```



```
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT #3- JARDINE CRESCENT RESIDENTIAL AREA
CALIB STANDHYD      ID=[2], NHYD=["C3-RES"], DT=[2](min), AREA=[6.4](ha),
                    XIMP=[0.3], TIMP=[0.4], DWF=[0.0](cms), LOSS=[2],
                    SCS curve number CN=[71],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[6.7](%),
                                         LGP=[45](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[1.5](%),
                                         LGI=[370](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
* SHIFT RESIDENTIAL TO NODE 2
SHIFT HYD           IDout=[3], NHYD=["3SHRES"], IDin=[2], TLAG=[27.53](min)
*%-----------------|-------------------------------------------------------|
*************************************************************************
* TOTAL PRE-DEVELOPMENT FLOW CATCHMENT #3
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["TOT3"], IDs to add=[3+1]
*%-----------------|-------------------------------------------------------|
*************************************************************************
* TOTAL PRE-DEVELOPMENT FLOW TO FLOW NODE 2
* INCLUDES CATCHMENTS 3 AND 4
*%-----------------|-------------------------------------------------------|
ADD HYD             IDsum=[8], NHYD=["TOTND2"], IDs to add=[6+4]
*%-----------------|-------------------------------------------------------|
* SHIFT NODE 2 TO POND OUTLET
*%-----------------|-------------------------------------------------------|
SHIFT HYD           IDout=[5], NHYD=["ND2N2B"], IDin=[8], TLAG=[12.68](min)
*%-----------------|-------------------------------------------------------|
* CATCHMENT #2E- AGRICULTURAL LAND USE
CALIB NASHYD        ID=[4], NHYD=["2E-AGR"], DT=[2]min, AREA=[9.72](ha),
                    DWF=[0](cms),  CN/C=[66], IA=[7.0](mm),
                    N=[3], TP=[0.70]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%-----------------|-------------------------------------------------------|
* NODE 2B: TOTAL FLOW FROM 4, 3, 2E
ADD HYD             IDsum=[8], NHYD=["NODE2B"], IDs to add=[4+5]
*%-----------------|-------------------------------------------------------|
*% 25-Year uncontrolled flow rate to be piped down to Airport Road
COMPUTE DUALHYD     IDin=[8], CINLET=[3.237](cms), NINLET=[1],
                    MAJID=[7], MajNHYD=[">25S"],
                    MINID=[5], MinNHYD=["<25E"],
                    TMJSTO=[0](cu-m)
*%-----------------|-------------------------------------------------------|
* SHIFT NODE 2B TO NODE 3
SHIFT HYD           IDout=[8], NHYD=["N2BND3"], IDin=[5], TLAG=[10.37](min)
*%-----------------|-------------------------------------------------------|
*************************************************************************

* CATCHMENT #2W- RESIDENTIAL LAND USE
CALIB STANDHYD      ID=[6], NHYD=["2W-RES"}, DT=[2](min), AREA=[36.91](ha),
                    XIMP=[0.3], TIMP=[0.5], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[44],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[2.0](%),
                                         LGP=[20](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[0.6](%),
                                         LGI=[700](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%-----------------|-------------------------------------------------------|
* CATCHMENT #2W- COMMERCIAL LAND USE
CALIB STANDHYD      ID=[1], NHYD=["2W-COM"}, DT=[2](min), AREA=[2.60](ha),
                    XIMP=[0.9], TIMP=[0.9], DWF=[0](cms), LOSS=[2],
```

```
                    SCS curve number CN=[44],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[0.5](%),
                                         LGP=[20](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[0.5](%),
                                         LGI=[245](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
* TOTAL FLOW FROM 2W
ADD HYD             IDsum=[4], NHYD=["TOT2W"], IDs to add=[6+1]
*%------------------|-------------------------------------------------------------|
* ALLIANCE HOMES EXTERNAL AREA #1
CALIB STANDHYD      ID=[6], NHYD=["EXT1"], DT=[2](min), AREA=[9.12](ha),
                    XIMP=[0.30], TIMP=[0.40], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[44],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[1.3](%),
                                         LGP=[40](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[0.8](%),
                                         LGI=[400](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
* SHIFT FLOW FROM ALLIANCE HOMES EXTERNAL AREA TO POND
SHIFT HYD           IDout=[2], NHYD=["SAHEXT"], IDin=[6], TLAG=[23.85](min)
*%------------------|-------------------------------------------------------------|
* TOTAL FLOW FROM ALLIANCE HOMES EXTERNAL AREAS
ADD HYD             IDsum=[6], NHYD=["2WEXT1"], IDs to add=[2+4]
*%------------------|-------------------------------------------------------------|
* 100-POST TO 5-PRE (0.984 FOR CATCHMENT #2 + EXT1) OVERCONTROL
ROUTE RESERVOIR     IDout=[2],   NHYD=["POND"],  IDin=[6],
                    RDT=[2](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                     (cms) - (ha-m)
                                   [ 0.000 ,  0.00   ]
                                   [ 0.951 ,  1.10   ]
                                   [    -1 ,    -1   ]  (max twenty pts)

                         IDovf=[5], NHYDovf=["POND-O"]
*%------------------|-------------------------------------------------------------|
* >25 YEAR SPILL + POND OUTFLOW
ADD HYD             IDsum=[6], NHYD=["POND-E"], IDs to add=[2+7]
*%------------------|-------------------------------------------------------------|
* + POND OVERFLOW
ADD HYD             IDsum=[1], NHYD=["POND-E"], IDs to add=[5+6]
*%------------------|-------------------------------------------------------------|
*******************************************************************************
* CATCHMENT #5- RESIDENTIAL AREA
CALIB STANDHYD      ID=[2], NHYD=["C5-RES"], DT=[2](min), AREA=[3.15](ha),
                    XIMP=[0.30], TIMP=[0.50], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[44],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[2.0](%),
                                         LGP=[20](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[0.5](%),
                                         LGI=[250](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
* SHIFT FLOW FROM CATCHMENT #5 TO NODE 6
SHIFT HYD           IDout=[3], NHYD=["SH5ND6"], IDin=[2], TLAG=[9.06](min)
*%------------------|-------------------------------------------------------------|
* CATCHMENT #6- INDUSTRIAL AREA
CALIB STANDHYD      ID=[7], NHYD=["C6-IND"], DT=[2](min), AREA=[4.79](ha),
                    XIMP=[0.75], TIMP=[0.75], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[44],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[0.5](%),
                                         LGP=[20](m), MNP=[0.25], SCP=[0](hrs),
```



```
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[0.5](%),
                                         LGI=[450](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
* TOTAL POST-DEVELOPMENT FLOW CATCHMENTS 5 AND 6
ADD HYD             IDsum=[5], NHYD=["TOT5&6"], IDs to add=[7+3]
*%------------------|-------------------------------------------------------------|
* TOTAL POST-DEVELOPMENT FLOW CATCHMENTS 5 AND 6 + ALLIANCE + >25YEAR
ADD HYD             IDsum=[6], NHYD=["TOTND6"], IDs to add=[1+5]
*%------------------|-------------------------------------------------------------|
*******************************************************************************
*% 1.744m3/s flow rate to be piped down to outlet
COMPUTE DUALHYD     IDin=[6], CINLET=[1.744](cms), NINLET=[1],
                    MAJID=[5], MajNHYD=[">SURF"],
                    MINID=[9], MinNHYD=["<PIPE"],
                    TMJSTO=[0](cu-m)
*%------------------|-------------------------------------------------------------|
*******************************************************************************
* SHIFT FLOW FROM NODE 6 TO NODE 7
SHIFT HYD           IDout=[7], NHYD=["ND6ND7"], IDin=[5], TLAG=[23.72](min)
*%------------------|-------------------------------------------------------------|
* CATCHMENT #7-A - MEADOW
CALIB NASHYD        ID=[1], NHYD=["C7-AGR"], DT=[2]min, AREA=[4.75](ha),
                    DWF=[0](cms),  CN/C=[39], IA=[8.0](mm),
                    N=[3], TP=[0.63]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%------------------|-------------------------------------------------------------|
* CATCHMENT #7-R - RESIDENTIAL LAND USE
CALIB STANDHYD      ID=[6], NHYD=["C7-RES"], DT=[2](min), AREA=[5.05](ha),
                    XIMP=[0.3], TIMP=[0.50], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[44],
                    Pervious   surfaces: IAper=[5.0](mm), SLPP=[1.0](%),
                                         LGP=[20](m), MNP=[0.25], SCP=[0](hrs),
                    Impervious surfaces: IAimp=[2.0](mm), SLPI=[0.5](%),
                                         LGI=[475](m), MNI=[0.013], SCI=[0](hrs),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*%------------------|-------------------------------------------------------------|
ADD HYD             IDsum=[4], NHYD=["TOTC7"], IDs to add=[1+6]
*%------------------|-------------------------------------------------------------|
ADD HYD             IDsum=[6], NHYD=["TOTSF7"], IDs to add=[7+4]
*%------------------|-------------------------------------------------------------|
ADD HYD             IDsum=[7], NHYD=["TOTND7"], IDs to add=[6+9]
*%------------------|-------------------------------------------------------------|
*% 1.744m3/s flow rate to be piped down to outlet
COMPUTE DUALHYD     IDin=[7], CINLET=[1.744](cms), NINLET=[1],
                    MAJID=[5], MajNHYD=[">SURF"],
                    MINID=[9], MinNHYD=["<PIPE"],
                    TMJSTO=[0](cu-m)
*%------------------|-------------------------------------------------------------|
*******************************************************************************
* CATCHMENT #6
* TOTAL PRE-DEVELOPMENT FLOW TO FLOW NODE 8
*%------------------|-------------------------------------------------------------|
* SHIFT FLOW FROM FLOW NODE 7 TO FLOW NODE 8
SHIFT HYD           IDout=[1], NHYD=["ND7ND8"], IDin=[5], TLAG=[38.74](min)
*%------------------|-------------------------------------------------------------|
CALIB NASHYD        ID=[7], NHYD=["8-AGR"], DT=[2]min, AREA=[27.63](ha),
                    DWF=[0](cms),  CN/C=[66], IA=[7.0](mm),
                    N=[3], TP=[1.70]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*%------------------|-------------------------------------------------------------|
*******************************************************************************
* TOTAL PRE-DEVLOPMENT FLOW TO FLOW NODE 8 MINUS PIPE
```

```
*%-----------------|-------------------------------------------------------------|
ADD HYD           IDsum=[5], NHYD=["ND8-"], IDs to add=[1+7]
*%-----------------|-------------------------------------------------------------|
*****************************************************************************
* TOTAL PRE-DEVLOPMENT FLOW TO FLOW NODE 8 PLUS PIPE
*%-----------------|-------------------------------------------------------------|
ADD HYD           IDsum=[1], NHYD=["ND8+"], IDs to add=[9+5]
*%-----------------|-------------------------------------------------------------|
*****************************************************************************

*%
* CATCHMENT #1a - AGRICULTURAL LAND USE
*%
* SHIFT FLOW FROM FLOW NODE 3 (<25YEAR) TO NODE 4
* INCLUDES CATCHMENTS 4,3,2
SHIFT HYD         IDout=[6], NHYD=["ND3ND4"], IDin=[8], TLAG=[47.94](min)
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD      ID=[7], NHYD=["1a-AGR"], DT=[2]min, AREA=[48.72](ha),
                  DWF=[0](cms), CN/C=[66], IA=[7.0](mm),
                  N=[3], TP=[0.74]hrs,
                  RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
* TOTAL PRE-DEVLOPMENT FLOW FROM NODE 4
* INCLUDES CATCHMENTS 2,3,4 AND 1a
*%-----------------|-------------------------------------------------------------|
ADD HYD           IDsum=[4], NHYD=["NODE4"], IDs to add=[6+7]
*%-----------------|-------------------------------------------------------------|
* SHIFT FLOW FROM FLOW NODE 4 TO FLOW NODE 5
SHIFT HYD         IDout=[6], NHYD=["ND4ND5"], IDin=[4], TLAG=[27.31](min)
*%-----------------|-------------------------------------------------------------|
CALIB NASHYD      ID=[2], NHYD=["1b-AGR"], DT=[2]min, AREA=[39.77](ha),
                  DWF=[0](cms), CN/C=[66], IA=[7.0](mm),
                  N=[3], TP=[1.21]hrs,
                  RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
*****************************************************************************
* TOTAL PRE-DEVLOPMENT FLOW NODE 1b
* INCLUDES CATCHMENTS 2,3,4, 1a AND 1b
*%-----------------|-------------------------------------------------------------|
ADD HYD           IDsum=[5], NHYD=["NODE5"], IDs to add=[6+2]
*%-----------------|-------------------------------------------------------------|
*****************************************************************************
*% Airport Road Bridge Crossing - from HEC-RAS: QIDi=Qleave, QIDii=Qtot-Qleave
DIVERT HYD        IDin=[5], NIDout=[2],
                  outflow hydrographs (ID, NHYD)=[7,"AIRP-S"/4,"BRIDGE"]
                  flow distribution table: (modify as necessary)
                  Note: all flows are in (cms)
                      QIDi +  QIDii  =  QTOTAL
                     [   0  +    0   =    0   ]
                     [ 0.174+  1.141 =  1.315 ]
                     [ 0.497+  1.813 =  2.310 ]
                     [ 0.762+  2.329 =  3.091 ]
                     [ 1.272+  2.881 =  4.153 ]
                     [ 1.504+  3.087 =  4.591 ]
                     [ 1.790+  3.341 =  5.131 ]
                     [ 4.025+  4.001 =  8.026 ] end
*%-----------------|-------------------------------------------------------------|
* SHIFT FLOW FROM FLOW NODE 5 TO FLOW NODE 9
SHIFT HYD         IDout=[5], NHYD=["ND5ND9"], IDin=[7], TLAG=[38.70](min)
*%-----------------|-------------------------------------------------------------|
* CATCHMENT #9- AGRICULTURAL LAND USE
CALIB NASHYD      ID=[6], NHYD=["9-AGR"], DT=[2]min, AREA=[100.54](ha),
                  DWF=[0](cms), CN/C=[66], IA=[7.0](mm),
```



```
                  N=[3], TP=[1.36]hrs,
                  RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----------------|-------------------------------------------------------------|
ADD HYD           IDsum=[7], NHYD=["NODE9"], IDs to add=[5+6]
*%-----------------|-------------------------------------------------------------|
*****************************************************************************

*% 5-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START             TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[2]
*%                 ["5SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------------|
*% 10-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START             TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[3]
*%                 ["10SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------------|
*% 25-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START             TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[4]
*%                 ["25SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------------|
*% 50-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START             TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[5]
*%                 ["50SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------------|
*% 100-year SCS Type-II Storm Distribution for Owen Sound, ON. (6-hour)
START             TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[6]
*%                 ["100SCS6.stm"] <--storm filename
*%-----------------|-------------------------------------------------------------|
*% Timmins Regional Storm (12-hour)
START             TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[7]
*%                 ["12Regtim.089"] <--storm filename
*%-----------------|-------------------------------------------------------------|
*% 25mm Quality Storm (4-hour)
START             TZERO=[0.0], METOUT=[2], NSTORM=[1], NRUN=[8]
*%                 ["25mm4hr.stm"] <--storm filename
*%-----------------|-------------------------------------------------------------|
FINISH
```

```
SSSSS  W   W  M   M  H   H  Y   Y  M   M   000        999   55555 ========
S      W W W  MM MM  H   H   Y Y   MM MM  O   O    9   9  5
SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O ##  9   9  5       Ver.  3.1
    S  W W    M   M  H   H    Y    M   M  O   O     9999  5555  Oct. 1997
SSSSS   W W   M   M  H   H    Y    M   M   000          9      5 ========
                                                    9   9      5 # 3846413
     StormWater Management HYdrologic Model          999   5555  ========

*******************************************************************************
************************** SWMHYMO-95w Ver/3.1 ********************************
*******  A single event and continuous hydrologic simulation model  ********
*******     based on the principles of HYMO and its successors      ********
*******                 OTTHYMO-83 and OTTHYMO-89.                  ********
*******************************************************************************
******* Distributed by:  J.F. Sabourin and Associates Inc.           ********
*******                  Ottawa,  Ontario: (613) 727-5199           ********
*******                  Gatineau, Quebec: (819) 243-6858           ********
*******                  E-Mail: swmhymo@jfsa.Com                   ********
*******************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++ Licensed user: R.J. Burnside and Associates                    +++++++
+++++++                Stayner                SERIAL#:3846413         +++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************
*******            ++++++ PROGRAM ARRAY DIMENSIONS ++++++             ********
*******            Maximum value for ID numbers  :     10            ********
*******            Max. number of rainfall points:   5000            ********
*******            Max. number of flow points    :   5000            ********
*******************************************************************************

*** DESCRIPTION SUMMARY TABLE HEADERS (units depend on METOUT in START) ***
*******************************************************************************
***     ID:  Hydrograph IDentification numbers, (1-10).                     ***
***   NHYD:  Hydrograph reference numbers, (6 digits or characters).        ***
***   AREA:  Drainage area associated with hydrograph, (ac.) or (ha.).      ***
*** QPEAK:  Peak flow of simulated hydrograph, (ft^3/s) or (m^3/s).        ***
*** TpeakDate_hh:mm is the date and time of the peak flow.                 ***
***   R.V.:  Runoff Volume of simulated hydrograph, (in) or (mm).           ***
***   R.C.:  Runoff Coefficient of simulated hydrograph, (ratio).           ***
***      *:  see WARNING or NOTE message printed at end of run.             ***
***     **:  see  ERROR  message printed at end of run.                     ***
*******************************************************************************
*******************************************************************************

:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::

*******************************************************************************

********************   S U M M A R Y   O U T P U T   ***********************
*******************************************************************************
*       DATE: 2010-01-19      TIME: 15:07:44      RUN COUNTER: 002156         *
*******************************************************************************
* Input   filename: W:\100113~2\ALT#4C~1.DAT                                  *
* Output  filename: W:\100113~2\ALT#4C~1.out                                  *
* Summary filename: W:\100113~2\ALT#4C~1.sum                                  *
* User comments:                                                              *
* 1:_____________________________________________________________________     *
* 2:_____________________________________________________________________     *
* 3:_____________________________________________________________________     *
```



```
*******************************************************************************

*#*****************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 11/11/2009
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#*****************************************************************************
RUN:COMMAND#
001:0001----------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   1 ]
001:0002----------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  = 2-Year SCS Type-II Storm Distribution (6-hour) Owen Sound, O
     [SDT=30.00:SDUR=   6.50:PTOT= 37.20]
001:0003--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C4-AGR    118.68      .724 No_date    4:38    5.73 .154
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
001:0004--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C4-RES      2.20      .102 No_date    3:30   17.91 .481
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
001:0005--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
 *  CALIB STANDHYD     03:C4-COM      1.38      .134 No_date    3:30   32.44 .872
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
001:0006--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:C4-AGR    118.68      .724 No_date    4:38    5.73  n/a
                     + 02:C4-RES      2.20      .102 No_date    3:30   17.91  n/a
     [DT= 2.00]  SUM=  04:TAGRE    120.88      .741 No_date    4:36    5.95  n/a
001:0007--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TAGRE    120.88      .741 No_date    4:36    5.95  n/a
                     + 03:C4-COM      1.38      .134 No_date    3:30   32.44  n/a
     [DT= 2.00]  SUM=  05:TOT4     122.26      .753 No_date    4:30    6.25  n/a
001:0008--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:TOT4     122.26      .753 No_date    4:30    6.25  n/a
     [LAG= 31.7 min]<- 06:TOTSH4   122.26      .753 No_date    5:00    6.25  n/a
001:0009--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C3-AGR     34.92      .211 No_date    4:30    5.33 .143
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
001:0010--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C3-RES      6.40      .257 No_date    3:32   16.78 .451
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
001:0011--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES      6.40      .257 No_date    3:32   16.78  n/a
     [LAG= 27.5 min]<- 03:3SHRES      6.40      .257 No_date    3:58   16.78  n/a
001:0012--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
    ADD HYD              03:3SHRES     6.40      .257 No_date    3:58   16.78  n/a
                    +    01:C3-AGR    34.92      .211 No_date    4:30    5.33  n/a
     [DT= 2.00]  SUM=    04:TOT3      41.32      .413 No_date    3:58    7.10  n/a
001:0013--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              06:TOTSH4    122.26      .753 No_date    5:00    6.25  n/a
                    +    04:TOT3      41.32      .413 No_date    3:58    7.10  n/a
     [DT= 2.00]  SUM=    08:TOTND2    163.58      .997 No_date    4:58    6.47  n/a
001:0014--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       ->  08:TOTND2    163.58      .997 No_date    4:58    6.47  n/a
     [LAG= 12.7 min]<-  05:ND2N2B    163.58      .997 No_date    5:10    6.47  n/a
001:0015--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD         04:2E-AGR     9.72      .070 No_date    4:20    5.66 .152
     [CN= 66.0: N= 3.00]
     [Tp=  .70:DT= 2.00]
001:0016--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              04:2E-AGR     9.72      .070 No_date    4:20    5.66  n/a
                    +    05:ND2N2B    163.58      .997 No_date    5:10    6.47  n/a
     [DT= 2.00]  SUM=    08:NODE2B    173.30     1.045 No_date    5:08    6.42  n/a
001:0017--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD      08:NODE2B    173.30     1.045 No_date    5:08    6.42  n/a
      Major System  <    07:>25S        .00      .000 No_date    0:00     .00  n/a
      Minor System  \    05:<25E      173.30     1.045 No_date    5:08    6.42  n/a
001:0018--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       ->  05:<25E      173.30     1.045 No_date    5:08    6.42  n/a
     [LAG= 10.4 min]<-  08:N2BND3    173.30     1.045 No_date    5:18    6.42  n/a
001:0019--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD       06:2W-RES     36.91     1.094 No_date    3:34   13.55 .364
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .60:LGI= 700.:MNI=.013:SCI=   .0]
001:0020--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD       01:2W-COM      2.60      .239 No_date    3:30   31.97 .859
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
001:0021--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              06:2W-RES     36.91     1.094 No_date    3:34   13.55  n/a
                    +    01:2W-COM      2.60      .239 No_date    3:30   31.97  n/a
     [DT= 2.00]  SUM=    04:TOT2W     39.51     1.316 No_date    3:32   14.76  n/a
001:0022--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD       06:EXT1       9.12      .280 No_date    3:30   13.01 .350
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
001:0023--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       ->  06:EXT1       9.12      .280 No_date    3:30   13.01  n/a
     [LAG= 23.9 min]<-  02:SAHEXT     9.12      .280 No_date    3:52   13.01  n/a
001:0024--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              02:SAHEXT     9.12      .280 No_date    3:52   13.01  n/a
                    +    04:TOT2W     39.51     1.316 No_date    3:32   14.76  n/a
     [DT= 2.00]  SUM=    06:2WEXT1    48.63     1.487 No_date    3:34   14.43  n/a
001:0025--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE RESERVOIR ->  06:2WEXT1    48.63     1.487 No_date    3:34   14.43  n/a
     [RDT= 2.00] out<-  02:POND      48.63      .356 No_date    4:40   14.43  n/a
          overflow <=   05:POND-O      .00      .000 No_date    0:00     .00  n/a
     {MxStoUsed=.4119E+00,  TotOvfVol=.0000E+00}
001:0026--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              02:POND      48.63      .356 No_date    4:40   14.43  n/a
                    +    07:>25S        .00      .000 No_date    0:00     .00  n/a
     [DT= 2.00]  SUM=    06:POND-E    48.63      .356 No_date    4:40   14.43  n/a
```



```
001:0027--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              05:POND-O      .00      .000 No_date    0:00     .00  n/a
                    +    06:POND-E    48.63      .356 No_date    4:40   14.43  n/a
     [DT= 2.00]  SUM=    01:POND-E    48.63      .356 No_date    4:40   14.43  n/a
001:0028--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD       02:C5-RES     3.15      .108 No_date    3:30   13.55 .364
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 250.:MNI=.013:SCI=   .0]
001:0029--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       ->  02:C5-RES     3.15      .108 No_date    3:30   13.55  n/a
     [LAG=  9.1 min]<-  03:SH5ND6     3.15      .108 No_date    3:38   13.55  n/a
001:0030--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD       07:C6-IND     4.79      .340 No_date    3:32   27.13 .729
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 450.:MNI=.013:SCI=   .0]
001:0031--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              07:C6-IND     4.79      .340 No_date    3:32   27.13  n/a
                    +    03:SH5ND6     3.15      .108 No_date    3:38   13.55  n/a
     [DT= 2.00]  SUM=    05:TOT5&6     7.94      .440 No_date    3:32   21.74  n/a
001:0032--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              01:POND-E    48.63      .356 No_date    4:40   14.43  n/a
                    +    05:TOT5&6     7.94      .440 No_date    3:32   21.74  n/a
     [DT= 2.00]  SUM=    06:TOTND6    56.57      .621 No_date    3:36   15.46  n/a
001:0033--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD      06:TOTND6    56.57      .621 No_date    3:36   15.46  n/a
      Major System  <    05:>SURF       .00      .000 No_date    0:00     .00  n/a
      Minor System  \    09:<PIPE     56.57      .621 No_date    3:36   15.46  n/a
001:0034--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       ->  05:>SURF       .00      .000 No_date    0:00     .00  n/a
     [LAG= 23.7 min]<-  07:ND6ND7      .00      .000 No_date    0:22     .00  n/a
001:0035--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD         01:C7-AGR     4.75      .012 No_date    4:16    2.00 .054
     [CN= 39.0: N= 3.00]
     [Tp=  .63:DT= 2.00]
001:0036--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD       06:C7-RES     5.05      .155 No_date    3:32   13.55 .364
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 475.:MNI=.013:SCI=   .0]
001:0037--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              01:C7-AGR     4.75      .012 No_date    4:16    2.00  n/a
                    +    06:C7-RES     5.05      .155 No_date    3:32   13.55  n/a
     [DT= 2.00]  SUM=    04:TOTC7      9.80      .159 No_date    3:34    7.95  n/a
001:0038--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              07:ND6ND7      .00      .000 No_date    0:22     .00  n/a
                    +    04:TOTC7      9.80      .159 No_date    3:34    7.95  n/a
     [DT= 2.00]  SUM=    06:TOTSF7     9.80      .159 No_date    3:34    7.95  n/a
001:0039--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              06:TOTSF7     9.80      .159 No_date    3:34    7.95  n/a
                    +    09:<PIPE     56.57      .621 No_date    3:36   15.46  n/a
     [DT= 2.00]  SUM=    07:TOTND7    66.37      .777 No_date    3:36   14.35  n/a
001:0040--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD      07:TOTND7    66.37      .777 No_date    3:36   14.35  n/a
      Major System  <    05:>SURF       .00      .000 No_date    0:00     .00  n/a
      Minor System  \    09:<PIPE     66.37      .777 No_date    3:36   14.35  n/a
001:0041--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       ->  05:>SURF       .00      .000 No_date    0:00     .00  n/a
     [LAG= 38.7 min]<-  01:ND7ND8      .00      .000 No_date    0:38     .00  n/a
```

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001:0042---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:8-AGR     27.63     .109 No_date    5:40    5.66 .152
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
001:0043---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:ND7ND8      .00      .000 No_date    0:38     .00  n/a
                     + 07:8-AGR     27.63     .109 No_date    5:40    5.66  n/a
     [DT= 2.00]  SUM=  05:ND8-      27.63     .109 No_date    5:40    5.66  n/a
001:0044---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:<PIPE     66.37     .777 No_date    3:36   14.35  n/a
                     + 05:ND8-      27.63     .109 No_date    5:40    5.66  n/a
     [DT= 2.00]  SUM=  01:ND8+      94.00     .787 No_date    3:36   11.80  n/a
001:0045---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:N2BND3   173.30    1.045 No_date    5:18    6.42  n/a
     [LAG= 47.9 min]<- 06:ND3ND4   173.30    1.045 No_date    6:04    6.42  n/a
001:0046---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:1a-AGR    48.72     .338 No_date    4:22    5.66 .152
     [CN= 66.0: N= 3.00]
     [Tp=  .74:DT= 2.00]
001:0047---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:ND3ND4   173.30    1.045 No_date    6:04    6.42  n/a
                     + 07:1a-AGR    48.72     .338 No_date    4:22    5.66  n/a
     [DT= 2.00]  SUM=  04:NODE4     222.02    1.180 No_date    5:58    6.26  n/a
001:0048---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 04:NODE4    222.02    1.180 No_date    5:58    6.26  n/a
     [LAG= 27.3 min]<- 06:ND4ND5   222.02    1.180 No_date    6:24    6.26  n/a
001:0049---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:1b-AGR    39.77     .199 No_date    5:00    5.66 .152
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
001:0050---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:ND4ND5   222.02    1.180 No_date    6:24    6.26  n/a
                     + 02:1b-AGR    39.77     .199 No_date    5:00    5.66  n/a
     [DT= 2.00]  SUM=  05:NODE5     261.79    1.315 No_date    6:20    6.17  n/a
001:0051---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    DIVERT HYD      -> 05:NODE5    261.79    1.315 No_date    6:20    6.17  n/a
          diverted <= 07:AIRP-S     34.64     .174 No_date    6:20    6.17  n/a
          diverted <= 04:BRIDGE    227.15    1.141 No_date    6:20    6.17  n/a
001:0052---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 07:AIRP-S    34.64     .174 No_date    6:20    6.17  n/a
     [LAG= 38.7 min]<- 05:ND5ND9    34.64     .174 No_date    6:58    6.17  n/a
001:0053---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:9-AGR    100.54     .465 No_date    5:12    5.66 .152
     [CN= 66.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
001:0054---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:ND5ND9    34.64     .174 No_date    6:58    6.17  n/a
                     + 06:9-AGR    100.54     .465 No_date    5:12    5.66  n/a
     [DT= 2.00]  SUM=  07:NODE9     135.18     .555 No_date    5:52    5.79  n/a
 ** END OF RUN :   1

********************************************************************************



RUN:COMMAND#
002:0055---------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
```



```
     [NRUN  =   2 ]
*#*****************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 11/11/2009
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#*****************************************************************************
002:0057---------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  = 5-Year SCS Type-II Storm Distribution (6-hour) Owen Sound, O
     [SDT=30.00:SDUR=   6.50:PTOT= 48.30]
002:0058---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C4-AGR   118.68    1.311 No_date    4:34   10.16 .210
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
002:0059---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C4-RES     2.20     .154 No_date    3:30   25.68 .532
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
002:0060---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
 *  CALIB STANDHYD     03:C4-COM     1.38     .176 No_date    3:30   42.95 .889
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
002:0061---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:C4-AGR   118.68    1.311 No_date    4:34   10.16  n/a
                     + 02:C4-RES     2.20     .154 No_date    3:30   25.68  n/a
     [DT= 2.00]  SUM=  04:TAGRE    120.88    1.336 No_date    4:32   10.44  n/a
002:0062---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TAGRE    120.88    1.336 No_date    4:32   10.44  n/a
                     + 03:C4-COM     1.38     .176 No_date    3:30   42.95  n/a
     [DT= 2.00]  SUM=  05:TOT4     122.26    1.355 No_date    4:30   10.81  n/a
002:0063---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:TOT4     122.26    1.355 No_date    4:30   10.81  n/a
     [LAG= 31.7 min]<- 06:TOTSH4   122.26    1.355 No_date    5:00   10.81  n/a
002:0064---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C3-AGR    34.92     .385 No_date    4:28    9.49 .196
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
002:0065---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C3-RES     6.40     .386 No_date    3:30   24.09 .499
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
002:0066---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES     6.40     .386 No_date    3:30   24.09  n/a
     [LAG= 27.5 min]<- 03:3SHRES     6.40     .386 No_date    3:56   24.09  n/a
002:0067---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:3SHRES     6.40     .386 No_date    3:56   24.09  n/a
                     + 01:C3-AGR    34.92     .385 No_date    4:28    9.49  n/a
     [DT= 2.00]  SUM=  04:TOT3      41.32     .682 No_date    3:58   11.75  n/a
002:0068---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTSH4   122.26    1.355 No_date    5:00   10.81  n/a
                     + 04:TOT3      41.32     .682 No_date    3:58   11.75  n/a
     [DT= 2.00]  SUM=  08:TOTND2   163.58    1.765 No_date    4:56   11.05  n/a
002:0069---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2   163.58    1.765 No_date    4:56   11.05  n/a
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    [LAG= 12.7 min]<- 05:ND2N2B   163.58     1.765 No_date    5:08   11.05  n/a
002:0070--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      04:2E-AGR     9.72      .125 No_date    4:16    9.91 .205
     [CN= 66.0: N= 3.00]
     [Tp=  .70:DT= 2.00]
002:0071--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           04:2E-AGR     9.72      .125 No_date    4:16    9.91  n/a
                    + 05:ND2N2B   163.58     1.765 No_date    5:08   11.05  n/a
     [DT= 2.00]  SUM= 08:NODE2B   173.30     1.848 No_date    5:06   10.98  n/a
002:0072--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   08:NODE2B   173.30     1.848 No_date    5:06   10.98  n/a
       Major System / 07:>25S        .00      .000 No_date    0:00     .00  n/a
       Minor System \ 05:<25E     173.30     1.848 No_date    5:06   10.98  n/a
002:0073--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:<25E     173.30     1.848 No_date    5:06   10.98  n/a
     [LAG= 10.4 min]<- 08:N2BND3   173.30     1.848 No_date    5:16   10.98  n/a
002:0074--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    06:2W-RES     36.91     1.568 No_date    3:34   18.97 .393
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .60:LGI= 700.:MNI=.013:SCI=   .0]
002:0075--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    01:2W-COM      2.60      .314 No_date    3:30   42.18 .873
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
002:0076--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:2W-RES     36.91     1.568 No_date    3:34   18.97  n/a
                    + 01:2W-COM      2.60      .314 No_date    3:30   42.18  n/a
     [DT= 2.00]  SUM= 04:TOT2W      39.51     1.865 No_date    3:32   20.50  n/a
002:0077--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    06:EXT1        9.12      .386 No_date    3:30   18.11 .375
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
002:0078--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:EXT1        9.12      .386 No_date    3:30   18.11  n/a
     [LAG= 23.9 min]<- 02:SAHEXT      9.12      .386 No_date    3:52   18.11  n/a
002:0079--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           02:SAHEXT      9.12      .386 No_date    3:52   18.11  n/a
                    + 04:TOT2W      39.51     1.865 No_date    3:32   20.50  n/a
     [DT= 2.00]  SUM= 06:2WEXT1     48.63     2.112 No_date    3:34   20.05  n/a
002:0080--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE RESERVOIR -> 06:2WEXT1    48.63     2.112 No_date    3:34   20.05  n/a
      [RDT= 2.00] out<- 02:POND      48.63      .496 No_date    4:38   20.05  n/a
          overflow <= 05:POND-O        .00      .000 No_date    0:00     .00  n/a
    {MxStoUsed=.5735E+00,  TotovfVol=.0000E+00}
002:0081--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           02:POND       48.63      .496 No_date    4:38   20.05  n/a
                    + 07:>25S         .00      .000 No_date    0:00     .00  n/a
     [DT= 2.00]  SUM= 06:POND-E     48.63      .496 No_date    4:38   20.05  n/a
002:0082--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           05:POND-O        .00      .000 No_date    0:00     .00  n/a
                    + 06:POND-E     48.63      .496 No_date    4:38   20.05  n/a
     [DT= 2.00]  SUM= 01:POND-E     48.63      .496 No_date    4:38   20.05  n/a
002:0083--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    02:C5-RES      3.15      .152 No_date    3:30   18.97 .393
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
```



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     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 250.:MNI=.013:SCI=   .0]
002:0084--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C5-RES      3.15      .152 No_date    3:30   18.97  n/a
     [LAG=  9.1 min]<- 03:SH5ND6      3.15      .152 No_date    3:38   18.97  n/a
002:0085--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    07:C6-IND      4.79      .458 No_date    3:30   36.00 .745
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 450.:MNI=.013:SCI=   .0]
002:0086--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           07:C6-IND      4.79      .458 No_date    3:30   36.00  n/a
                    + 03:SH5ND6      3.15      .152 No_date    3:38   18.97  n/a
     [DT= 2.00]  SUM= 05:TOT5&6      7.94      .595 No_date    3:32   29.25  n/a
002:0087--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:POND-E     48.63      .496 No_date    4:38   20.05  n/a
                    + 05:TOT5&6      7.94      .595 No_date    3:32   29.25  n/a
     [DT= 2.00]  SUM= 06:TOTND6     56.57      .846 No_date    3:34   21.34  n/a
002:0088--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   06:TOTND6     56.57      .846 No_date    3:34   21.34  n/a
       Major System / 05:>SURF        .00      .000 No_date    0:00     .00  n/a
       Minor System \ 09:<PIPE      56.57      .846 No_date    3:34   21.34  n/a
002:0089--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF        .00      .000 No_date    0:00     .00  n/a
     [LAG= 23.7 min]<- 07:ND6ND7       .00      .000 No_date    0:22     .00  n/a
002:0090--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      01:C7-AGR      4.75      .024 No_date    4:14    3.71 .077
     [CN= 39.0: N= 3.00]
     [Tp=  .63:DT= 2.00]
002:0091--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    06:C7-RES      5.05      .221 No_date    3:32   18.97 .393
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 475.:MNI=.013:SCI=   .0]
002:0092--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:C7-AGR      4.75      .024 No_date    4:14    3.71  n/a
                    + 06:C7-RES      5.05      .221 No_date    3:32   18.97  n/a
     [DT= 2.00]  SUM= 04:TOTC7       9.80      .229 No_date    3:32   11.57  n/a
002:0093--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           07:ND6ND7       .00      .000 No_date    0:22     .00  n/a
                    + 04:TOTC7       9.80      .229 No_date    3:32   11.57  n/a
     [DT= 2.00]  SUM= 06:TOTSF7      9.80      .229 No_date    3:32   11.57  n/a
002:0094--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:TOTSF7      9.80      .229 No_date    3:32   11.57  n/a
                    + 09:<PIPE     56.57      .846 No_date    3:34   21.34  n/a
     [DT= 2.00]  SUM= 07:TOTND7     66.37     1.074 No_date    3:34   19.90  n/a
002:0095--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   07:TOTND7     66.37     1.074 No_date    3:34   19.90  n/a
       Major System / 05:>SURF        .00      .000 No_date    0:00     .00  n/a
       Minor System \ 09:<PIPE      66.37     1.074 No_date    3:34   19.90  n/a
002:0096--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF        .00      .000 No_date    0:00     .00  n/a
     [LAG= 38.7 min]<- 01:ND7ND8       .00      .000 No_date    0:38     .00  n/a
002:0097--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      07:8-AGR      27.63      .193 No_date    5:36    9.91 .205
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
002:0098--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:ND7ND8       .00      .000 No_date    0:38     .00  n/a
                    + 07:8-AGR      27.63      .193 No_date    5:36    9.91  n/a
     [DT= 2.00]  SUM= 05:ND8-       27.63      .193 No_date    5:36    9.91  n/a
002:0099--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
    ADD HYD            09:<PIPE    66.37     1.074 No_date    3:34    19.90  n/a
                   +   05:ND8-     27.63      .193 No_date    5:36     9.91  n/a
     [DT= 2.00]   SUM=  01:ND8+     94.00     1.091 No_date    3:34    16.96  n/a
002:0100--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:N2BND3   173.30     1.848 No_date    5:16    10.98  n/a
     [LAG= 47.9 min]<- 06:ND3ND4   173.30     1.848 No_date    6:02    10.98  n/a
002:0101--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:1a-AGR    48.72      .603 No_date    4:20     9.91 .205
     [CN= 66.0: N= 3.00]
     [Tp=  .74:DT= 2.00]
002:0102--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:ND3ND4   173.30     1.848 No_date    6:02    10.98  n/a
                   +   07:1a-AGR    48.72      .603 No_date    4:20     9.91  n/a
     [DT= 2.00]   SUM=  04:NODE4    222.02     2.079 No_date    5:56    10.75  n/a
002:0103--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 04:NODE4    222.02     2.079 No_date    5:56    10.75  n/a
     [LAG= 27.3 min]<- 06:ND4ND5   222.02     2.079 No_date    6:22    10.75  n/a
002:0104--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       02:1b-AGR    39.77      .353 No_date    4:58     9.91 .205
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
002:0105--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:ND4ND5   222.02     2.079 No_date    6:22    10.75  n/a
                   +   02:1b-AGR    39.77      .353 No_date    4:58     9.91  n/a
     [DT= 2.00]   SUM=  05:NODE5    261.79     2.310 No_date    6:18    10.62  n/a
002:0106--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    DIVERT HYD      -> 05:NODE5    261.79     2.310 No_date    6:18    10.62  n/a
          diverted <= 07:AIRP-S     45.55      .497 No_date    6:18    10.62  n/a
          diverted <= 04:BRIDGE    216.24     1.813 No_date    6:18    10.62  n/a
002:0107--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 07:AIRP-S    45.55      .497 No_date    6:18    10.62  n/a
     [LAG= 38.7 min]<- 05:ND5ND9    45.55      .497 No_date    6:56    10.62  n/a
002:0108--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       06:9-AGR    100.54      .823 No_date    5:10     9.91 .205
     [CN= 66.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
002:0109--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:ND5ND9    45.55      .497 No_date    6:56    10.62  n/a
                   +   06:9-AGR     100.54      .823 No_date    5:10     9.91  n/a
     [DT= 2.00]   SUM=  07:NODE9    146.09     1.085 No_date    6:12    10.13  n/a
  ** END OF RUN :   2
```

****

```
 RUN:COMMAND#
 003:0111-------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   3 ]
*#*************************************************************************
*#  Project Name: [Creemore East Drainage Study]     Project Number: [MCG 10770]
*#  Date        : 11/11/2009
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#*************************************************************************
 003:0113-------------------------------------------------------------------------
```



```
    READ STORM
     Filename = STORM.001
     Comment  = 10-Year SCS Type-II Storm Distribution (6-hour) Owen Sound,
     [SDT=30.00:SDUR=   6.50:PTOT= 55.70]
003:0114--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C4-AGR   118.68     1.772 No_date    4:34    13.61 .244
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
003:0115--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C4-RES     2.20      .190 No_date    3:30    31.18 .560
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
003:0116--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
 *  CALIB STANDHYD     03:C4-COM     1.38      .204 No_date    3:30    49.99 .898
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
003:0117--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:C4-AGR   118.68     1.772 No_date    4:34    13.61  n/a
                   +   02:C4-RES     2.20      .190 No_date    3:30    31.18  n/a
     [DT= 2.00]   SUM=  04:TAGRE    120.88     1.803 No_date    4:32    13.93  n/a
003:0118--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TAGRE    120.88     1.803 No_date    4:32    13.93  n/a
                   +   03:C4-COM     1.38      .204 No_date    3:30    49.99  n/a
     [DT= 2.00]   SUM=  05:TOT4     122.26     1.827 No_date    4:30    14.33  n/a
003:0119--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:TOT4     122.26     1.827 No_date    4:30    14.33  n/a
     [LAG= 31.7 min]<- 06:TOTSH4   122.26     1.827 No_date    5:00    14.33  n/a
003:0120--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C3-AGR    34.92      .522 No_date    4:26    12.74 .229
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
003:0121--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C3-RES     6.40      .474 No_date    3:30    29.30 .526
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
003:0122--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES     6.40      .474 No_date    3:30    29.30  n/a
     [LAG= 27.5 min]<- 03:3SHRES     6.40      .474 No_date    3:56    29.30  n/a
003:0123--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:3SHRES     6.40      .474 No_date    3:56    29.30  n/a
                   +   01:C3-AGR    34.92      .522 No_date    4:26    12.74  n/a
     [DT= 2.00]   SUM=  04:TOT3     41.32      .885 No_date    3:58    15.31  n/a
003:0124--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTSH4   122.26     1.827 No_date    5:00    14.33  n/a
                   +   04:TOT3     41.32      .885 No_date    3:58    15.31  n/a
     [DT= 2.00]   SUM=  08:TOTND2   163.58     2.367 No_date    4:56    14.58  n/a
003:0125--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2   163.58     2.367 No_date    4:56    14.58  n/a
     [LAG= 12.7 min]<- 05:ND2N2B   163.58     2.367 No_date    5:08    14.58  n/a
003:0126--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:2E-AGR     9.72      .168 No_date    4:16    13.21 .237
     [CN= 66.0: N= 3.00]
     [Tp=  .70:DT= 2.00]
003:0127--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:2E-AGR     9.72      .168 No_date    4:16    13.21  n/a
                   +   05:ND2N2B   163.58     2.367 No_date    5:08    14.58  n/a
     [DT= 2.00]   SUM=  08:NODE2B   173.30     2.478 No_date    5:06    14.50  n/a
```

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003:0128---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD    08:NODE2B    173.30     2.478 No_date     5:06    14.50  n/a
      Major System /   07:>25S         .00      .000 No_date     0:00      .00  n/a
      Minor System \   05:<25E     173.30     2.478 No_date     5:06    14.50  n/a
003:0129---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:<25E     173.30     2.478 No_date     5:06    14.50  n/a
     [LAG= 10.4 min]<- 08:N2BND3   173.30     2.478 No_date     5:16    14.50  n/a
003:0130---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:2W-RES     36.91     1.915 No_date     3:34    22.83 .410
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI= .60:LGI= 700.:MNI=.013:SCI=    .0]
003:0131---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     01:2W-COM      2.60      .365 No_date     3:30    49.02 .880
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=    .0]
003:0132---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:2W-RES     36.91     1.915 No_date     3:34    22.83  n/a
                     + 01:2W-COM      2.60      .365 No_date     3:30    49.02  n/a
     [DT= 2.00]  SUM=  04:TOT2W      39.51     2.254 No_date     3:32    24.55  n/a
003:0133---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:EXT1        9.12      .459 No_date     3:30    21.74 .390
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=    .0]
003:0134---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:EXT1        9.12      .459 No_date     3:30    21.74  n/a
     [LAG= 23.9 min]<- 02:SAHEXT      9.12      .459 No_date     3:52    21.74  n/a
003:0135---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:SAHEXT      9.12      .459 No_date     3:52    21.74  n/a
                     + 04:TOT2W      39.51     2.254 No_date     3:32    24.55  n/a
     [DT= 2.00]  SUM=  06:2WEXT1     48.63     2.536 No_date     3:34    24.03  n/a
003:0136---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE RESERVOIR -> 06:2WEXT1     48.63     2.536 No_date     3:34    24.03  n/a
     [RDT= 2.00] out<- 02:POND       48.63      .595 No_date     4:38    24.03  n/a
          overflow <= 05:POND-O        .00      .000 No_date     0:00      .00  n/a
    {MxStoUsed=.6882E+00,  TotOvfVol=.0000E+00}
003:0137---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:POND        48.63      .595 No_date     4:38    24.03  n/a
                     + 07:>25S         .00      .000 No_date     0:00      .00  n/a
     [DT= 2.00]  SUM=  06:POND-E      48.63      .595 No_date     4:38    24.03  n/a
003:0138---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:POND-O        .00      .000 No_date     0:00      .00  n/a
                     + 06:POND-E      48.63      .595 No_date     4:38    24.03  n/a
     [DT= 2.00]  SUM=  01:POND-E      48.63      .595 No_date     4:38    24.03  n/a
003:0139---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C5-RES      3.15      .186 No_date     3:30    22.83 .410
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 250.:MNI=.013:SCI=    .0]
003:0140---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C5-RES      3.15      .186 No_date     3:30    22.83  n/a
     [LAG=  9.1 min]<- 03:SH5ND6      3.15      .186 No_date     3:38    22.83  n/a
003:0141---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     07:C6-IND      4.79      .535 No_date     3:30    41.99 .754
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=    .0]
```



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     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 450.:MNI=.013:SCI=    .0]
003:0142---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:C6-IND      4.79      .535 No_date     3:30    41.99  n/a
                     + 03:SH5ND6      3.15      .186 No_date     3:38    22.83  n/a
     [DT= 2.00]  SUM=  05:TOT5&6      7.94      .703 No_date     3:32    34.39  n/a
003:0143---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:POND-E     48.63      .595 No_date     4:38    24.03  n/a
                     + 05:TOT5&6      7.94      .703 No_date     3:32    34.39  n/a
     [DT= 2.00]  SUM=  06:TOTND6     56.57     1.007 No_date     3:34    25.48  n/a
003:0144---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD    06:TOTND6     56.57     1.007 No_date     3:34    25.48  n/a
      Major System /   05:>SURF         .00      .000 No_date     0:00      .00  n/a
      Minor System \   09:<PIPE     56.57     1.007 No_date     3:34    25.48  n/a
003:0145---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF         .00      .000 No_date     0:00      .00  n/a
     [LAG= 23.7 min]<- 07:ND6ND7         .00      .000 No_date     0:22      .00  n/a
003:0146---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C7-AGR      4.75      .033 No_date     4:12     5.11 .092
     [CN= 39.0: N= 3.00]
     [Tp=  .63:DT= 2.00]
003:0147---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:C7-RES      5.05      .269 No_date     3:32    22.83 .410
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  20.:MNP=.250:SCP=    .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 475.:MNI=.013:SCI=    .0]
003:0148---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:C7-AGR      4.75      .033 No_date     4:12     5.11  n/a
                     + 06:C7-RES      5.05      .269 No_date     3:32    22.83  n/a
     [DT= 2.00]  SUM=  04:TOTC7       9.80      .281 No_date     3:32    14.24  n/a
003:0149---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:ND6ND7        .00      .000 No_date     0:22      .00  n/a
                     + 04:TOTC7       9.80      .281 No_date     3:32    14.24  n/a
     [DT= 2.00]  SUM=  06:TOTSF7      9.80      .281 No_date     3:32    14.24  n/a
003:0150---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTSF7      9.80      .281 No_date     3:32    14.24  n/a
                     + 09:<PIPE     56.57     1.007 No_date     3:34    25.48  n/a
     [DT= 2.00]  SUM=  07:TOTND7     66.37     1.287 No_date     3:34    23.82  n/a
003:0151---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD    07:TOTND7     66.37     1.287 No_date     3:34    23.82  n/a
      Major System /   05:>SURF         .00      .000 No_date     0:00      .00  n/a
      Minor System \   09:<PIPE     66.37     1.287 No_date     3:34    23.82  n/a
003:0152---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF         .00      .000 No_date     0:00      .00  n/a
     [LAG= 38.7 min]<- 01:ND7ND8         .00      .000 No_date     0:38      .00  n/a
003:0153---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:8-AGR      27.63      .258 No_date     5:34    13.21 .237
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
003:0154---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:ND7ND8        .00      .000 No_date     0:38      .00  n/a
                     + 07:8-AGR      27.63      .258 No_date     5:34    13.21  n/a
     [DT= 2.00]  SUM=  05:ND8-       27.63      .258 No_date     5:34    13.21  n/a
003:0155---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:<PIPE     66.37     1.287 No_date     3:34    23.82  n/a
                     + 05:ND8-       27.63      .258 No_date     5:34    13.21  n/a
     [DT= 2.00]  SUM=  01:ND8+       94.00     1.311 No_date     3:34    20.70  n/a
003:0156---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:N2BND3   173.30     2.478 No_date     5:16    14.50  n/a
     [LAG= 47.9 min]<- 06:ND3ND4   173.30     2.478 No_date     6:02    14.50  n/a
003:0157---------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:1a-AGR     48.72      .812 No_date     4:18    13.21 .237
     [CN= 66.0: N= 3.00]
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```
     [Tp=  .74:DT= 2.00]
003:0158----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              06:ND3ND4   173.30     2.478 No_date    6:02   14.50  n/a
                       + 07:1a-AGR    48.72      .812 No_date    4:18   13.21  n/a
     [DT= 2.00]  SUM=   04:NODE4    222.02     2.783 No_date    5:56   14.22  n/a
003:0159----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 04:NODE4    222.02     2.783 No_date    5:56   14.22  n/a
     [LAG= 27.3 min]<- 06:ND4ND5   222.02     2.783 No_date    6:22   14.22  n/a
003:0160----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD         02:1b-AGR    39.77      .474 No_date    4:56   13.21 .237
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
003:0161----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              06:ND4ND5   222.02     2.783 No_date    6:22   14.22  n/a
                       + 02:1b-AGR    39.77      .474 No_date    4:56   13.21  n/a
     [DT= 2.00]  SUM=   05:NODE5    261.79     3.091 No_date    6:18   14.07  n/a
003:0162----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    DIVERT HYD      -> 05:NODE5    261.79     3.091 No_date    6:18   14.07  n/a
           diverted <= 07:AIRP-S     52.08      .762 No_date    6:18   14.07  n/a
           diverted <= 04:BRIDGE    209.71     2.329 No_date    6:18   14.07  n/a
003:0163----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 07:AIRP-S     52.08      .762 No_date    6:18   14.07  n/a
     [LAG= 38.7 min]<- 05:ND5ND9    52.08      .762 No_date    6:56   14.07  n/a
003:0164----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD         06:9-AGR    100.54     1.103 No_date    5:08   13.21 .237
     [CN= 66.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
003:0165----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              05:ND5ND9    52.08      .762 No_date    6:56   14.07  n/a
                       + 06:9-AGR    100.54     1.103 No_date    5:08   13.21  n/a
     [DT= 2.00]  SUM=   07:NODE9    152.62     1.516 No_date    6:12   13.50  n/a
 ** END OF RUN :   3

**********************************************************************************



 RUN:COMMAND#
 004:0168----------------------------------------------------------------------------
     START
      [TZERO =    .00 hrs on        0]
      [METOUT=   2    (1=imperial, 2=metric output)]
      [NSTORM=   1 ]
      [NRUN  =   4 ]
*#**********************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 11/11/2009
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#**********************************************************************************
 004:0170----------------------------------------------------------------------------
     READ STORM
      Filename = STORM.001
      Comment  = 25-Year SCS Type-II Storm Distribution (6-hour) Owen Sound,
      [SDT=30.00:SDUR=   6.50:PTOT= 65.00]
004:0171----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD         01:C4-AGR   118.68     2.420 No_date    4:32   18.40 .283
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
004:0172----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    CALIB STANDHYD       02:C4-RES     2.20      .242 No_date    3:30   38.39 .591
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
004:0173----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
 *  CALIB STANDHYD       03:C4-COM     1.38      .240 No_date    3:30   58.90 .906
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
004:0174----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              01:C4-AGR   118.68     2.420 No_date    4:32   18.40  n/a
                       + 02:C4-RES     2.20      .242 No_date    3:30   38.39  n/a
     [DT= 2.00]  SUM=   04:TAGRE    120.88     2.458 No_date    4:30   18.77  n/a
004:0175----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              04:TAGRE    120.88     2.458 No_date    4:30   18.77  n/a
                       + 03:C4-COM     1.38      .240 No_date    3:30   58.90  n/a
     [DT= 2.00]  SUM=   05:TOT4     122.26     2.486 No_date    4:30   19.22  n/a
004:0176----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:TOT4     122.26     2.486 No_date    4:30   19.22  n/a
     [LAG= 31.7 min]<- 06:TOTSH4   122.26     2.486 No_date    5:00   19.22  n/a
004:0177----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD         01:C3-AGR    34.92      .716 No_date    4:24   17.30 .266
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
004:0178----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD       02:C3-RES     6.40      .605 No_date    3:30   36.14 .556
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
004:0179----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES     6.40      .605 No_date    3:30   36.14  n/a
     [LAG= 27.5 min]<- 03:3SHRES     6.40      .605 No_date    3:56   36.14  n/a
004:0180----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              03:3SHRES     6.40      .605 No_date    3:56   36.14  n/a
                       + 01:C3-AGR    34.92      .716 No_date    4:24   17.30  n/a
     [DT= 2.00]  SUM=   04:TOT3     41.32     1.180 No_date    3:58   20.22  n/a
004:0181----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              06:TOTSH4   122.26     2.486 No_date    5:00   19.22  n/a
                       + 04:TOT3     41.32     1.180 No_date    3:58   20.22  n/a
     [DT= 2.00]  SUM=   08:TOTND2   163.58     3.207 No_date    4:54   19.47  n/a
004:0182----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2   163.58     3.207 No_date    4:54   19.47  n/a
     [LAG= 12.7 min]<- 05:ND2N2B   163.58     3.207 No_date    5:06   19.47  n/a
004:0183----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD         04:2E-AGR     9.72      .229 No_date    4:14   17.81 .274
     [CN= 66.0: N= 3.00]
     [Tp=  .70:DT= 2.00]
004:0184----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD              04:2E-AGR     9.72      .229 No_date    4:14   17.81  n/a
                       + 05:ND2N2B   163.58     3.207 No_date    5:06   19.47  n/a
     [DT= 2.00]  SUM=   08:NODE2B   173.30     3.357 No_date    5:04   19.38  n/a
004:0185----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD      08:NODE2B   173.30     3.357 No_date    5:04   19.38  n/a
       Major System <    07:>25S        .75      .120 No_date    5:04   19.38  n/a
       Minor System <    05:<25E     172.55     3.237 No_date    4:50   19.38  n/a
004:0186----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:<25E     172.55     3.237 No_date    4:50   19.38  n/a
     [LAG= 10.4 min]<- 08:N2BND3   172.55     3.237 No_date    5:00   19.38  n/a
004:0187----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD       06:2W-RES    36.91     2.390 No_date    3:34   27.94 .430
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     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .60:LGI= 700.:MNI=.013:SCI=   .0]
004:0188--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     01:2W-COM      2.60      .429 No_date    3:30   57.64 .887
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
004:0189--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:2W-RES     36.91     2.390 No_date    3:34   27.94  n/a
                     + 01:2W-COM      2.60      .429 No_date    3:30   57.64  n/a
      [DT= 2.00]  SUM= 04:TOT2W      39.51     2.786 No_date    3:32   29.89  n/a
004:0190--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:EXT1        9.12      .563 No_date    3:30   26.54 .408
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
004:0191--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:EXT1        9.12      .563 No_date    3:30   26.54  n/a
      [LAG= 23.9 min]<- 02:SAHEXT     9.12      .563 No_date    3:52   26.54  n/a
004:0192--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:SAHEXT      9.12      .563 No_date    3:52   26.54  n/a
                     + 04:TOT2W      39.51     2.786 No_date    3:32   29.89  n/a
      [DT= 2.00]  SUM= 06:2WEXT1     48.63     3.128 No_date    3:34   29.26  n/a
004:0193--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE RESERVOIR -> 06:2WEXT1     48.63     3.128 No_date    3:34   29.26  n/a
      [RDT= 2.00] out<- 02:POND      48.63      .727 No_date    4:36   29.26  n/a
           overflow <= 05:POND-O       .00      .000 No_date    0:00     .00  n/a
     {MxStoUsed=.8407E+00,  TotOvfVol=.0000E+00}
004:0194--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:POND        48.63      .727 No_date    4:36   29.26  n/a
                     + 07:>25S          .75      .120 No_date    5:04   19.38  n/a
      [DT= 2.00]  SUM= 06:POND-E      49.38      .827 No_date    5:02   29.11  n/a
004:0195--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            05:POND-O        .00      .000 No_date    0:00     .00  n/a
                     + 06:POND-E      49.38      .827 No_date    5:02   29.11  n/a
      [DT= 2.00]  SUM= 01:POND-E      49.38      .827 No_date    5:02   29.11  n/a
004:0196--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C5-RES      3.15      .231 No_date    3:30   27.94 .430
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 250.:MNI=.013:SCI=   .0]
004:0197--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C5-RES      3.15      .231 No_date    3:30   27.94  n/a
      [LAG=  9.1 min]<- 03:SH5ND6     3.15      .231 No_date    3:38   27.94  n/a
004:0198--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     07:C6-IND      4.79      .635 No_date    3:30   49.60 .763
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 450.:MNI=.013:SCI=   .0]
004:0199--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:C6-IND      4.79      .635 No_date    3:30   49.60  n/a
                     + 03:SH5ND6      3.15      .231 No_date    3:38   27.94  n/a
      [DT= 2.00]  SUM= 05:TOT5&6      7.94      .842 No_date    3:32   41.00  n/a
004:0200--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:POND-E      49.38      .827 No_date    5:02   29.11  n/a
                     + 05:TOT5&6      7.94      .842 No_date    3:32   41.00  n/a
      [DT= 2.00]  SUM= 06:TOTND6      57.32    1.215 No_date    3:34   30.76  n/a
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004:0201--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD    06:TOTND6      57.32    1.215 No_date    3:34   30.76  n/a
       Major System <  05:>SURF         .00      .000 No_date    0:00     .00  n/a
       Minor System <  09:<PIPE      57.32    1.215 No_date    3:34   30.76  n/a
004:0202--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF         .00      .000 No_date    0:00     .00  n/a
      [LAG= 23.7 min]<- 07:ND6ND7       .00      .000 No_date    0:22     .00  n/a
004:0203--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C7-AGR      4.75      .046 No_date    4:12    7.15 .110
     [CN= 39.0: N= 3.00]
     [Tp=  .63:DT= 2.00]
004:0204--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:C7-RES      5.05      .334 No_date    3:32   27.94 .430
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 475.:MNI=.013:SCI=   .0]
004:0205--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:C7-AGR      4.75      .046 No_date    4:12    7.15  n/a
                     + 06:C7-RES      5.05      .334 No_date    3:32   27.94  n/a
      [DT= 2.00]  SUM= 04:TOTC7       9.80      .351 No_date    3:32   17.86  n/a
004:0206--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            07:ND6ND7        .00      .000 No_date    0:22     .00  n/a
                     + 04:TOTC7       9.80      .351 No_date    3:32   17.86  n/a
      [DT= 2.00]  SUM= 06:TOTSF7      9.80      .351 No_date    3:32   17.86  n/a
004:0207--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTSF7      9.80      .351 No_date    3:32   17.86  n/a
                     + 09:<PIPE      57.32    1.215 No_date    3:34   30.76  n/a
      [DT= 2.00]  SUM= 07:TOTND7      67.12    1.566 No_date    3:34   28.88  n/a
004:0208--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD    07:TOTND7      67.12    1.566 No_date    3:34   28.88  n/a
       Major System <  05:>SURF         .00      .000 No_date    0:00     .00  n/a
       Minor System <  09:<PIPE      67.12    1.566 No_date    3:34   28.88  n/a
004:0209--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF         .00      .000 No_date    0:00     .00  n/a
      [LAG= 38.7 min]<- 01:ND7ND8       .00      .000 No_date    0:38     .00  n/a
004:0210--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:8-AGR      27.63      .349 No_date    5:32   17.81 .274
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
004:0211--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:ND7ND8        .00      .000 No_date    0:38     .00  n/a
                     + 07:8-AGR      27.63      .349 No_date    5:32   17.81  n/a
      [DT= 2.00]  SUM= 05:ND8-        27.63      .349 No_date    5:32   17.81  n/a
004:0212--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            09:<PIPE      67.12    1.566 No_date    3:34   28.88  n/a
                     + 05:ND8-       27.63      .349 No_date    5:32   17.81  n/a
      [DT= 2.00]  SUM= 01:ND8+       94.75    1.602 No_date    3:34   25.65  n/a
004:0213--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:N2BND3    172.55    3.237 No_date    5:00   19.38  n/a
      [LAG= 47.9 min]<- 06:ND3ND4   172.55    3.237 No_date    5:46   19.38  n/a
004:0214--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       07:1a-AGR     48.72    1.105 No_date    4:18   17.81 .274
     [CN= 66.0: N= 3.00]
     [Tp=  .74:DT= 2.00]
004:0215--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:ND3ND4    172.55    3.237 No_date    5:46   19.38  n/a
                     + 07:1a-AGR      48.72    1.105 No_date    4:18   17.81  n/a
      [DT= 2.00]  SUM= 04:NODE4      221.27    3.711 No_date    5:44   19.03  n/a
004:0216--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 04:NODE4      221.27    3.711 No_date    5:44   19.03  n/a
      [LAG= 27.3 min]<- 06:ND4ND5    221.27    3.711 No_date    6:10   19.03  n/a
004:0217--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```

```
    CALIB NASHYD        02:1b-AGR     39.77      .643 No_date    4:54   17.81 .274
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
004:0218--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             06:ND4ND5    221.27    3.711 No_date    6:10   19.03  n/a
                    +   02:1b-AGR     39.77      .643 No_date    4:54   17.81  n/a
     [DT= 2.00]  SUM=   05:NODE5     261.04    4.153 No_date    6:10   18.85  n/a
004:0219--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    DIVERT HYD      -> 05:NODE5     261.04    4.153 No_date    6:10   18.85  n/a
          diverted <= 07:AIRP-S      62.09    1.272 No_date    6:10   18.85  n/a
          diverted <= 04:BRIDGE     198.96    2.881 No_date    6:10   18.85  n/a
004:0220--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 07:AIRP-S     62.09    1.272 No_date    6:10   18.85  n/a
     [LAG= 38.7 min]<- 05:ND5ND9     62.09    1.272 No_date    6:48   18.85  n/a
004:0221--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        06:9-AGR     100.54    1.496 No_date    5:06   17.81 .274
     [CN= 66.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
004:0222--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             05:ND5ND9     62.09    1.272 No_date    6:48   18.85  n/a
                    +   06:9-AGR     100.54    1.496 No_date    5:06   17.81  n/a
     [DT= 2.00]  SUM=   07:NODE9     162.63    2.210 No_date    6:12   18.21  n/a
 ** END OF RUN :   4
```

****

```
RUN:COMMAND#
005:0226--------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   5 ]
*##########################################################################
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 11/11/2009
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*##########################################################################
 005:0228--------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  = 50-Year SCS Type-II Storm Distribution (6-hour) Owen Sound,
     [SDT=30.00:SDUR=   6.50:PTOT= 71.90]
005:0229--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        01:C4-AGR    118.68    2.943 No_date    4:30   22.26 .310
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
005:0230--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      02:C4-RES      2.20      .279 No_date    3:30   43.92 .611
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
005:0231--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
 *  CALIB STANDHYD      03:C4-COM      1.38      .266 No_date    3:30   65.53 .911
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
```



```
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
005:0232--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:C4-AGR    118.68    2.943 No_date    4:30   22.26  n/a
                    +   02:C4-RES      2.20      .279 No_date    3:30   43.92  n/a
     [DT= 2.00]  SUM=   04:TAGRE     120.88    2.987 No_date    4:30   22.65  n/a
005:0233--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:TAGRE     120.88    2.987 No_date    4:30   22.65  n/a
                    +   03:C4-COM      1.38      .266 No_date    3:30   65.53  n/a
     [DT= 2.00]  SUM=   05:TOT4      122.26    3.018 No_date    4:30   23.14  n/a
005:0234--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:TOT4      122.26    3.018 No_date    4:30   23.14  n/a
     [LAG= 31.7 min]<- 06:TOTSH4    122.26    3.018 No_date    5:00   23.14  n/a
005:0235--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        01:C3-AGR     34.92      .873 No_date    4:24   20.97 .292
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
005:0236--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      02:C3-RES      6.40      .715 No_date    3:30   41.41 .576
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
005:0237--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES      6.40      .715 No_date    3:30   41.41  n/a
     [LAG= 27.5 min]<- 03:3SHRES      6.40      .715 No_date    3:56   41.41  n/a
005:0238--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             03:3SHRES      6.40      .715 No_date    3:56   41.41  n/a
                    +   01:C3-AGR     34.92      .873 No_date    4:24   20.97  n/a
     [DT= 2.00]  SUM=   04:TOT3      41.32    1.422 No_date    3:58   24.13  n/a
005:0239--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             06:TOTSH4    122.26    3.018 No_date    5:00   23.14  n/a
                    +   04:TOT3      41.32    1.422 No_date    3:58   24.13  n/a
     [DT= 2.00]  SUM=   08:TOTND2    163.58    3.883 No_date    4:54   23.39  n/a
005:0240--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2    163.58    3.883 No_date    4:54   23.39  n/a
     [LAG= 12.7 min]<- 05:ND2N2B    163.58    3.883 No_date    5:06   23.39  n/a
005:0241--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        04:2E-AGR      9.72      .278 No_date    4:14   21.52 .299
     [CN= 66.0: N= 3.00]
     [Tp=  .70:DT= 2.00]
005:0242--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             04:2E-AGR      9.72      .278 No_date    4:14   21.52  n/a
                    +   05:ND2N2B    163.58    3.883 No_date    5:06   23.39  n/a
     [DT= 2.00]  SUM=   08:NODE2B    173.30    4.064 No_date    5:04   23.28  n/a
005:0243--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD     08:NODE2B    173.30    4.064 No_date    5:04   23.28  n/a
      Major System  /   07:>25S       10.90      .827 No_date    5:04   23.28  n/a
      Minor System  \   05:<25E     162.40    3.237 No_date    4:30   23.28  n/a
005:0244--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:<25E     162.40    3.237 No_date    4:30   23.28  n/a
     [LAG= 10.4 min]<- 08:N28ND3    162.40    3.237 No_date    4:40   23.28  n/a
005:0245--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      06:2W-RES     36.91    2.783 No_date    3:32   31.89 .444
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .60:LGI= 700.:MNI=.013:SCI=   .0]
005:0246--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      01:2W-COM      2.60      .476 No_date    3:30   64.06 .891
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
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    [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
005:0247--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:2W-RES     36.91    2.783 No_date    3:32   31.89  n/a
                    + 01:2W-COM      2.60     .476 No_date    3:30   64.06  n/a
    [DT= 2.00]  SUM=  04:TOT2W      39.51    3.235 No_date    3:32   34.01  n/a
005:0248--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    06:EXT1        9.12     .645 No_date    3:30   30.25 .421
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
005:0249--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 06:EXT1        9.12     .645 No_date    3:30   30.25  n/a
     [LAG= 23.9 min]<- 02:SAHEXT     9.12     .645 No_date    3:52   30.25  n/a
005:0250--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           02:SAHEXT      9.12     .645 No_date    3:52   30.25  n/a
                    + 04:TOT2W      39.51    3.235 No_date    3:32   34.01  n/a
    [DT= 2.00]  SUM=  06:2WEXT1     48.63    3.606 No_date    3:32   33.30  n/a
005:0251--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE RESERVOIR -> 06:2WEXT1    48.63    3.606 No_date    3:32   33.30  n/a
     [RDT= 2.00] out<- 02:POND      48.63     .828 No_date    4:36   33.30  n/a
          overflow <= 05:POND-O      .00     .000 No_date    0:00     .00  n/a
     {MxStoUsed=.9582E+00,  TotOvfVol=.0000E+00}
005:0252--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           02:POND       48.63     .828 No_date    4:36   33.30  n/a
                    + 07:>25S       10.90     .827 No_date    5:04   23.28  n/a
    [DT= 2.00]  SUM=  06:POND-E     59.53    1.632 No_date    5:02   31.47  n/a
005:0253--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           05:POND-O      .00     .000 No_date    0:00     .00  n/a
                    + 06:POND-E     59.53    1.632 No_date    5:02   31.47  n/a
    [DT= 2.00]  SUM=  01:POND-E     59.53    1.632 No_date    5:02   31.47  n/a
005:0254--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    02:C5-RES      3.15     .265 No_date    3:30   31.89 .444
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 250.:MNI=.013:SCI=   .0]
005:0255--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 02:C5-RES      3.15     .265 No_date    3:30   31.89  n/a
     [LAG=  9.1 min]<- 03:SH5ND6     3.15     .265 No_date    3:38   31.89  n/a
005:0256--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    07:C6-IND      4.79     .714 No_date    3:30   55.29 .769
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 450.:MNI=.013:SCI=   .0]
005:0257--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           07:C6-IND      4.79     .714 No_date    3:30   55.29  n/a
                    + 03:SH5ND6      3.15     .265 No_date    3:38   31.89  n/a
    [DT= 2.00]  SUM=  05:TOT5&6      7.94     .948 No_date    3:30   46.01  n/a
005:0258--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:POND-E     59.53    1.632 No_date    5:02   31.47  n/a
                    + 05:TOT5&6      7.94     .948 No_date    3:30   46.01  n/a
    [DT= 2.00]  SUM=  06:TOTND6     67.47    1.730 No_date    5:02   33.18  n/a
005:0259--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   06:TOTND6     67.47    1.730 No_date    5:02   33.18  n/a
      Major System /  05:>SURF        .00     .000 No_date    0:00     .00  n/a
      Minor System \  09:<PIPE      67.47    1.730 No_date    5:02   33.18  n/a
005:0260--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 05:>SURF        .00     .000 No_date    0:00     .00  n/a
     [LAG= 23.7 min]<- 07:ND6ND7      .00     .000 No_date    0:22     .00  n/a
005:0261--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      01:C7-AGR      4.75     .058 No_date    4:12    8.85 .123
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     [CN= 39.0: N= 3.00]
     [Tp=  .63:DT= 2.00]
005:0262--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    06:C7-RES      5.05     .382 No_date    3:32   31.89 .444
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 475.:MNI=.013:SCI=   .0]
005:0263--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:C7-AGR      4.75     .058 No_date    4:12    8.85  n/a
                    + 06:C7-RES      5.05     .382 No_date    3:32   31.89  n/a
    [DT= 2.00]  SUM=  04:TOTC7       9.80     .405 No_date    3:32   20.73  n/a
005:0264--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           07:ND6ND7      .00     .000 No_date    0:22     .00  n/a
                    + 04:TOTC7       9.80     .405 No_date    3:32   20.73  n/a
    [DT= 2.00]  SUM=  06:TOTSF7      9.80     .405 No_date    3:32   20.73  n/a
005:0265--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:TOTSF7      9.80     .405 No_date    3:32   20.73  n/a
                    + 09:<PIPE      67.47    1.730 No_date    5:02   33.18  n/a
    [DT= 2.00]  SUM=  07:TOTND7     77.27    1.819 No_date    5:00   31.60  n/a
005:0266--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   07:TOTND7     77.27    1.819 No_date    5:00   31.60  n/a
      Major System /  05:>SURF        .23     .075 No_date    5:00   31.60  n/a
      Minor System \  09:<PIPE      77.04    1.744 No_date    3:32   31.60  n/a
005:0267--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 05:>SURF        .23     .075 No_date    5:00   31.60  n/a
     [LAG= 38.7 min]<- 01:ND7ND8      .23     .075 No_date    5:38   31.60  n/a
005:0268--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      07:8-AGR      27.63     .423 No_date    5:30   21.52 .299
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
005:0269--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:ND7ND8      .23     .075 No_date    5:38   31.60  n/a
                    + 07:8-AGR      27.63     .423 No_date    5:30   21.52  n/a
    [DT= 2.00]  SUM=  05:ND8-       27.86     .497 No_date    5:38   21.60  n/a
005:0270--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           09:<PIPE      77.04    1.744 No_date    3:32   31.60  n/a
                    + 05:ND8-       27.86     .497 No_date    5:38   21.60  n/a
    [DT= 2.00]  SUM=  01:ND8+      104.90    2.156 No_date    5:10   28.94  n/a
005:0271--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 08:N2BND3    162.40    3.237 No_date    4:40   23.28  n/a
     [LAG= 47.9 min]<- 06:ND3ND4    162.40    3.237 No_date    5:26   23.28  n/a
005:0272--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      07:1a-AGR     48.72    1.342 No_date    4:18   21.52 .299
     [CN= 66.0: N= 3.00]
     [Tp=  .74:DT= 2.00]
005:0273--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:ND3ND4     162.40    3.237 No_date    5:26   23.28  n/a
                    + 07:1a-AGR     48.72    1.342 No_date    4:18   21.52  n/a
    [DT= 2.00]  SUM=  04:NODE4      211.12    3.973 No_date    5:24   22.88  n/a
005:0274--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 04:NODE4     211.12    3.973 No_date    5:24   22.88  n/a
     [LAG= 27.3 min]<- 06:ND4ND5    211.12    3.973 No_date    5:50   22.88  n/a
005:0275--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      02:1b-AGR     39.77     .780 No_date    4:54   21.52 .299
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
005:0276--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:ND4ND5     211.12    3.973 No_date    5:50   22.88  n/a
                    + 02:1b-AGR     39.77     .780 No_date    4:54   21.52  n/a
    [DT= 2.00]  SUM=  05:NODE5      250.89    4.591 No_date    5:50   22.66  n/a
005:0277--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    DIVERT HYD     -> 05:NODE5     250.89    4.591 No_date    5:50   22.66  n/a
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          diverted <= 07:AIRP-S     64.30     1.504 No_date     5:50    22.66  n/a
          diverted <= 04:BRIDGE    186.59     3.087 No_date     5:50    22.66  n/a
005:0278--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 07:AIRP-S     64.30     1.504 No_date     5:50    22.66  n/a
     [LAG= 38.7 min]<- 05:ND5ND9     64.30     1.504 No_date     6:28    22.66  n/a
005:0279--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        06:9-AGR     100.54     1.813 No_date     5:06    21.52 .299
     [CN= 66.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
005:0280--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             05:ND5ND9     64.30     1.504 No_date     6:28    22.66  n/a
                      + 06:9-AGR     100.54     1.813 No_date     5:06    21.52  n/a
     [DT= 2.00]  SUM=  07:NODE9     164.84     2.820 No_date     6:12    21.96  n/a
 ** END OF RUN :   5

**********************************************************************************




RUN:COMMAND#
006:0285--------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on       0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   6 ]
*#**********************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 11/11/2009
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#**********************************************************************************
006:0287--------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  = 100-Year SCS Type-II Storm Distribution (6-hour) Owen Sound,
     [SDT=30.00:SDUR=   6.50:PTOT= 78.70]
006:0288--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C4-AGR    118.68     3.490 No_date     4:30    26.28 .334
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
006:0289--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C4-RES      2.20      .317 No_date     3:30    49.49 .629
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
006:0290--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
  * CALIB STANDHYD     03:C4-COM      1.38      .292 No_date     3:30    72.09 .916
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
006:0291--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:C4-AGR    118.68     3.490 No_date     4:30    26.28  n/a
                     + 02:C4-RES      2.20      .317 No_date     3:30    49.49  n/a
     [DT= 2.00]  SUM=  04:TAGRE     120.88     3.539 No_date     4:30    26.70  n/a
006:0292--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TAGRE     120.88     3.539 No_date     4:30    26.70  n/a
                     + 03:C4-COM      1.38      .292 No_date     3:30    72.09  n/a
```



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     [DT= 2.00]  SUM=  05:TOT4      122.26     3.574 No_date     4:30    27.21  n/a
006:0293--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:TOT4      122.26     3.574 No_date     4:30    27.21  n/a
     [LAG= 31.7 min]<- 06:TOTSH4    122.26     3.574 No_date     5:00    27.21  n/a
006:0294--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C3-AGR     34.92     1.037 No_date     4:24    24.80 .315
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
006:0295--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C3-RES      6.40      .815 No_date     3:30    46.74 .594
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
006:0296--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES      6.40      .815 No_date     3:30    46.74  n/a
     [LAG= 27.5 min]<- 03:3SHRES      6.40      .815 No_date     3:56    46.74  n/a
006:0297--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            03:3SHRES      6.40      .815 No_date     3:56    46.74  n/a
                     + 01:C3-AGR     34.92     1.037 No_date     4:24    24.80  n/a
     [DT= 2.00]  SUM=  04:TOT3       41.32     1.663 No_date     3:58    28.20  n/a
006:0298--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTSH4    122.26     3.574 No_date     5:00    27.21  n/a
                     + 04:TOT3       41.32     1.663 No_date     3:58    28.20  n/a
     [DT= 2.00]  SUM=  08:TOTND2    163.58     4.590 No_date     4:52    27.46  n/a
006:0299--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2    163.58     4.590 No_date     4:52    27.46  n/a
     [LAG= 12.7 min]<- 05:ND2N2B    163.58     4.590 No_date     5:04    27.46  n/a
006:0300--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:2E-AGR      9.72      .329 No_date     4:14    25.38 .323
     [CN= 66.0: N= 3.00]
     [Tp=  .70:DT= 2.00]
006:0301--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:2E-AGR      9.72      .329 No_date     4:14    25.38  n/a
                     + 05:ND2N2B    163.58     4.590 No_date     5:04    27.46  n/a
     [DT= 2.00]  SUM=  08:NODE2B    173.30     4.804 No_date     5:02    27.34  n/a
006:0302--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD    08:NODE2B    173.30     4.804 No_date     5:02    27.34  n/a
      Major System <   07:>25S      22.97     1.567 No_date     5:02    27.34  n/a
      Minor System <   05:<25E     150.33     3.237 No_date     4:10    27.34  n/a
006:0303--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:<25E     150.33     3.237 No_date     4:10    27.34  n/a
     [LAG= 10.4 min]<- 08:N2BND3    150.33     3.237 No_date     4:20    27.34  n/a
006:0304--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:2W-RES     36.91     3.154 No_date     3:32    35.92 .456
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .60:LGI= 700.:MNI=.013:SCI=   .0]
006:0305--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     01:2W-COM      2.60      .523 No_date     3:30    70.40 .895
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
006:0306--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:2W-RES     36.91     3.154 No_date     3:32    35.92  n/a
                     + 01:2W-COM      2.60      .523 No_date     3:30    70.40  n/a
     [DT= 2.00]  SUM=  04:TOT2W      39.51     3.649 No_date     3:32    38.19  n/a
006:0307--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:EXT1        9.12      .734 No_date     3:30    34.04 .432
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
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```
    [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
    [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
006:0308--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:EXT1       9.12      .734 No_date     3:30   34.04  n/a
     [LAG= 23.9 min]<- 02:SAHEXT     9.12      .734 No_date     3:52   34.04  n/a
006:0309--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           02:SAHEXT      9.12      .734 No_date     3:52   34.04  n/a
                    + 04:TOT2W      39.51     3.649 No_date     3:32   38.19  n/a
     [DT= 2.00]  SUM= 06:2WEXT1     48.63     4.104 No_date     3:32   37.41  n/a
006:0310--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE RESERVOIR -> 06:2WEXT1    48.63     4.104 No_date     3:32   37.41  n/a
     [RDT= 2.00] out<- 02:POND      48.63      .932 No_date     4:36   37.41  n/a
          overflow <= 05:POND-O       .00      .000 No_date     0:00     .00  n/a
    {MxStoUsed=.1078E+01,  TotOvfVol=.0000E+00}
006:0311--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           02:POND        48.63      .932 No_date     4:36   37.41  n/a
                    + 07:>25S       22.97     1.567 No_date     5:02   27.34  n/a
     [DT= 2.00]  SUM= 06:POND-E     71.60     2.474 No_date     5:02   34.18  n/a
006:0312--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           05:POND-O       .00      .000 No_date     0:00     .00  n/a
                    + 06:POND-E     71.60     2.474 No_date     5:02   34.18  n/a
     [DT= 2.00]  SUM= 01:POND-E     71.60     2.474 No_date     5:02   34.18  n/a
006:0313--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    02:C5-RES       3.15      .299 No_date     3:30   35.92 .456
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 250.:MNI=.013:SCI=   .0]
006:0314--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C5-RES     3.15      .299 No_date     3:30   35.92  n/a
     [LAG=  9.1 min]<- 03:SH5ND6     3.15      .299 No_date     3:38   35.92  n/a
006:0315--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    07:C6-IND       4.79      .789 No_date     3:30   60.95 .774
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 450.:MNI=.013:SCI=   .0]
006:0316--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           07:C6-IND       4.79      .789 No_date     3:30   60.95  n/a
                    + 03:SH5ND6      3.15      .299 No_date     3:38   35.92  n/a
     [DT= 2.00]  SUM= 05:TOT5&6      7.94     1.053 No_date     3:30   51.02  n/a
006:0317--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:POND-E      71.60     2.474 No_date     5:02   34.18  n/a
                    + 05:TOT5&6      7.94     1.053 No_date     3:30   51.02  n/a
     [DT= 2.00]  SUM= 06:TOTND6      79.54     2.582 No_date     5:02   35.86  n/a
006:0318--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   06:TOTND6      79.54     2.582 No_date     5:02   35.86  n/a
       Major System < 05:>SURF        6.44      .838 No_date     5:02   35.86  n/a
       Minor System < 09:<PIPE       73.09     1.744 No_date     4:30   35.86  n/a
006:0319--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF      6.44      .838 No_date     5:02   35.86  n/a
     [LAG= 23.7 min]<- 07:ND6ND7     6.44      .838 No_date     5:24   35.86  n/a
006:0320--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      01:C7-AGR       4.75      .070 No_date     4:12   10.68 .136
     [CN= 39.0: N= 3.00]
     [Tp=  .63:DT= 2.00]
006:0321--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    06:C7-RES       5.05      .438 No_date     3:32   35.92 .456
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 475.:MNI=.013:SCI=   .0]
006:D322--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
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    ADD HYD           01:C7-AGR       4.75      .070 No_date     4:12   10.68  n/a
                    + 06:C7-RES       5.05      .438 No_date     3:32   35.92  n/a
     [DT= 2.00]  SUM= 04:TOTC7        9.80      .466 No_date     3:32   23.69  n/a
006:0323--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           07:ND6ND7       6.44      .838 No_date     5:24   35.86  n/a
                    + 04:TOTC7        9.80      .466 No_date     3:32   23.69  n/a
     [DT= 2.00]  SUM= 06:TOTSF7      16.24      .915 No_date     5:22   28.52  n/a
006:0324--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:TOTSF7      16.24      .915 No_date     5:22   28.52  n/a
                    + 09:<PIPE       73.09     1.744 No_date     4:30   35.86  n/a
     [DT= 2.00]  SUM= 07:TOTND7      89.34     2.659 No_date     5:22   34.53  n/a
006:0325--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   07:TOTND7      89.34     2.659 No_date     5:22   34.53  n/a
       Major System < 05:>SURF        7.82      .915 No_date     5:22   34.53  n/a
       Minor System < 09:<PIPE       81.51     1.744 No_date     3:26   34.53  n/a
006:0326--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF      7.82      .915 No_date     5:22   34.53  n/a
     [LAG= 38.7 min]<- 01:ND7ND8     7.82      .915 No_date     6:00   34.53  n/a
006:0327--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      07:8-AGR       27.63      .500 No_date     5:30   25.38 .323
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
006:0328--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:ND7ND8       7.82      .915 No_date     6:00   34.53  n/a
                    + 07:8-AGR       27.63      .500 No_date     5:30   25.38  n/a
     [DT= 2.00]  SUM= 05:ND8-        35.45     1.393 No_date     6:00   27.40  n/a
006:0329--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           09:<PIPE       81.51     1.744 No_date     3:26   34.53  n/a
                    + 05:ND8-        35.45     1.393 No_date     6:00   27.40  n/a
     [DT= 2.00]  SUM= 01:ND8+       116.97     3.041 No_date     5:50   32.37  n/a
006:0330--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:N2BND3    150.33     3.237 No_date     4:20   27.34  n/a
     [LAG= 47.9 min]<- 06:ND3ND4    150.33     3.237 No_date     5:06   27.34  n/a
006:0331--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      07:1a-AGR      48.72     1.590 No_date     4:16   25.38 .323
     [CN= 66.0: N= 3.00]
     [Tp=  .74:DT= 2.00]
006:0332--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:ND3ND4     150.33     3.237 No_date     5:06   27.34  n/a
                    + 07:1a-AGR      48.72     1.590 No_date     4:16   25.38  n/a
     [DT= 2.00]  SUM= 04:NODE4      199.05     4.317 No_date     5:06   26.86  n/a
006:0333--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 04:NODE4     199.05     4.317 No_date     5:06   26.86  n/a
     [LAG= 27.3 min]<- 06:ND4ND5    199.05     4.317 No_date     5:32   26.86  n/a
006:0334--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      02:1b-AGR      39.77      .923 No_date     4:52   25.38 .323
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
006:0335--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:ND4ND5     199.05     4.317 No_date     5:32   26.86  n/a
                    + 02:1b-AGR      39.77      .923 No_date     4:52   25.38  n/a
     [DT= 2.00]  SUM= 05:NODE5      238.82     5.131 No_date     5:32   26.62  n/a
006:0336--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    OIVERT HYD      -> 05:NODE5     238.82     5.131 No_date     5:32   26.62  n/a
          diverted <= 07:AIRP-S      64.46     1.790 No_date     5:32   26.62  n/a
          diverted <= 04:BRIDGE     174.36     3.341 No_date     5:32   26.62  n/a
006:0337--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 07:AIRP-S     64.46     1.790 No_date     5:32   26.62  n/a
     [LAG= 38.7 min]<- 05:ND5ND9     64.46     1.790 No_date     6:10   26.62  n/a
006:0338--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      06:9-AGR      100.54     2.145 No_date     5:04   25.38 .323
     [CN= 66.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
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006:0339----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD          05:ND5ND9    64.46     1.790 No_date     6:10   26.62  n/a
                   + 06:9-AGR    100.54     2.145 No_date     5:04   25.38  n/a
     [DT= 2.00]  SUM= 07:NODE9    165.00     3.448 No_date     6:10   25.86  n/a
 ** END OF RUN :   6

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RUN:COMMAND#
007:0345----------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2    (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   7 ]
*#*****************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 11/11/2009
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#*****************************************************************************
 007:0347----------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  = TIMMINS REGIONAL STORM (12-hour)
     [SDT=60.00:SDUR=  12.00:PTOT=193.00]
 007:0348----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD     01:C4-AGR   118.68     6.693 No_date     7:42  112.39 .582
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
 007:0349----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD   02:C4-RES     2.20      .229 No_date     7:00  152.61 .791
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
 007:0350----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
  * CALIB STANDHYD   03:C4-COM     1.38      .161 No_date     7:00  184.01 .953
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
 007:0351----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD          01:C4-AGR   118.68     6.693 No_date     7:42  112.39  n/a
                   + 02:C4-RES     2.20      .229 No_date     7:00  152.61  n/a
     [DT= 2.00]  SUM= 04:TAGRE    120.88     6.806 No_date     7:42  113.12  n/a
 007:0352----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD          04:TAGRE    120.88     6.806 No_date     7:42  113.12  n/a
                   + 03:C4-COM     1.38      .161 No_date     7:00  184.01  n/a
     [DT= 2.00]  SUM= 05:TOT4     122.26     6.881 No_date     7:42  113.92  n/a
 007:0353----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 05:TOT4     122.26     6.881 No_date     7:42  113.92  n/a
     [LAG= 31.7 min]<- 06:TOTSH4  122.26     6.881 No_date     8:12  113.92  n/a
 007:0354----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD     01:C3-AGR    34.92     1.977 No_date     7:34  108.36 .561
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
 007:0355----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    CALIB STANDHYD   02:C3-RES     6.40      .635 No_date     7:00  147.09 .762
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
 007:0356----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 02:C3-RES     6.40      .635 No_date     7:00  147.09  n/a
     [LAG= 27.5 min]<- 03:3SHRES    6.40      .635 No_date     7:26  147.09  n/a
 007:0357----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD          03:3SHRES     6.40      .635 No_date     7:26  147.09  n/a
                   + 01:C3-AGR    34.92     1.977 No_date     7:34  108.36  n/a
     [DT= 2.00]  SUM= 04:TOT3     41.32     2.595 No_date     7:26  114.36  n/a
 007:0358----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD          06:TOTSH4   122.26     6.881 No_date     8:12  113.92  n/a
                   + 04:TOT3     41.32     2.595 No_date     7:26  114.36  n/a
     [DT= 2.00]  SUM= 08:TOTND2   163.58     9.027 No_date     8:06  114.03  n/a
 007:0359----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 08:TOTND2   163.58     9.027 No_date     8:06  114.03  n/a
     [LAG= 12.7 min]<- 05:ND2N2B  163.58     9.027 No_date     8:18  114.03  n/a
 007:0360----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD     04:2E-AGR     9.72      .590 No_date     7:24  109.19 .566
     [CN= 66.0: N= 3.00]
     [Tp=  .70:DT= 2.00]
 007:0361----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD          04:2E-AGR     9.72      .590 No_date     7:24  109.19  n/a
                   + 05:ND2N2B  163.58     9.027 No_date     8:18  114.03  n/a
     [DT= 2.00]  SUM= 08:NODE2B   173.30     9.509 No_date     8:16  113.76  n/a
 007:0362----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD  08:NODE2B   173.30     9.509 No_date     8:16  113.76  n/a
      Major System \ 07:>25S      75.08     6.272 No_date     8:16  113.76  n/a
      Minor System / 05:<25E      98.22     3.237 No_date     6:38  113.76  n/a
 007:0363----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 05:<25E     98.22     3.237 No_date     6:38  113.76  n/a
     [LAG= 10.4 min]<- 08:N2BND3  98.22     3.237 No_date     6:48  113.76  n/a
 007:0364----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD   06:2W-RES    36.91     2.743 No_date     7:02  117.06 .607
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .60:LGI= 700.:MNI=.013:SCI=   .0]
 007:0365----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD   01:2W-COM     2.60      .291 No_date     7:00  178.81 .926
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
 007:0366----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD          06:2W-RES    36.91     2.743 No_date     7:02  117.06  n/a
                   + 01:2W-COM     2.60      .291 No_date     7:00  178.81  n/a
     [DT= 2.00]  SUM= 04:TOT2W    39.51     3.029 No_date     7:00  121.12  n/a
 007:0367----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD   06:EXT1       9.12      .628 No_date     7:00  110.82 .574
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
 007:0368----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD      -> 06:EXT1       9.12      .628 No_date     7:00  110.82  n/a
     [LAG= 23.9 min]<- 02:SAHEXT    9.12      .628 No_date     7:22  110.82  n/a
 007:0369----------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD          02:SAHEXT     9.12      .628 No_date     7:22  110.82  n/a
                   + 04:TOT2W     39.51     3.029 No_date     7:00  121.12  n/a
     [DT= 2.00]  SUM= 06:2WEXT1   48.63     3.596 No_date     7:02  119.19  n/a
```

```
007:0370----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE RESERVOIR -> 06:2WEXT1    48.63     3.596 No_date    7:02  119.19  n/a
     [RDT= 2.00] out<- 02:POND      33.44      .951 No_date    6:44  119.19  n/a
           overflow <= 05:POND-O    15.19     2.642 No_date    7:02  119.19  n/a
     {MxStoUsed=.1106E+01,  TotOvfVol=.1811E+01}
007:0371----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             02:POND      33.44      .951 No_date    6:44  119.19  n/a
                      + 07:>25S      75.08     6.272 No_date    8:16  113.76  n/a
      [DT= 2.00]  SUM=  06:POND-E   108.52     7.223 No_date    8:16  115.43  n/a
007:0372----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             05:POND-O    15.19     2.642 No_date    7:02  119.19  n/a
                      + 06:POND-E   108.52     7.223 No_date    8:16  115.43  n/a
      [DT= 2.00]  SUM=  01:POND-E   123.71     9.692 No_date    9:18  138.39  n/a
007:0373----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      02:C5-RES     3.15      .244 No_date    7:00  117.06 .607
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 250.:MNI=.013:SCI=   .0]
007:0374----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C5-RES     3.15      .244 No_date    7:00  117.06  n/a
     [LAG=  9.1 min]<- 03:SH5ND6     3.15      .244 No_date    7:08  117.06  n/a
007:0375----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      07:C6-IND     4.79      .478 No_date    7:00  160.53 .832
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 450.:MNI=.013:SCI=   .0]
007:0376----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             07:C6-IND     4.79      .478 No_date    7:00  160.53  n/a
                      + 03:SH5ND6     3.15      .244 No_date    7:08  117.06  n/a
      [DT= 2.00]  SUM=  05:TOT5&6     7.94      .715 No_date    7:00  143.28  n/a
007:0377----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:POND-E   123.71     9.692 No_date    9:18  138.39  n/a
                      + 05:TOT5&6     7.94      .715 No_date    7:00  143.28  n/a
      [DT= 2.00]  SUM=  06:TOTND6   131.65    10.015 No_date    9:18  138.69  n/a
007:0378----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD     06:TOTND6   131.65    10.015 No_date    9:18  138.69  n/a
       Major System /   05:>SURF     73.57     8.271 No_date    9:18  138.69  n/a
       Minor System \   09:<PIPE     58.08     1.744 No_date    2:34  138.69  n/a
007:0379----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF     73.57     8.271 No_date    9:18  138.69  n/a
     [LAG= 23.7 min]<- 07:ND6ND7    73.57     8.271 No_date    9:40  138.69  n/a
007:0380----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        01:C7-AGR     4.75      .153 No_date    7:22   58.78 .305
     [CN= 39.0: N= 3.00]
     [Tp=  .63:DT= 2.00]
007:0381----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD      06:C7-RES     5.05      .377 No_date    7:00  117.06 .607
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 475.:MNI=.013:SCI=   .0]
007:0382----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:C7-AGR     4.75      .153 No_date    7:22   58.78  n/a
                      + 06:C7-RES     5.05      .377 No_date    7:00  117.06  n/a
      [DT= 2.00]  SUM=  04:TOTC7      9.80      .513 No_date    7:04   88.81  n/a
007:0383----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             07:ND6ND7   73.57     8.271 No_date    9:40  138.69  n/a
                      + 04:TOTC7      9.80      .513 No_date    7:04   88.81  n/a
      [DT= 2.00]  SUM=  06:TOTSF7   83.37     8.540 No_date    9:40  132.82  n/a
007:0384----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             06:TOTSF7   83.37     8.540 No_date    9:40  132.82  n/a
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                      + 09:<PIPE     58.08     1.744 No_date    2:34  138.69  n/a
      [DT= 2.00]  SUM=  07:TOTND7   141.45    10.284 No_date    9:40  135.23  n/a
007:0385----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD     07:TOTND7   141.45    10.284 No_date    9:40  135.23  n/a
       Major System /   05:>SURF     81.04     8.540 No_date    9:40  135.23  n/a
       Minor System \   09:<PIPE     60.42     1.744 No_date    2:30  135.23  n/a
007:0386----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF     81.04     8.540 No_date    9:40  135.23  n/a
     [LAG= 38.7 min]<- 01:ND7ND8    81.04     8.540 No_date   10:18  135.23  n/a
007:0387----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        07:8-AGR     27.63     1.248 No_date    9:32  109.19 .566
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
007:0388----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             01:ND7ND8    81.04     8.540 No_date   10:18  135.23  n/a
                      + 07:8-AGR     27.63     1.248 No_date    9:32  109.19  n/a
      [DT= 2.00]  SUM=  05:ND8-     108.67     9.732 No_date   10:18  128.61  n/a
007:0389----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             09:<PIPE     60.42     1.744 No_date    2:30  135.23  n/a
                      + 05:ND8-     108.67     9.732 No_date   10:18  128.61  n/a
      [DT= 2.00]  SUM=  01:ND8+     169.08    11.476 No_date   10:18  130.97  n/a
007:0390----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:N2BND3    98.22     3.237 No_date    6:48  113.76  n/a
     [LAG= 47.9 min]<- 06:ND3ND4    98.22     3.237 No_date    7:34  113.76  n/a
007:0391----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        07:1a-AGR    48.72     2.892 No_date    7:28  109.19 .566
     [CN= 66.0: N= 3.00]
     [Tp=  .74:DT= 2.00]
007:0392----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             06:ND3ND4    98.22     3.237 No_date    7:34  113.76  n/a
                      + 07:1a-AGR    48.72     2.892 No_date    7:28  109.19  n/a
      [DT= 2.00]  SUM=  04:NODE4    146.94     6.111 No_date    7:34  112.24  n/a
007:0393----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 04:NODE4    146.94     6.111 No_date    7:34  112.24  n/a
     [LAG= 27.3 min]<- 06:ND4ND5    146.94     6.111 No_date    8:00  112.24  n/a
007:0394----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        02:1b-AGR    39.77     1.936 No_date    8:22  109.19 .566
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
007:0395----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             06:ND4ND5    146.94     6.111 No_date    8:00  112.24  n/a
                      + 02:1b-AGR    39.77     1.936 No_date    8:22  109.19  n/a
      [DT= 2.00]  SUM=  05:NODE5    186.71     8.026 No_date    8:00  111.59  n/a
007:0396----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
 *  DIVERT HYD      -> 05:NODE5    186.71     8.026 No_date    8:00  111.59  n/a
           diverted <= 07:AIRP-S     70.14     4.025 No_date    8:00  111.59  n/a
           diverted <= 04:BRIDGE    116.57     4.001 No_date    8:00  111.59  n/a
007:0397----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 07:AIRP-S     70.14     4.025 No_date    8:00  111.59  n/a
     [LAG= 38.7 min]<- 05:ND5ND9    70.14     4.025 No_date    8:38  111.59  n/a
007:0398----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD        06:9-AGR    100.54     4.792 No_date    9:10  109.19 .566
     [CN= 66.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
007:0399----------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD             05:ND5ND9    70.14     4.025 No_date    8:38  111.59  n/a
                      + 06:9-AGR    100.54     4.792 No_date    9:10  109.19  n/a
      [DT= 2.00]  SUM=  07:NODE9    170.68     8.760 No_date    8:38  110.18  n/a
 ** END OF RUN :   7

********************************************************************************
```

```
RUN:COMMAND#
008:0406----------------------------------------------------------------------------
    START
     [TZERO =    .00 hrs on        0]
     [METOUT=   2     (1=imperial, 2=metric output)]
     [NSTORM=   1 ]
     [NRUN  =   8 ]
*#*****************************************************************************
*#  Project Name: [Creemore East Drainage Study]    Project Number: [MCG 10770]
*#  Date        : 11/11/2009
*#  Modeller    : [I.Chan]
*#  Company     : R.J. Burnside and Associates
*#  License #   : 3846413
*#*****************************************************************************
008:0408----------------------------------------------------------------------------
    READ STORM
     Filename = STORM.001
     Comment  = 25mm Chicago Storm Distribution (4-hour) Owen Sound, ON.
     [SDT=10.00:SDUR=   4.00:PTOT= 25.00]
008:0409--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C4-AGR    118.68      .240 No_date    2:52     2.12 .085
     [CN= 68.0: N= 3.00]
     [Tp=  .91:DT= 2.00]
008:0410--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C4-RES      2.20      .105 No_date    1:20    10.27 .411
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.00:LGP=  50.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 120.:MNI=.013:SCI=   .0]
008:0411--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
  * CALIB STANDHYD     03:C4-COM      1.38      .202 No_date    1:20    21.03 .841
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=   5.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=2.00:LGI=  35.:MNI=.013:SCI=   .0]
008:0412--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            01:C4-AGR    118.68      .240 No_date    2:52     2.12  n/a
                     + 02:C4-RES      2.20      .105 No_date    1:20    10.27  n/a
     [DT= 2.00]  SUM=  04:TAGRE     120.88      .250 No_date    2:50     2.27  n/a
008:0413--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:TAGRE     120.88      .250 No_date    2:50     2.27  n/a
                     + 03:C4-COM      1.38      .202 No_date    1:20    21.03  n/a
     [DT= 2.00]  SUM=  05:TOT4      122.26      .309 No_date    1:20     2.48  n/a
008:0414--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:TOT4      122.26      .309 No_date    1:20     2.48  n/a
     [LAG= 31.7 min]<- 06:TOTSH4    122.26      .309 No_date    1:50     2.48  n/a
008:0415--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       01:C3-AGR     34.92      .069 No_date    2:42     1.96 .078
     [CN= 66.0: N= 3.00]
     [Tp=  .82:DT= 2.00]
008:0416--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     02:C3-RES      6.40      .245 No_date    1:22     9.64 .386
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 71.0]
     [Pervious     area: IAper=5.00:SLPP=6.70:LGP=  45.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI=1.50:LGI= 370.:MNI=.013:SCI=   .0]
008:0417--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C3-RES      6.40      .245 No_date    1:22     9.64  n/a
     [LAG= 27.5 min]<- 03:3SHRES      6.40      .245 No_date    1:48     9.64  n/a
008:0418--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
```



```
    ADD HYD            03:3SHRES      6.40      .245 No_date    1:48     9.64  n/a
                     + 01:C3-AGR     34.92      .069 No_date    2:42     1.96  n/a
     [DT= 2.00]  SUM=  04:TOT3      41.32      .276 No_date    1:48     3.15  n/a
008:0419--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:TOTSH4    122.26      .309 No_date    1:50     2.48  n/a
                     + 04:TOT3      41.32      .276 No_date    1:48     3.15  n/a
     [DT= 2.00]  SUM=  08:TOTND2    163.58      .577 No_date    1:48     2.65  n/a
008:0420--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:TOTND2    163.58      .577 No_date    1:48     2.65  n/a
     [LAG= 12.7 min]<- 05:ND2N2B    163.58      .577 No_date    2:00     2.65  n/a
008:0421--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD       04:2E-AGR      9.72      .024 No_date    2:26     2.18 .087
     [CN= 66.0: N= 3.00]
     [Tp=  .70:DT= 2.00]
008:0422--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            04:2E-AGR      9.72      .024 No_date    2:26     2.18  n/a
                     + 05:ND2N2B    163.58      .577 No_date    2:00     2.65  n/a
     [DT= 2.00]  SUM=  08:NODE2B    173.30      .596 No_date    2:00     2.62  n/a
008:0423--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD    08:NODE2B    173.30      .596 No_date    2:00     2.62  n/a
      Major System <   07:>25S         .00      .000 No_date    0:00      .00  n/a
      Minor System >   05:<25E      173.30      .596 No_date    2:00     2.62  n/a
008:0424--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:<25E      173.30      .596 No_date    2:00     2.62  n/a
     [LAG= 10.4 min]<- 08:N2BND3    173.30      .596 No_date    2:10     2.62  n/a
008:0425--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:2W-RES     36.91      .961 No_date    1:28     8.18 .327
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .60:LGI= 700.:MNI=.013:SCI=   .0]
008:0426--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     01:2W-COM      2.60      .283 No_date    1:22    20.82 .833
     [XIMP=.90:TIMP=.90]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 245.:MNI=.013:SCI=   .0]
008:0427--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            06:2W-RES     36.91      .961 No_date    1:28     8.18  n/a
                     + 01:2W-COM      2.60      .283 No_date    1:22    20.82  n/a
     [DT= 2.00]  SUM=  04:TOT2W     39.51     1.170 No_date    1:26     9.01  n/a
008:0428--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD     06:EXT1        9.12      .301 No_date    1:24     7.91 .316
     [XIMP=.30:TIMP=.40]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.30:LGP=  40.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .80:LGI= 400.:MNI=.013:SCI=   .0]
008:0429--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 06:EXT1        9.12      .301 No_date    1:24     7.91  n/a
     [LAG= 23.9 min]<- 02:SAHEXT      9.12      .301 No_date    1:46     7.91  n/a
008:0430--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:SAHEXT      9.12      .301 No_date    1:46     7.91  n/a
                     + 04:TOT2W     39.51     1.170 No_date    1:26     9.01  n/a
     [DT= 2.00]  SUM=  06:2WEXT1    48.63     1.208 No_date    1:26     8.80  n/a
008:0431--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ROUTE RESERVOIR -> 06:2WEXT1    48.63     1.208 No_date    1:26     8.80  n/a
     [RDT= 2.00] out<- 02:POND      48.63      .217 No_date    2:38     8.80  n/a
          overflow <= 05:POND-O        .00      .000 No_date    0:00      .00  n/a
     {MxStoUsed=.2510E+00,  TotOvfVol=.0000E+00}
008:0432--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD            02:POND       48.63      .217 No_date    2:38     8.80  n/a
                     + 07:>25S          .00      .000 No_date    0:00      .00  n/a
     [DT= 2.00]  SUM=  06:POND-E     48.63      .217 No_date    2:38     8.80  n/a
```

```
008:0433--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           05:POND-O       .00     .000 No_date    0:00     .00  n/a
                    + 06:POND-E     48.63     .217 No_date    2:38    8.80  n/a
     [DT= 2.00]  SUM= 01:POND-E     48.63     .217 No_date    2:38    8.80  n/a
008:0434--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    02:C5-RES       3.15     .115 No_date    1:22    8.18 .327
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=2.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 250.:MNI=.013:SCI=   .0]
008:0435--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 02:C5-RES       3.15     .115 No_date    1:22    8.18  n/a
     [LAG=  9.1 min]<- 03:SH5ND6       3.15     .115 No_date    1:30    8.18  n/a
008:0436--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    07:C6-IND       4.79     .351 No_date    1:26   17.55 .702
     [XIMP=.75:TIMP=.75]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP= .50:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 450.:MNI=.013:SCI=   .0]
008:0437--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           07:C6-IND       4.79     .351 No_date    1:26   17.55  n/a
                    + 03:SH5ND6       3.15     .115 No_date    1:30    8.18  n/a
     [DT= 2.00]  SUM= 05:TOT5&6        7.94     .448 No_date    1:26   13.83  n/a
008:0438--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:POND-E      48.63     .217 No_date    2:38    8.80  n/a
                    + 05:TOT5&6       7.94     .448 No_date    1:26   13.83  n/a
     [DT= 2.00]  SUM= 06:TOTND6      56.57     .526 No_date    1:28    9.51  n/a
008:0439--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   06:TOTND6      56.57     .526 No_date    1:28    9.51  n/a
      Major System /  05:>SURF         .00     .000 No_date    0:00     .00  n/a
      Minor System \  09:<PIPE       56.57     .526 No_date    1:28    9.51  n/a
008:0440--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF         .00     .000 No_date    0:00     .00  n/a
     [LAG= 23.7 min]<- 07:ND6ND7        .00     .000 No_date    0:22     .00  n/a
008:0441--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      01:C7-AGR       4.75     .004 No_date    2:24     .70 .028
     [CN= 39.0: N= 3.00]
     [Tp=  .63:DT= 2.00]
008:0442--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB STANDHYD    06:C7-RES       5.05     .148 No_date    1:26    8.18 .327
     [XIMP=.30:TIMP=.50]
     [LOSS= 2 :CN= 44.0]
     [Pervious     area: IAper=5.00:SLPP=1.00:LGP=  20.:MNP=.250:SCP=   .0]
     [Impervious   area: IAimp=2.00:SLPI= .50:LGI= 475.:MNI=.013:SCI=   .0]
008:0443--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:C7-AGR       4.75     .004 No_date    2:24     .70  n/a
                    + 06:C7-RES       5.05     .148 No_date    1:26    8.18  n/a
     [DT= 2.00]  SUM= 04:TOTC7         9.80     .148 No_date    1:26    4.55  n/a
008:0444--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           07:ND6ND7        .00     .000 No_date    0:22     .00  n/a
                    + 04:TOTC7        9.80     .148 No_date    1:26    4.55  n/a
     [DT= 2.00]  SUM= 06:TOTSF7        9.80     .148 No_date    1:26    4.55  n/a
008:0445--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:TOTSF7        9.80     .148 No_date    1:26    4.55  n/a
                    + 09:<PIPE      56.57     .526 No_date    1:28    9.51  n/a
     [DT= 2.00]  SUM= 07:TOTND7      66.37     .668 No_date    1:28    8.78  n/a
008:0446--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    COMPUTE DUALHYD   07:TOTND7      66.37     .668 No_date    1:28    8.78  n/a
      Major System /  05:>SURF         .00     .000 No_date    0:00     .00  n/a
      Minor System \  09:<PIPE       66.37     .668 No_date    1:28    8.78  n/a
008:0447--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 05:>SURF         .00     .000 No_date    0:00     .00  n/a
     [LAG= 38.7 min]<- 01:ND7ND8        .00     .000 No_date    0:38     .00  n/a
```



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008:0448--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      07:8-AGR       27.63     .042 No_date    4:06    2.18 .087
     [CN= 66.0: N= 3.00]
     [Tp= 1.70:DT= 2.00]
008:0449--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           01:ND7ND8        .00     .000 No_date    0:38     .00  n/a
                    + 07:8-AGR       27.63     .042 No_date    4:06    2.18  n/a
     [DT= 2.00]  SUM= 05:ND8-        27.63     .042 No_date    4:06    2.18  n/a
008:0450--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           09:<PIPE       66.37     .668 No_date    1:28    8.78  n/a
                    + 05:ND8-        27.63     .042 No_date    4:06    2.18  n/a
     [DT= 2.00]  SUM= 01:ND8+        94.00     .669 No_date    1:28    6.84  n/a
008:0451--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 08:N2BND3    173.30     .596 No_date    2:10    2.62  n/a
     [LAG= 47.9 min]<- 06:ND3ND4    173.30     .596 No_date    2:56    2.62  n/a
008:0452--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      07:1a-AGR      48.72     .114 No_date    2:30    2.18 .087
     [CN= 66.0: N= 3.00]
     [Tp=  .74:DT= 2.00]
008:0453--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:ND3ND4    173.30     .596 No_date    2:56    2.62  n/a
                    + 07:1a-AGR      48.72     .114 No_date    2:30    2.18  n/a
     [DT= 2.00]  SUM= 04:NODE4      222.02     .702 No_date    2:56    2.52  n/a
008:0454--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 04:NODE4     222.02     .702 No_date    2:56    2.52  n/a
     [LAG= 27.3 min]<- 06:ND4ND5    222.02     .702 No_date    3:22    2.52  n/a
008:0455--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      02:1b-AGR      39.77     .072 No_date    3:18    2.18 .087
     [CN= 66.0: N= 3.00]
     [Tp= 1.21:DT= 2.00]
008:0456--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           06:ND4ND5    222.02     .702 No_date    3:22    2.52  n/a
                    + 02:1b-AGR      39.77     .072 No_date    3:18    2.18  n/a
     [DT= 2.00]  SUM= 05:NODE5      261.79     .774 No_date    3:22    2.47  n/a
008:0457--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    DIVERT HYD      -> 05:NODE5     261.79     .774 No_date    3:22    2.47  n/a
          diverted <= 07:AIRP-S      34.64     .102 No_date    3:22    2.47  n/a
          diverted <= 04:BRIDGE     227.15     .672 No_date    3:22    2.47  n/a
008:0458--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    SHIFT HYD       -> 07:AIRP-S     34.64     .102 No_date    3:22    2.47  n/a
     [LAG= 38.7 min]<- 05:ND5ND9     34.64     .102 No_date    4:00    2.47  n/a
008:0459--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    CALIB NASHYD      06:9-AGR      100.54     .171 No_date    3:34    2.18 .087
     [CN= 66.0: N= 3.00]
     [Tp= 1.36:DT= 2.00]
008:0460--------------ID:NHYD-------AREA----QPEAK-TpeakDate_hh:mm----R.V.-R.C.-
    ADD HYD           05:ND5ND9      34.64     .102 No_date    4:00    2.47  n/a
                    + 06:9-AGR      100.54     .171 No_date    3:34    2.18  n/a
     [DT= 2.00]  SUM= 07:NODE9      135.18     .269 No_date    4:00    2.25  n/a
008:0468--------------------------------------------------------------------------
    FINISH
--------------------------------------------------------------------------------
********************************************************************************
    WARNINGS / ERRORS / NOTES
    -------------------------
0005 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
0060 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
0116 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
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                Use a smaller DT or a larger area.
0173 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                Use a smaller DT or a larger area.
0231 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                Use a smaller DT or a larger area.
0290 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                Use a smaller DT or a larger area.
0350 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                Use a smaller DT or a larger area.
0396 DIVERT HYD      ->
     *** WARNING: Outflow tables were exceeded.
0411 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                Use a smaller DT or a larger area.
  Simulation ended on 2010-01-19     at 15:07:46
```

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A3 – Hydraulic Calculations (HEC-RAS)

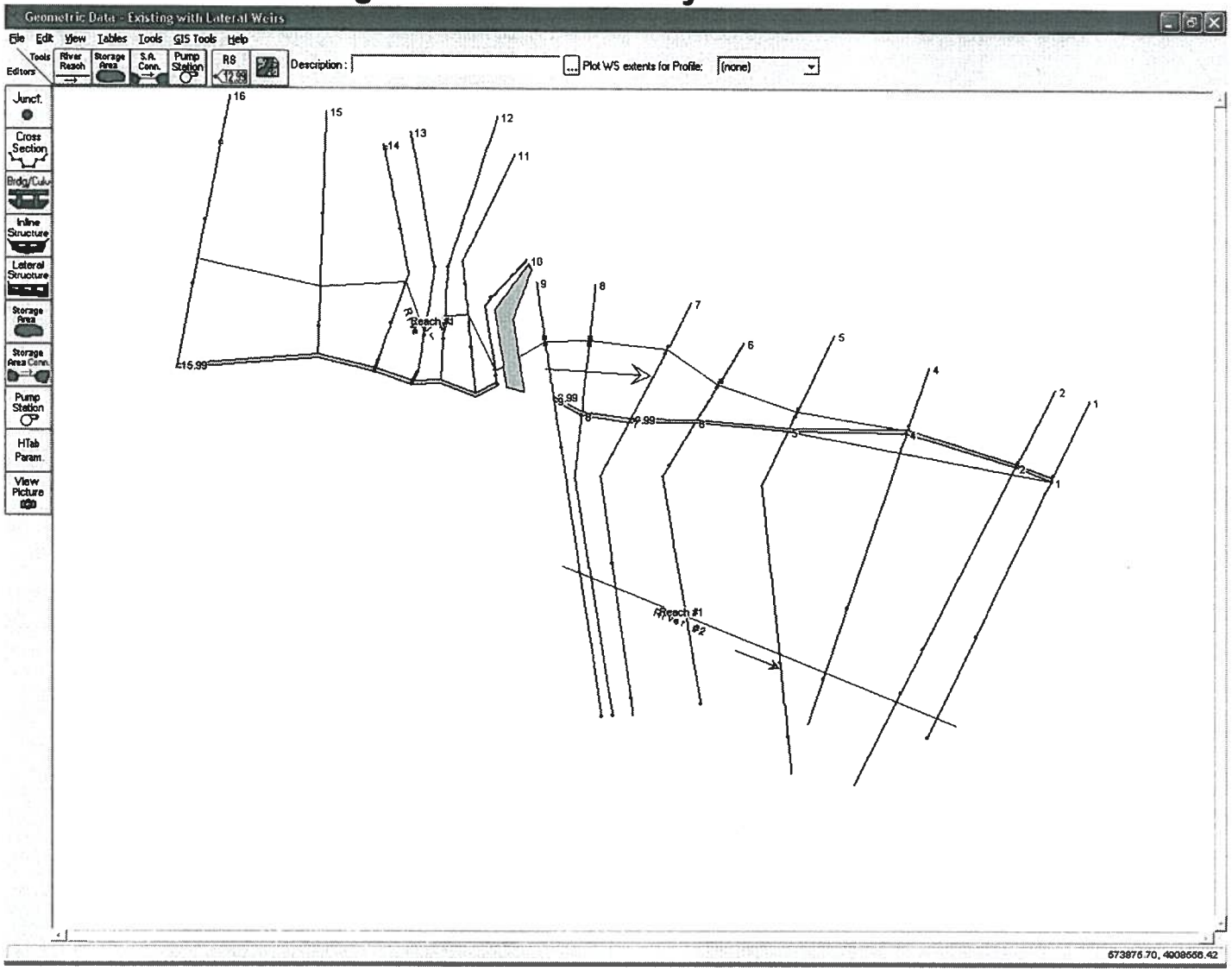
- Existing Condition
- Alternative #4

BURNSIDE

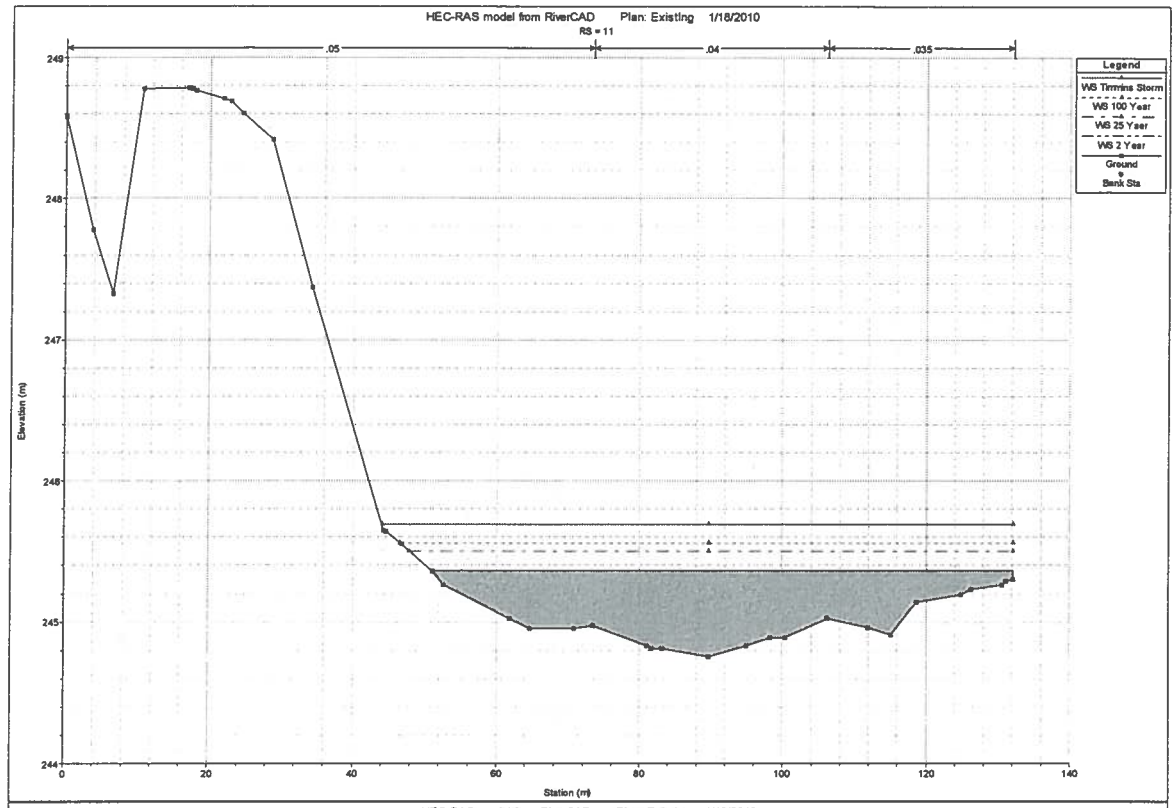
[THE DIFFERENCE IS OUR PEOPLE]

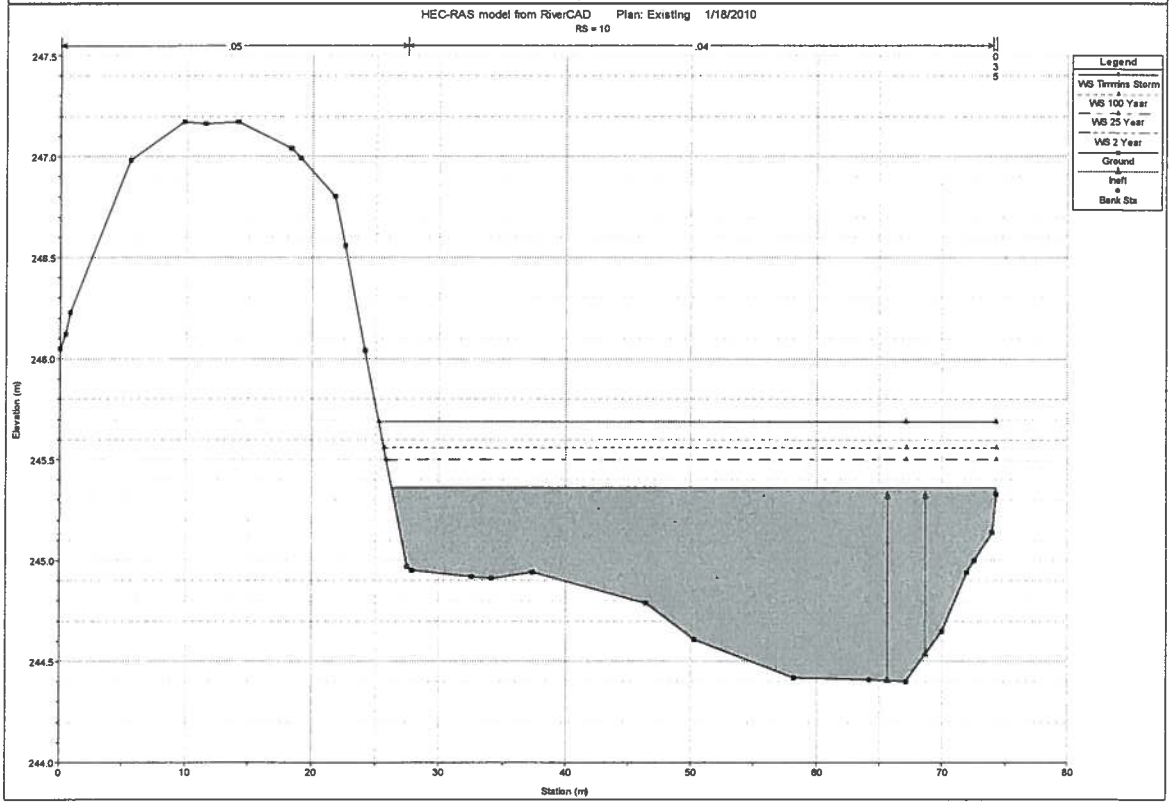
Existing Condition

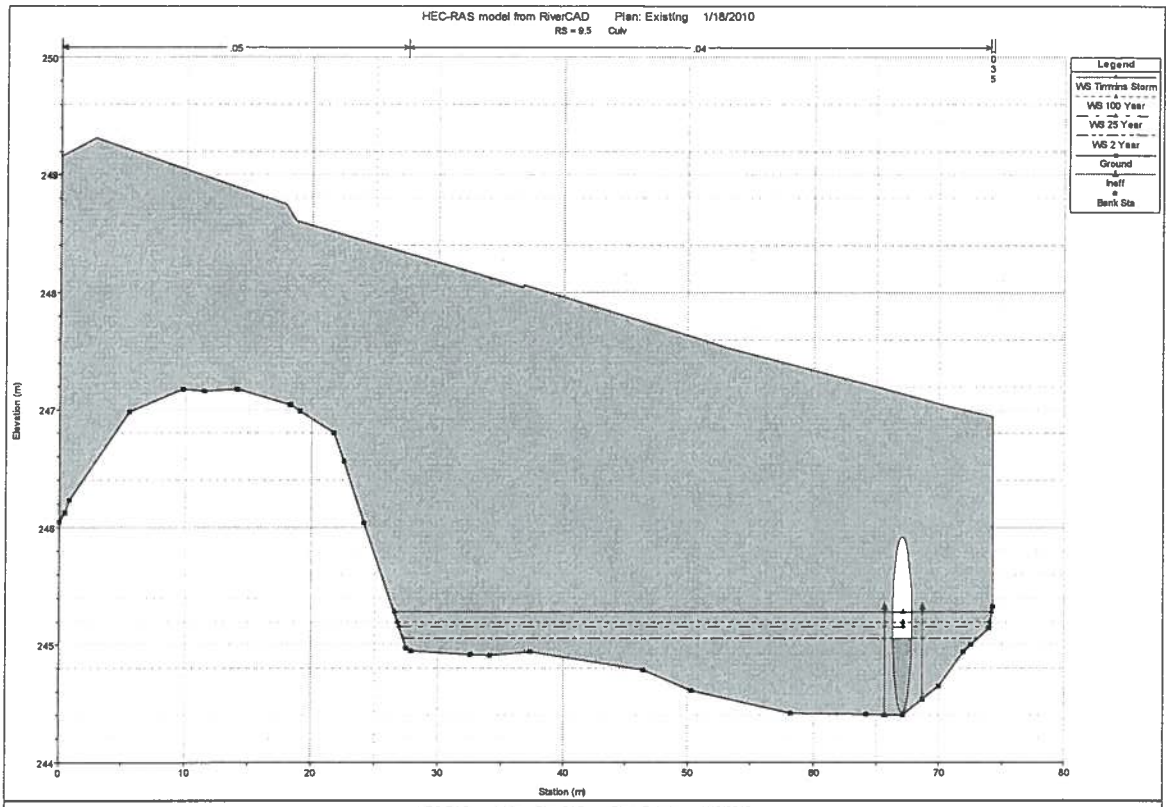
HEC-RAS Model Existing Conditions Geometry

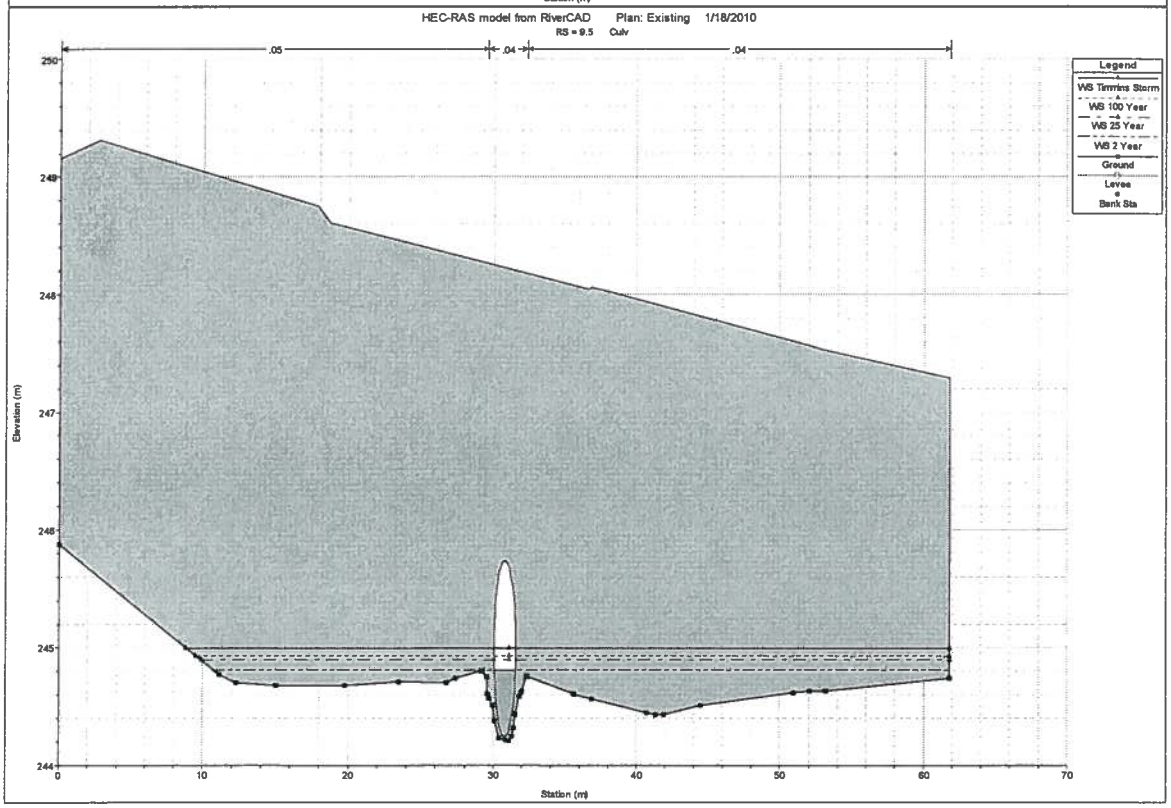


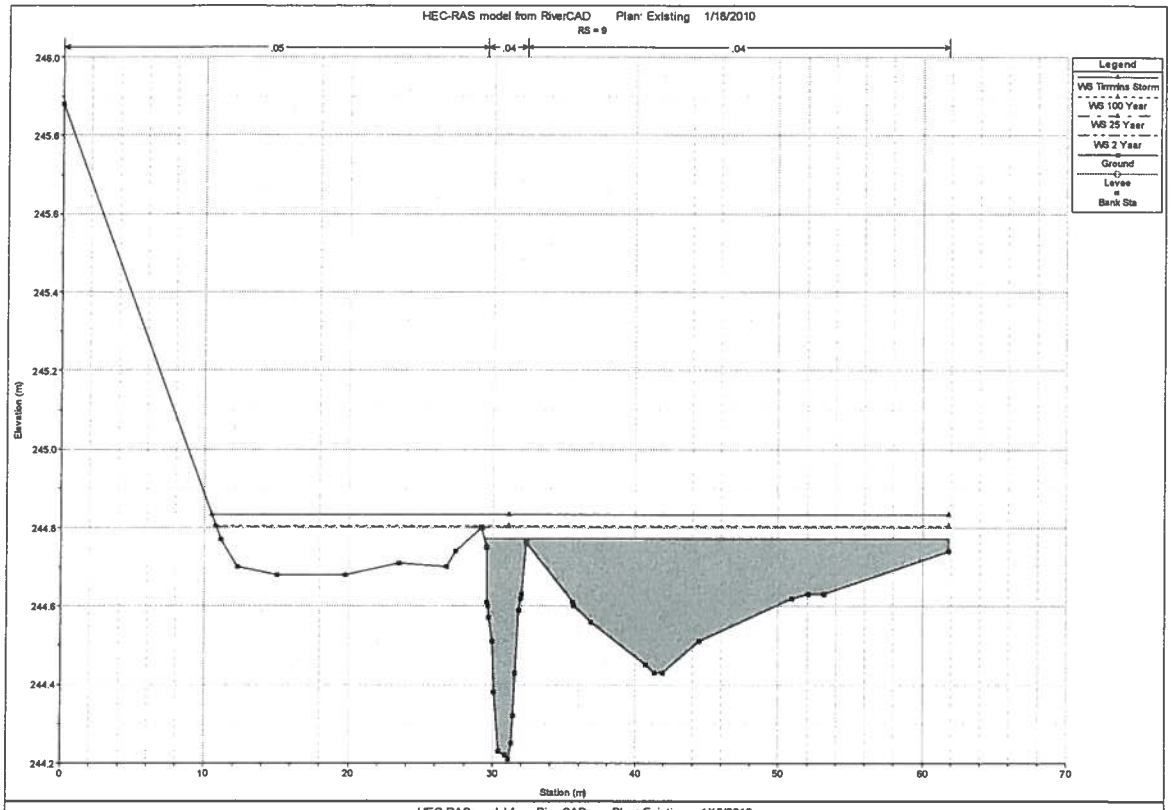
HEC-RAS Geometry Output - Existing Conditions

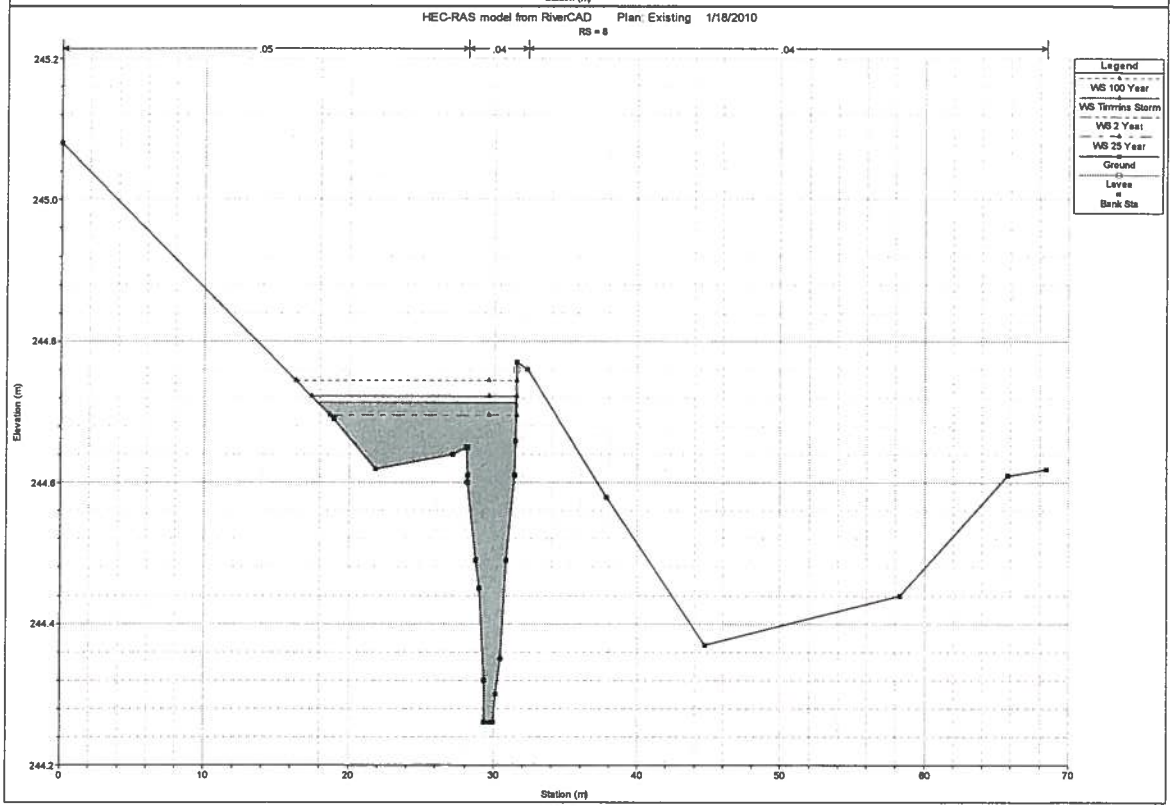





HEC-RAS model from RiverCAD Plan: Existing 1/18/2010
RS = 9.5 Culv
.05
.04
.035
Legend
WS Timmins Storm
WS 100 Year
WS 25 Year
WS 2 Year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


HEC-RAS model from RiverCAD Plan: Existing 1/18/2010
RS = 9.5 Culv
.05
.04
.04
Legend
WS Timmins Storm
WS 100 Year
WS 25 Year
WS 2 Year
Ground
Levee
Bank Sta
Elevation (m)
Station (m)


HEC-RAS model from RiverCAD Plan: Existing 1/18/2010
RS = 9
.05
.04
.04
Legend
WS Timmins Storm
WS 100 Year
WS 25 Year
WS 2 Year
Ground
Levee
Bank Sta
Elevation (m)
Station (m)


HEC-RAS model from RiverCAD Plan: Existing 1/18/2010
RS = 8
.05
.04
.04
Legend
WS 100 Year
WS Timmins Storm
WS 2 Year
WS 25 Year
Ground
Levee
Bank Sta
Elevation (m)
Station (m)

HEC-RAS Plan: Existing River: River #1 Reach: Reach #1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach #1	16	2 Year	1.665	245.47	245.51	245.51	245.55	0.026530	0.30	1.98	29.45	0.68
Reach #1	16	5 Year	2.751	245.47	245.54	245.54	245.59	0.024613	0.43	3.13	39.91	0.72
Reach #1	16	10 Year	3.638	245.47	245.57	245.57	245.61	0.020988	0.49	4.22	47.77	0.70
Reach #1	16	25 Year	4.882	245.47	245.59	245.59	245.64	0.023585	0.58	5.23	55.61	0.76
Reach #1	16	50 Year	5.881	245.47	245.60	245.60	245.65	0.025159	0.65	6.12	63.43	0.81
Reach #1	16	100 Year	6.915	245.47	245.63	245.62	245.67	0.019147	0.64	7.79	72.66	0.72
Reach #1	16	Timmins Storm	16.803	245.47	245.77	245.70	245.81	0.006166	0.69	22.39	133.94	0.48
Reach #1	15.99		Lat Struct									
Reach #1	15	2 Year	1.665	245.07	245.37		245.37	0.000297	0.15	11.76	70.32	0.11
Reach #1	15	5 Year	2.751	245.07	245.43		245.43	0.000318	0.18	16.49	81.84	0.11
Reach #1	15	10 Year	3.638	245.07	245.47		245.47	0.000327	0.20	19.71	85.44	0.12
Reach #1	15	25 Year	4.882	245.07	245.52		245.52	0.000337	0.22	23.81	89.83	0.12
Reach #1	15	50 Year	5.881	245.07	245.55		245.55	0.000346	0.24	26.81	92.91	0.13
Reach #1	15	100 Year	6.836	245.07	245.58		245.58	0.000353	0.25	29.51	95.60	0.13
Reach #1	15	Timmins Storm	12.302	245.07	245.71		245.72	0.000372	0.32	43.29	105.21	0.14
Reach #1	14	2 Year	1.665	244.95	245.36	245.05	245.36	0.000090	0.11	15.98	57.88	0.06
Reach #1	14	5 Year	2.751	244.95	245.42	245.08	245.42	0.000136	0.14	19.46	60.24	0.08
Reach #1	14	10 Year	3.638	244.95	245.46	245.10	245.48	0.000167	0.17	21.74	62.05	0.09
Reach #1	14	25 Year	4.882	244.95	245.50	245.12	245.51	0.000203	0.20	24.60	64.26	0.10
Reach #1	14	50 Year	5.881	244.95	245.54	245.15	245.54	0.000229	0.23	26.87	65.81	0.11
Reach #1	14	100 Year	6.836	244.95	245.56	245.16	245.57	0.000252	0.25	28.65	70.32	0.11
Reach #1	14	Timmins Storm	12.241	244.95	245.70	245.23	245.70	0.000340	0.34	38.90	86.23	0.14
Reach #1	13	2 Year	1.665	244.54	245.36		245.36	0.000026	0.08	22.68	59.87	0.04
Reach #1	13	5 Year	2.751	244.54	245.42		245.42	0.000048	0.12	26.30	63.58	0.05
Reach #1	13	10 Year	3.638	244.54	245.46		245.46	0.000066	0.15	28.68	65.92	0.06
Reach #1	13	25 Year	4.882	244.54	245.50		245.50	0.000091	0.18	31.72	70.08	0.07
Reach #1	13	50 Year	5.881	244.54	245.53		245.54	0.000110	0.20	33.98	75.16	0.08
Reach #1	13	100 Year	6.836	244.54	245.56		245.56	0.000128	0.22	36.25	89.69	0.09
Reach #1	13	Timmins Storm	12.241	244.54	245.69		245.70	0.000202	0.32	50.53	112.37	0.11
Reach #1	12	2 Year	1.665	244.76	245.36		245.36	0.000047	0.10	18.89	58.54	0.05
Reach #1	12	5 Year	2.751	244.76	245.42		245.42	0.000083	0.14	22.54	67.88	0.06
Reach #1	12	10 Year	3.638	244.76	245.46		245.46	0.000111	0.17	25.12	73.11	0.08
Reach #1	12	25 Year	4.882	244.76	245.50		245.50	0.000145	0.20	28.50	78.76	0.09
Reach #1	12	50 Year	5.881	244.76	245.53		245.53	0.000167	0.23	31.00	80.60	0.09
Reach #1	12	100 Year	6.836	244.76	245.56		245.56	0.000187	0.25	33.22	82.19	0.10
Reach #1	12	Timmins Storm	12.241	244.76	245.69		245.70	0.000270	0.34	44.47	89.79	0.12
Reach #1	11	2 Year	1.649	244.75	245.36		245.36	0.000017	0.07	30.05	81.09	0.03
Reach #1	11	5 Year	2.669	244.75	245.42		245.42	0.000028	0.09	34.80	82.40	0.04
Reach #1	11	10 Year	3.478	244.75	245.46		245.46	0.000037	0.11	37.83	83.21	0.04
Reach #1	11	25 Year	4.584	244.75	245.50		245.50	0.000048	0.13	41.55	84.21	0.05
Reach #1	11	50 Year	5.451	244.75	245.53		245.53	0.000056	0.14	44.20	84.91	0.06
Reach #1	11	100 Year	6.273	244.75	245.56		245.56	0.000063	0.16	46.53	85.53	0.06
Reach #1	11	Timmins Storm	10.667	244.75	245.69		245.69	0.000093	0.21	57.93	88.03	0.07
Reach #1	10	2 Year	1.270	244.40	245.36	244.70	245.36	0.000005	0.04	30.94	48.06	0.02
Reach #1	10	5 Year	1.414	244.40	245.42	244.71	245.42	0.000004	0.04	33.75	48.24	0.02
Reach #1	10	10 Year	1.510	244.40	245.46	244.73	245.46	0.000004	0.04	35.51	48.35	0.02
Reach #1	10	25 Year	1.628	244.40	245.50	244.75	245.50	0.000004	0.04	37.66	48.49	0.02
Reach #1	10	50 Year	1.710	244.40	245.53	244.76	245.53	0.000004	0.04	39.18	48.59	0.02
Reach #1	10	100 Year	1.788	244.40	245.56	244.77	245.56	0.000004	0.04	40.51	48.68	0.02
Reach #1	10	Timmins Storm	2.159	244.40	245.69	244.81	245.69	0.000004	0.05	46.94	49.09	0.01
Reach #1	9.5		Culvert									
Reach #1	9	2 Year	1.270	244.21	244.77	244.68	244.78	0.000594	0.28	6.17	32.41	0.15
Reach #1	9	5 Year	1.414	244.21	244.78	244.71	244.79	0.000628	0.30	6.49	32.48	0.16
Reach #1	9	10 Year	1.510	244.21	244.79	244.72	244.79	0.000648	0.30	6.69	32.52	0.16
Reach #1	9	25 Year	1.628	244.21	244.80	244.74	244.81	0.000489	0.27	8.96	51.01	0.14
Reach #1	9	50 Year	1.710	244.21	244.80	244.76	244.80	0.000547	0.29	8.92	51.00	0.15
Reach #1	9	100 Year	1.788	244.21	244.80	244.76	244.81	0.000576	0.29	9.04	51.03	0.15
Reach #1	9	Timmins Storm	2.159	244.21	244.83	244.76	244.84	0.000535	0.30	10.52	51.32	0.15
Reach #1	8.99		Lat Struct									
Reach #1	8	2 Year	0.967	244.26	244.71	244.83	244.74	0.005818	0.81	1.68	13.73	0.48
Reach #1	8	5 Year	1.043	244.26	244.72	244.83	244.75	0.005821	0.82	1.80	14.17	0.48
Reach #1	8	10 Year	1.094	244.26	244.73	244.68	244.76	0.005614	0.83	1.89	14.48	0.48
Reach #1	8	25 Year	1.288	244.26	244.70	244.70	244.76	0.014117	1.21	1.44	12.84	0.74
Reach #1	8	50 Year	1.201	244.26	244.74	244.69	244.77	0.005837	0.85	2.05	15.02	0.49
Reach #1	8	100 Year	1.247	244.26	244.74	244.69	244.77	0.005842	0.88	2.13	15.26	0.49
Reach #1	8	Timmins Storm	1.601	244.26	244.72	244.72	244.79	0.013806	1.27	1.80	14.16	0.74
Reach #1	7	2 Year	0.818	244.00	244.43		244.47	0.007808	0.86	1.00	7.65	0.55
Reach #1	7	5 Year	0.858	244.00	244.43		244.47	0.008024	0.88	1.03	8.37	0.56
Reach #1	7	10 Year	0.886	244.00	244.44		244.48	0.008167	0.90	1.06	8.81	0.56
Reach #1	7	25 Year	1.177	244.00	244.46	244.38	244.51	0.010332	1.06	1.30	13.08	0.64

HEC-RAS Plan: Existing River: River #1 Reach: Reach #1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach #1	7	50 Year	0.939	244.00	244.44		244.48	0.008493	0.93	1.11	8.80	0.58
Reach #1	7	100 Year	0.964	244.00	244.44		244.49	0.008610	0.94	1.14	10.22	0.58
Reach #1	7	Timmins Storm	1.382	244.00	244.47	244.46	244.53	0.011083	1.14	1.53	18.59	0.67
Reach #1	6.99	[illegible]	Lat Struct									
Reach #1	6	2 Year	0.818	243.86	244.27	244.22	244.29	0.003907	0.65	1.96	21.94	0.39
Reach #1	6	5 Year	0.858	243.86	244.28	244.22	244.29	0.003890	0.65	2.06	22.64	0.39
Reach #1	6	10 Year	0.886	243.86	244.28	244.23	244.29	0.003879	0.66	2.15	23.11	0.39
Reach #1	6	25 Year	1.177	243.86	244.31	244.26	244.32	0.003314	0.64	2.91	24.80	0.37
Reach #1	6	50 Year	0.939	243.86	244.29	244.23	244.30	0.003848	0.66	2.28	24.00	0.39
Reach #1	6	100 Year	0.964	243.86	244.29	244.24	244.30	0.003832	0.66	2.35	24.40	0.39
Reach #1	6	Timmins Storm	1.382	243.86	244.33	244.27	244.34	0.003218	0.65	3.31	24.84	0.37
Reach #1	5	2 Year	0.818	243.76	244.14	244.06	244.15	0.002468	0.51	2.24	16.87	0.32
Reach #1	5	5 Year	0.858	243.76	244.15	244.07	244.16	0.002430	0.51	2.34	17.00	0.31
Reach #1	5	10 Year	0.886	243.76	244.15	244.07	244.16	0.002404	0.51	2.40	17.09	0.31
Reach #1	5	25 Year	1.177	243.76	244.19	244.10	244.20	0.002256	0.54	3.03	17.93	0.31
Reach #1	5	50 Year	0.939	243.76	244.16	244.07	244.17	0.002358	0.52	2.53	17.26	0.31
Reach #1	5	100 Year	0.964	243.76	244.16	244.07	244.17	0.002340	0.52	2.58	17.34	0.31
Reach #1	5	Timmins Storm	1.382	243.76	244.21		244.22	0.002148	0.55	3.46	19.48	0.31
Reach #1	4	2 Year	0.818	243.38	243.78		243.84	0.016725	1.10	0.74	3.61	0.78
Reach #1	4	5 Year	0.858	243.38	243.79		243.85	0.016411	1.11	0.77	3.69	0.77
Reach #1	4	10 Year	0.886	243.38	243.79		243.86	0.016239	1.12	0.79	3.73	0.77
Reach #1	4	25 Year	1.177	243.38	243.86		243.92	0.013283	1.13	1.04	4.08	0.71
Reach #1	4	50 Year	0.939	243.38	243.81		243.87	0.015820	1.12	0.83	3.79	0.76
Reach #1	4	100 Year	0.964	243.38	243.81		243.88	0.015627	1.13	0.85	3.82	0.76
Reach #1	4	Timmins Storm	1.382	243.38	243.89		243.96	0.013009	1.17	1.18	4.26	0.71
Reach #1	2	2 Year	0.818	242.95	243.46		243.50	0.006205	0.88	0.93	2.84	0.49
Reach #1	2	5 Year	0.858	242.95	243.47		243.51	0.006186	0.89	0.97	2.87	0.49
Reach #1	2	10 Year	0.886	242.95	243.48		243.52	0.006173	0.89	0.99	2.89	0.49
Reach #1	2	25 Year	1.177	242.95	243.54		243.59	0.006517	0.99	1.21	5.63	0.51
Reach #1	2	50 Year	0.939	242.95	243.49		243.54	0.006149	0.91	1.03	2.93	0.49
Reach #1	2	100 Year	0.964	242.95	243.50		243.54	0.006138	0.92	1.05	2.94	0.49
Reach #1	2	Timmins Storm	1.382	242.95	243.58		243.63	0.006855	1.06	1.40	6.83	0.52
Reach #1	1	2 Year	0.818	242.83	243.35	243.19	243.39	0.005007	0.81	1.01	2.92	0.44
Reach #1	1	5 Year	0.858	242.83	243.36	243.20	243.40	0.005005	0.82	1.04	2.95	0.44
Reach #1	1	10 Year	0.886	242.83	243.37	243.20	243.41	0.005004	0.83	1.07	2.97	0.44
Reach #1	1	25 Year	1.177	242.83	243.44	243.25	243.48	0.005004	0.90	1.50	9.64	0.45
Reach #1	1	50 Year	0.939	242.83	243.39	243.21	243.42	0.005007	0.84	1.11	3.01	0.44
Reach #1	1	100 Year	0.964	242.83	243.39	243.21	243.43	0.005001	0.85	1.14	4.35	0.44
Reach #1	1	Timmins Storm	1.382	242.83	243.47	243.28	243.51	0.005003	0.94	1.82	10.85	0.45

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Alternative #4

Culvert Calculator Report
Proposed Edward Street Culvert

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	1.50 m	Headwater Depth/ Height	1.39
Computed Headwater Elevation	1.37 m	Discharge	3.7110 m³/s
Inlet Control HW Elev	1.20 m	Tailwater Elevation	0.66 m
Outlet Control HW Elev	1.37 m	Control Type	Outlet Control

Grades			
Upstream Invert	0.10 m	Downstream Invert	0.00 m
Length	20.00 m	Constructed Slope	0.005000 m/m

Hydraulic Profile			
Profile	CompositeM2Pressure	Depth, Downstream	0.66 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.66 m
Velocity Downstream	2.44 m/s	Critical Slope	0.019556 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.91 m
Section Size	900 mm	Rise	0.91 m
Number Sections	3		

Outlet Control Properties			
Outlet Control HW Elev	1.37 m	Upstream Velocity Head	0.18 m
Ke	0.70	Entrance Loss	0.13 m

Inlet Control Properties			
Inlet Control HW Elev	1.20 m	Flow Control	Transition
Inlet Type	Mitered to slope	Area Full	2.0 m²
K	0.02100	HDS 5 Chart	2
M	1.33000	HDS 5 Scale	2
C	0.04630	Equation Form	1
Y	0.75000		

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Culvert Calculator Report
Pr. Elizabeth Street Culvert at Conc 3

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1.00	m	Headwater Depth/ Height	1.96	
Computed Headwater Elevation	0.99	m	Discharge	0.2310	m³/s
Inlet Control HW Elev	0.72	m	Tailwater Elevation	0.34	m
Outlet Control HW Elev	0.99	m	Control Type	Outlet Control	

Grades					
Upstream Invert	0.10	m	Downstream Invert	0.00	m
Length	20.00	m	Constructed Slope	0.005000	m/m

Hydraulic Profile					
Profile	CompositeM2Pressure		Depth, Downstream	0.34	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.34	m
Velocity Downstream	1.76	m/s	Critical Slope	0.025720	m/m

Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.46	m
Section Size	450 mm		Rise	0.46	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev	0.99	m	Upstream Velocity Head	0.10	m
Ke	0.90		Entrance Loss	0.09	m

Inlet Control Properties					
Inlet Control HW Elev	0.72	m	Flow Control	Transition	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

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Culvert Calculator Report
Pr. Edward Street Culvert at Conc 3

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	1.50 m	Headwater Depth/ Height	1.91
Computed Headwater Elevation	1.26 m	Discharge	0.5110 m³/s
Inlet Control HW Elev	0.98 m	Tailwater Elevation	0.47 m
Outlet Control HW Elev	1.26 m	Control Type	Outlet Control

Grades			
Upstream Invert	0.10 m	Downstream Invert	0.00 m
Length	20.00 m	Constructed Slope	0.005000 m/m

Hydraulic Profile			
Profile	CompositeM2Pressure	Depth, Downstream	0.47 m
Slope Type	Mild	Normal Depth	N/A m
Flow Regime	Subcritical	Critical Depth	0.47 m
Velocity Downstream	2.12 m/s	Critical Slope	0.024922 m/m

Section			
Section Shape	Circular	Mannings Coefficient	0.024
Section Material	CMP	Span	0.61 m
Section Size	600 mm	Rise	0.61 m
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	1.26 m	Upstream Velocity Head	0.16 m
Ke	0.90	Entrance Loss	0.14 m

Inlet Control Properties			
Inlet Control HW Elev	0.98 m	Flow Control	Submerged
Inlet Type	Projecting	Area Full	0.3 m²
K	0.03400	HDS 5 Chart	2
M	1.50000	HDS 5 Scale	3
C	0.05530	Equation Form	1
Y	0.54000		

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Culvert Calculator Report
Pr. Dwy Culverts SR6/7 & Conc 3

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1.50	m	Headwater Depth/ Height	2.52	
Computed Headwater Elevation	1.34	m	Discharge	0.3490	m³/s
Inlet Control HW Elev	0.92	m	Tailwater Elevation	0.30	m
Outlet Control HW Elev	1.34	m	Control Type	Outlet Control	

Grades					
Upstream Invert	0.08	m	Downstream Invert	0.00	m
Length	20.00	m	Constructed Slope	0.004000	m/m

Hydraulic Profile					
Profile	CompositeM2Pressure		Depth, Downstream	0.40	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.40	m
Velocity Downstream	2.05	m/s	Critical Slope	0.029944	m/m

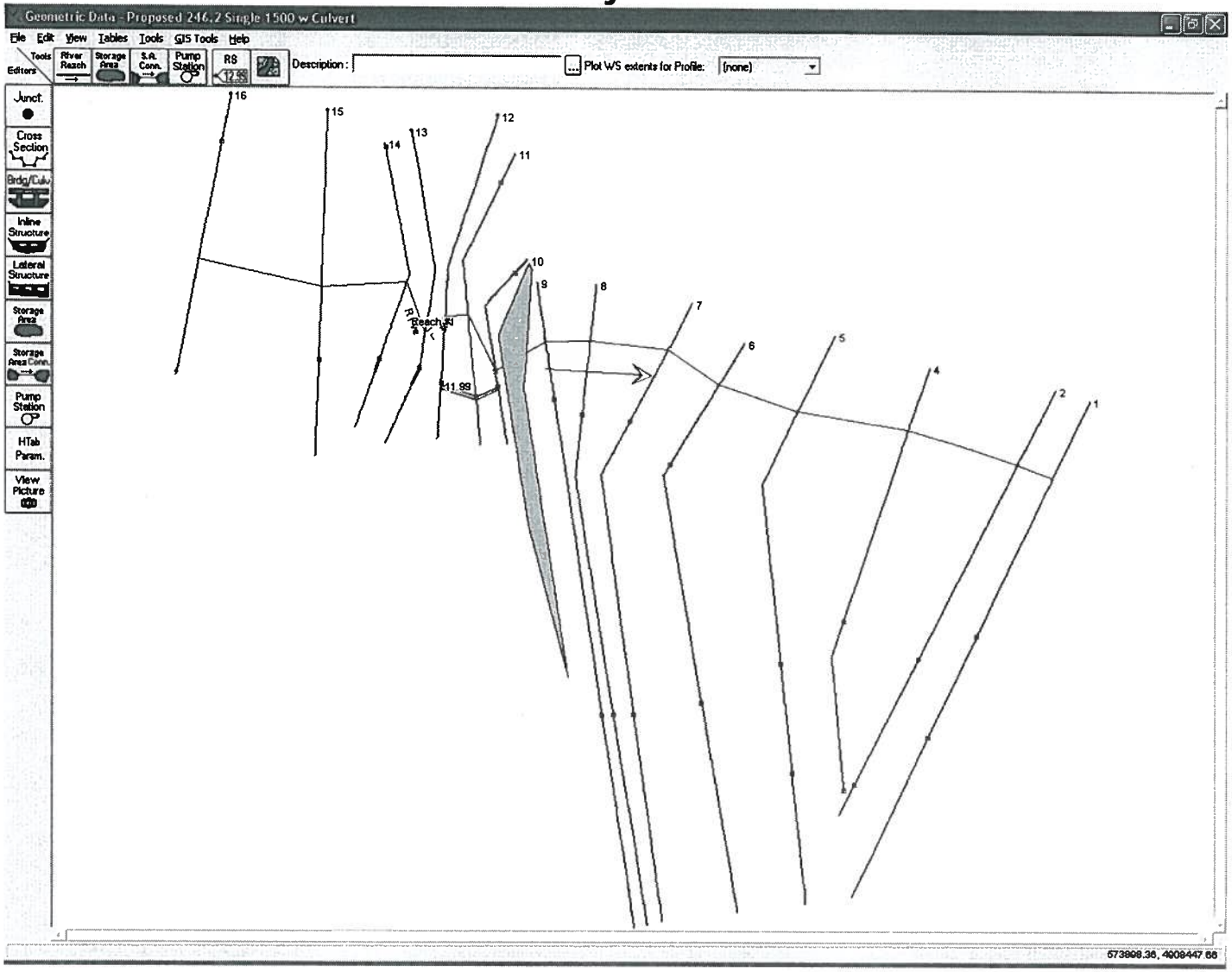
Section					
Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.50	m
Section Size	500 mm		Rise	0.50	m
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev	1.34	m	Upstream Velocity Head	0.16	m
Ke	0.90		Entrance Loss	0.14	m

Inlet Control Properties					
Inlet Control HW Elev	0.92	m	Flow Control	Submerged	
Inlet Type	Projecting		Area Full	0.2	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

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R. J. Burnside & Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

HEC-RAS Model Alternative #4 Geometry



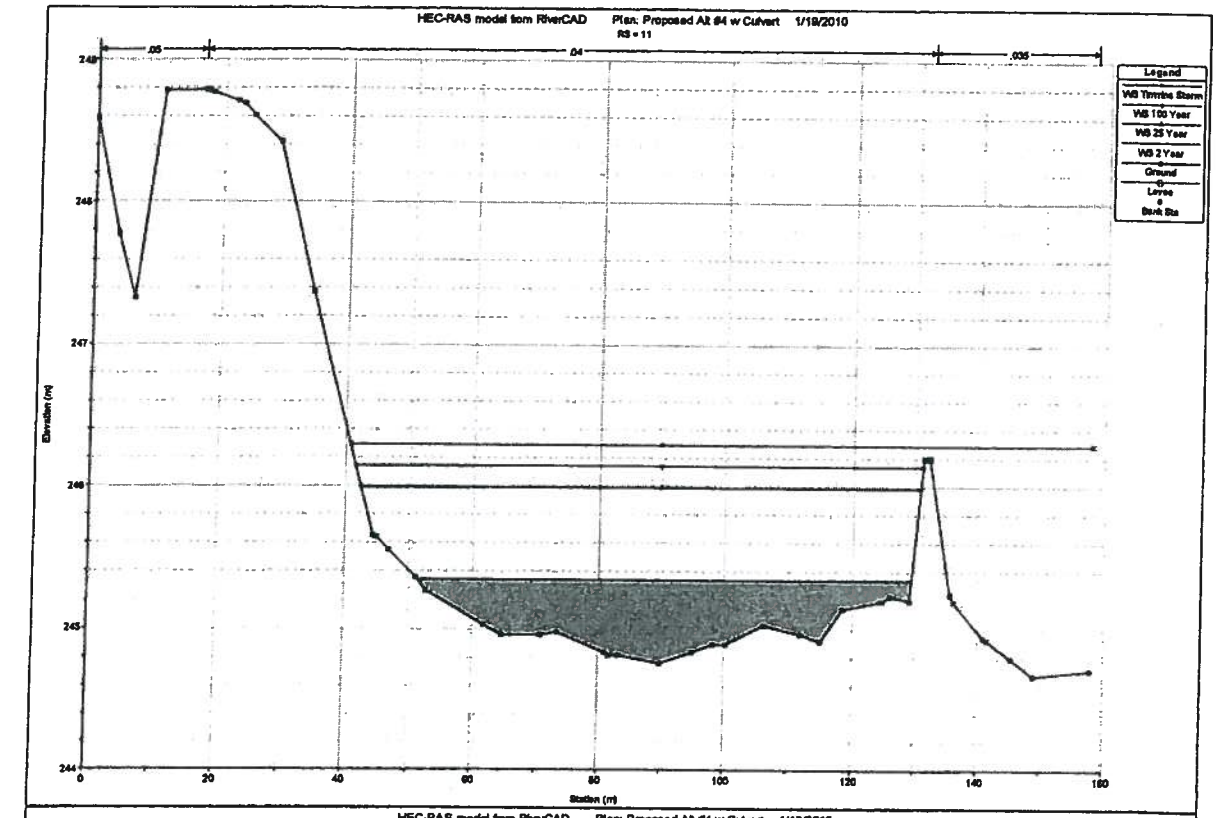
HEC-RAS Plan: Prop. Alt#4 Culv River: River #1 Reach: Reach #1

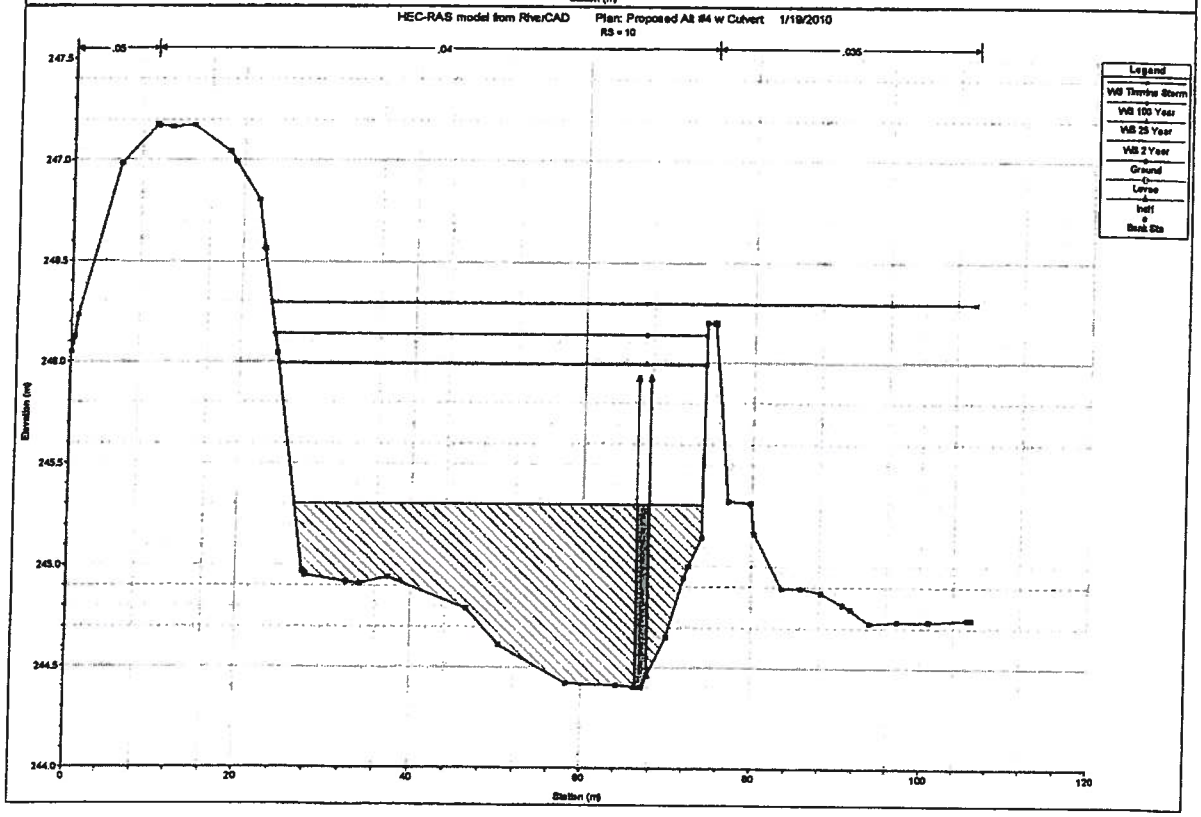
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach #1	16	2 Year	1.315	245.34	245.50	245.50	245.53	0.038141	0.79	1.68	25.98	0.99
Reach #1	16	5 Year	2.310	245.34	245.63	245.53	245.63	0.002706	0.29	7.84	72.84	0.29
Reach #1	16	10 Year	3.091	245.34	245.82	245.55	245.82	0.000148	0.11	28.64	135.23	0.07
Reach #1	16	25 Year	4.153	245.34	245.99	245.57	245.99	0.000035	0.08	52.85	137.58	0.04
Reach #1	16	50 Year	4.591	245.34	246.07	245.58	246.07	0.000024	0.07	62.99	138.55	0.03
Reach #1	16	100 Year	5.131	245.34	246.14	245.59	246.14	0.000018	0.07	73.54	139.56	0.03
Reach #1	16	Timmins Storm	8.026	245.34	246.30	245.63	246.30	0.000020	0.08	95.06	142.20	0.03
Reach #1	15	2 Year	1.315	245.07	245.36	245.17	245.35	0.000281	0.12	10.63	66.27	0.10
Reach #1	15	5 Year	2.310	245.07	245.62	245.19	245.62	0.000032	0.07	33.43	97.15	0.04
Reach #1	15	10 Year	3.091	245.07	245.81	245.21	245.81	0.000014	0.06	53.27	111.07	0.03
Reach #1	15	25 Year	4.153	245.07	245.99	245.23	245.99	0.000010	0.06	74.25	122.21	0.02
Reach #1	15	50 Year	4.591	245.07	246.07	245.24	246.07	0.000008	0.06	83.36	124.83	0.02
Reach #1	15	100 Year	5.131	245.07	246.14	245.25	246.14	0.000007	0.06	92.94	127.14	0.02
Reach #1	15	Timmins Storm	8.026	245.07	246.29	245.29	246.29	0.000005	0.05	152.89	178.87	0.02
Reach #1	14	2 Year	1.315	244.95	245.35	245.05	245.35	0.000072	0.09	15.07	57.25	0.05
Reach #1	14	5 Year	2.310	244.95	245.62	245.07	245.62	0.000025	0.07	32.70	76.03	0.03
Reach #1	14	10 Year	3.091	244.95	245.81	245.09	245.81	0.000015	0.06	49.49	95.42	0.03
Reach #1	14	25 Year	4.153	244.95	245.99	245.11	245.99	0.000011	0.06	68.36	105.93	0.02
Reach #1	14	50 Year	4.591	244.95	246.07	245.12	246.07	0.000009	0.06	76.18	106.07	0.02
Reach #1	14	100 Year	5.131	244.95	246.14	245.13	246.14	0.000008	0.06	84.25	106.22	0.02
Reach #1	14	Timmins Storm	8.026	244.95	246.29	245.18	246.29	0.000011	0.06	100.48	108.52	0.03
Reach #1	13	2 Year	1.315	244.54	245.35	244.69	245.35	0.000022	0.06	21.73	58.33	0.03
Reach #1	13	5 Year	2.310	244.54	245.62	244.76	245.62	0.000017	0.05	42.01	106.48	0.03
Reach #1	13	10 Year	3.091	244.54	245.81	244.80	245.81	0.000008	0.05	62.89	110.75	0.02
Reach #1	13	25 Year	4.153	244.54	245.99	244.85	245.99	0.000006	0.05	83.04	114.84	0.02
Reach #1	13	50 Year	4.591	244.54	246.07	244.87	246.07	0.000006	0.05	91.57	116.52	0.02
Reach #1	13	100 Year	5.131	244.54	246.14	244.98	246.14	0.000005	0.05	100.50	118.26	0.02
Reach #1	13	Timmins Storm	8.026	244.54	246.29	245.03	246.29	0.000005	0.05	149.58	157.52	0.02
Reach #1	12	2 Year	1.315	244.76	245.35	244.92	245.35	0.000039	0.07	17.99	58.41	0.04
Reach #1	12	5 Year	2.310	244.76	245.62	244.97	245.62	0.000017	0.06	38.32	85.75	0.03
Reach #1	12	10 Year	3.091	244.76	245.81	244.99	245.81	0.000010	0.06	55.79	94.53	0.02
Reach #1	12	25 Year	4.153	244.76	245.99	245.02	245.99	0.000008	0.06	72.90	98.62	0.02
Reach #1	12	50 Year	4.591	244.76	246.07	245.03	246.07	0.000007	0.06	80.07	97.60	0.02
Reach #1	12	100 Year	5.131	244.76	246.14	245.04	246.14	0.000006	0.06	87.52	98.40	0.02
Reach #1	12	Timmins Storm	8.026	244.76	246.29	245.08	246.29	0.000006	0.06	130.49	128.04	0.02
Reach #1	11.99		Lat Struct									
Reach #1	11	2 Year	1.315	244.75	245.35	244.88	245.35	0.000013	0.05	28.66	78.13	0.02
Reach #1	11	5 Year	2.310	244.75	245.62	244.93	245.62	0.000006	0.05	50.97	84.79	0.02
Reach #1	11	10 Year	3.091	244.75	245.81	244.95	245.81	0.000005	0.05	67.55	86.98	0.02
Reach #1	11	25 Year	4.153	244.75	245.99	244.98	245.99	0.000004	0.05	83.21	88.36	0.02
Reach #1	11	50 Year	4.591	244.75	246.07	244.98	246.07	0.000004	0.05	89.75	88.94	0.02
Reach #1	11	100 Year	5.131	244.75	246.14	244.99	246.14	0.000004	0.05	96.53	89.53	0.02
Reach #1	11	Timmins Storm	7.616	244.75	246.29	245.03	246.29	0.000003	0.05	145.16	117.32	0.01
Reach #1	10	2 Year	1.141	244.40	245.30	244.81	245.34	0.001391	0.86	1.33	47.61	0.29
Reach #1	10	5 Year	1.815	244.40	245.56	244.95	245.61	0.001530	1.07	1.70	48.48	0.32
Reach #1	10	10 Year	2.344	244.40	245.73	245.04	245.81	0.001578	1.19	1.96	49.08	0.33
Reach #1	10	25 Year	2.879	244.40	245.99	245.14	245.99	0.000003	0.05	61.70	49.97	0.01
Reach #1	10	50 Year	3.099	244.40	246.07	245.17	246.07	0.000003	0.05	65.40	50.22	0.01
Reach #1	10	100 Year	3.327	244.40	246.14	245.21	246.14	0.000002	0.05	69.22	50.48	0.01
Reach #1	10	Timmins Storm	3.921	244.40	246.29	245.31	246.29	0.000001	0.03	119.59	82.81	0.01
Reach #1	9.5		Culvert									
Reach #1	9	2 Year	1.141	244.06	244.20	244.17	244.21	0.008573	0.43	2.63	32.30	0.49
Reach #1	9	5 Year	1.815	244.06	244.24	244.19	244.25	0.007200	0.44	4.11	43.15	0.46
Reach #1	9	10 Year	2.344	244.06	244.27	244.21	244.28	0.006732	0.45	5.24	51.47	0.45
Reach #1	9	25 Year	2.879	244.06	244.29	244.22	244.30	0.005235	0.44	6.49	53.52	0.41
Reach #1	9	50 Year	3.099	244.06	244.30	244.22	244.31	0.005041	0.45	6.89	54.03	0.40
Reach #1	9	100 Year	3.327	244.06	244.31	244.23	244.32	0.004945	0.46	7.26	54.50	0.40
Reach #1	9	Timmins Storm	3.921	244.06	244.33	244.24	244.34	0.004739	0.47	8.31	57.79	0.40
Reach #1	8	2 Year	1.141	243.90	244.13	244.03	244.14	0.001706	0.25	4.57	38.44	0.23
Reach #1	8	5 Year	1.815	243.90	244.18	244.06	244.18	0.001751	0.28	6.37	44.81	0.24
Reach #1	8	10 Year	2.344	243.90	244.21	244.07	244.21	0.001741	0.30	7.71	49.01	0.24
Reach #1	8	25 Year	2.879	243.90	244.23	244.09	244.23	0.001776	0.32	8.88	51.79	0.25
Reach #1	8	50 Year	3.099	243.90	244.24	244.09	244.24	0.001786	0.33	9.29	52.37	0.25
Reach #1	8	100 Year	3.327	243.90	244.24	244.10	244.25	0.001920	0.35	9.51	52.67	0.26
Reach #1	8	Timmins Storm	3.921	243.90	244.26	244.12	244.27	0.001916	0.37	10.62	54.18	0.27
Reach #1	7	2 Year	1.141	243.81	244.00	243.96	244.01	0.007752	0.46	2.49	26.11	0.47
Reach #1	7	5 Year	1.815	243.81	244.04	243.98	244.05	0.007092	0.50	3.64	31.60	0.47
Reach #1	7	10 Year	2.344	243.81	244.06	244.00	244.08	0.006924	0.53	4.45	34.93	0.47
Reach #1	7	25 Year	2.879	243.81	244.09	244.01	244.10	0.006746	0.55	5.24	37.92	0.47
Reach #1	7	50 Year	3.099	243.81	244.09	244.02	244.11	0.006741	0.56	5.54	38.99	0.47
Reach #1	7	100 Year	3.327	243.81	244.11	244.02	244.12	0.006123	0.55	6.06	40.77	0.45

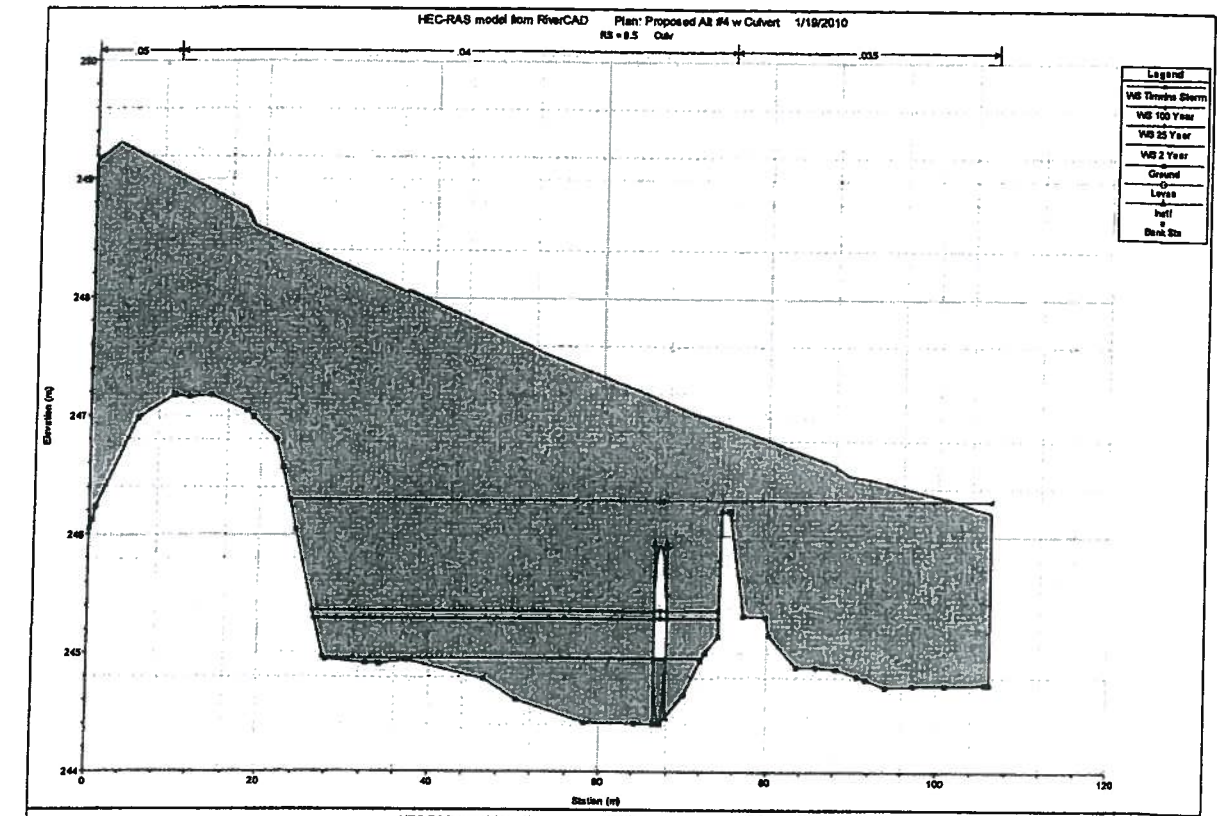
HEC-RAS Plan: Prop. Alt#4 Culv River: River #1 Reach: Reach #1 (Continued)

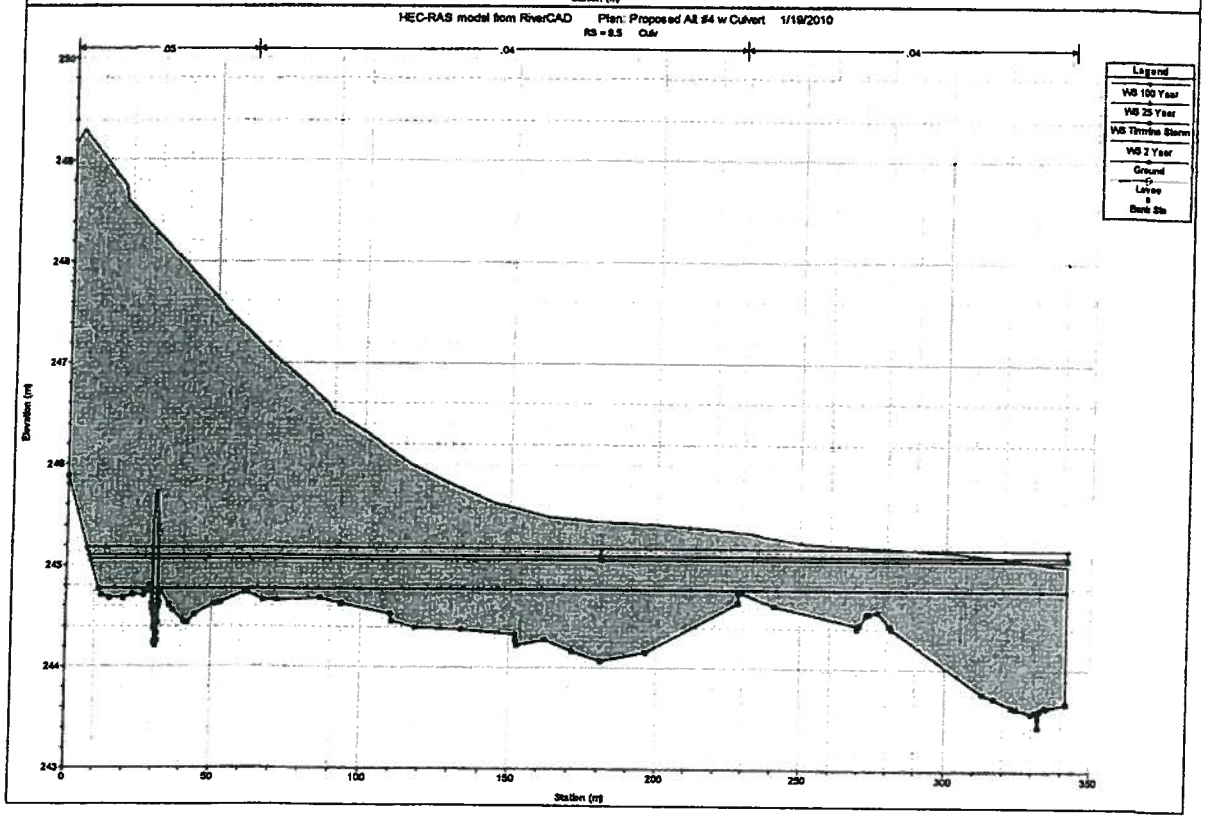
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach #1	7	Timmins Storm	3.921	243.81	244.13	244.04	244.14	0.006177	0.57	6.84	43.34	0.46
Reach #1	6	2 Year	1.141	243.66	243.85	243.77	243.86	0.003154	0.32	3.61	33.84	0.31
Reach #1	6	5 Year	1.815	243.66	243.89	243.81	243.90	0.003288	0.38	5.03	39.84	0.32
Reach #1	6	10 Year	2.344	243.66	243.92	243.81	243.92	0.003283	0.38	6.09	43.80	0.33
Reach #1	6	25 Year	2.879	243.66	243.94	243.83	243.95	0.003351	0.41	7.05	47.09	0.34
Reach #1	6	50 Year	3.099	243.66	243.95	243.84	243.96	0.003304	0.41	7.49	48.52	0.34
Reach #1	6	100 Year	3.327	243.66	243.96	243.84	243.96	0.003326	0.42	7.88	49.76	0.34
Reach #1	6	Timmins Storm	3.921	243.66	243.97	243.86	243.98	0.003509	0.45	8.74	52.37	0.35
Reach #1	5	2 Year	1.141	243.45	243.59	243.55	243.61	0.011810	0.62	1.85	17.01	0.60
Reach #1	5	5 Year	1.815	243.45	243.63	243.58	243.66	0.010118	0.67	2.70	19.49	0.58
Reach #1	5	10 Year	2.344	243.45	243.66	243.61	243.69	0.009571	0.71	3.30	21.07	0.57
Reach #1	5	25 Year	2.879	243.45	243.70	243.63	243.72	0.008171	0.71	4.04	22.87	0.54
Reach #1	5	50 Year	3.099	243.45	243.71	243.63	243.74	0.007521	0.71	4.39	23.66	0.52
Reach #1	5	100 Year	3.327	243.45	243.72	243.64	243.75	0.007531	0.72	4.62	24.17	0.53
Reach #1	5	Timmins Storm	3.921	243.45	243.75	243.66	243.78	0.006983	0.73	5.35	25.72	0.51
Reach #1	4	2 Year	1.141	243.10	243.31	243.20	243.31	0.002611	0.37	3.10	19.95	0.30
Reach #1	4	5 Year	1.815	243.10	243.36	243.24	243.37	0.002691	0.43	4.26	22.58	0.31
Reach #1	4	10 Year	2.344	243.10	243.40	243.25	243.41	0.002744	0.46	5.08	24.27	0.32
Reach #1	4	25 Year	2.879	243.10	243.44	243.27	243.45	0.002872	0.47	6.15	29.79	0.33
Reach #1	4	50 Year	3.099	243.10	243.45	243.28	243.46	0.002995	0.47	6.65	33.47	0.33
Reach #1	4	100 Year	3.327	243.10	243.47	243.29	243.48	0.003085	0.47	7.14	36.69	0.34
Reach #1	4	Timmins Storm	3.921	243.10	243.50	243.31	243.51	0.003121	0.48	8.50	44.76	0.34
Reach #1	2	2 Year	1.141	242.91	243.07	243.01	243.09	0.006422	0.51	2.25	17.60	0.45
Reach #1	2	5 Year	1.815	242.91	243.12	243.04	243.14	0.006262	0.58	3.14	19.81	0.46
Reach #1	2	10 Year	2.344	242.91	243.15	243.06	243.17	0.006214	0.62	3.77	21.25	0.47
Reach #1	2	25 Year	2.879	242.91	243.18	243.09	243.20	0.006201	0.66	4.37	22.52	0.48
Reach #1	2	50 Year	3.099	242.91	243.19	243.09	243.21	0.006197	0.67	4.60	23.01	0.48
Reach #1	2	100 Year	3.327	242.91	243.20	243.10	243.22	0.006194	0.69	4.85	23.50	0.48
Reach #1	2	Timmins Storm	3.921	242.91	243.22	243.12	243.25	0.006199	0.72	5.45	24.67	0.49
Reach #1	1	2 Year	1.141	242.80	242.97	242.90	242.98	0.005000	0.45	2.53	19.60	0.40
Reach #1	1	5 Year	1.815	242.80	243.02	242.93	243.03	0.005001	0.52	3.51	22.25	0.41
Reach #1	1	10 Year	2.344	242.80	243.05	242.95	243.06	0.005005	0.56	4.22	23.96	0.42
Reach #1	1	25 Year	2.879	242.80	243.08	242.99	243.09	0.005001	0.59	4.89	25.50	0.43
Reach #1	1	50 Year	3.099	242.80	243.09	242.98	243.10	0.005000	0.60	5.16	26.08	0.43
Reach #1	1	100 Year	3.327	242.80	243.10	242.99	243.12	0.005006	0.61	5.43	26.66	0.43
Reach #1	1	Timmins Storm	3.921	242.80	243.12	243.00	243.14	0.005002	0.64	6.12	28.07	0.44

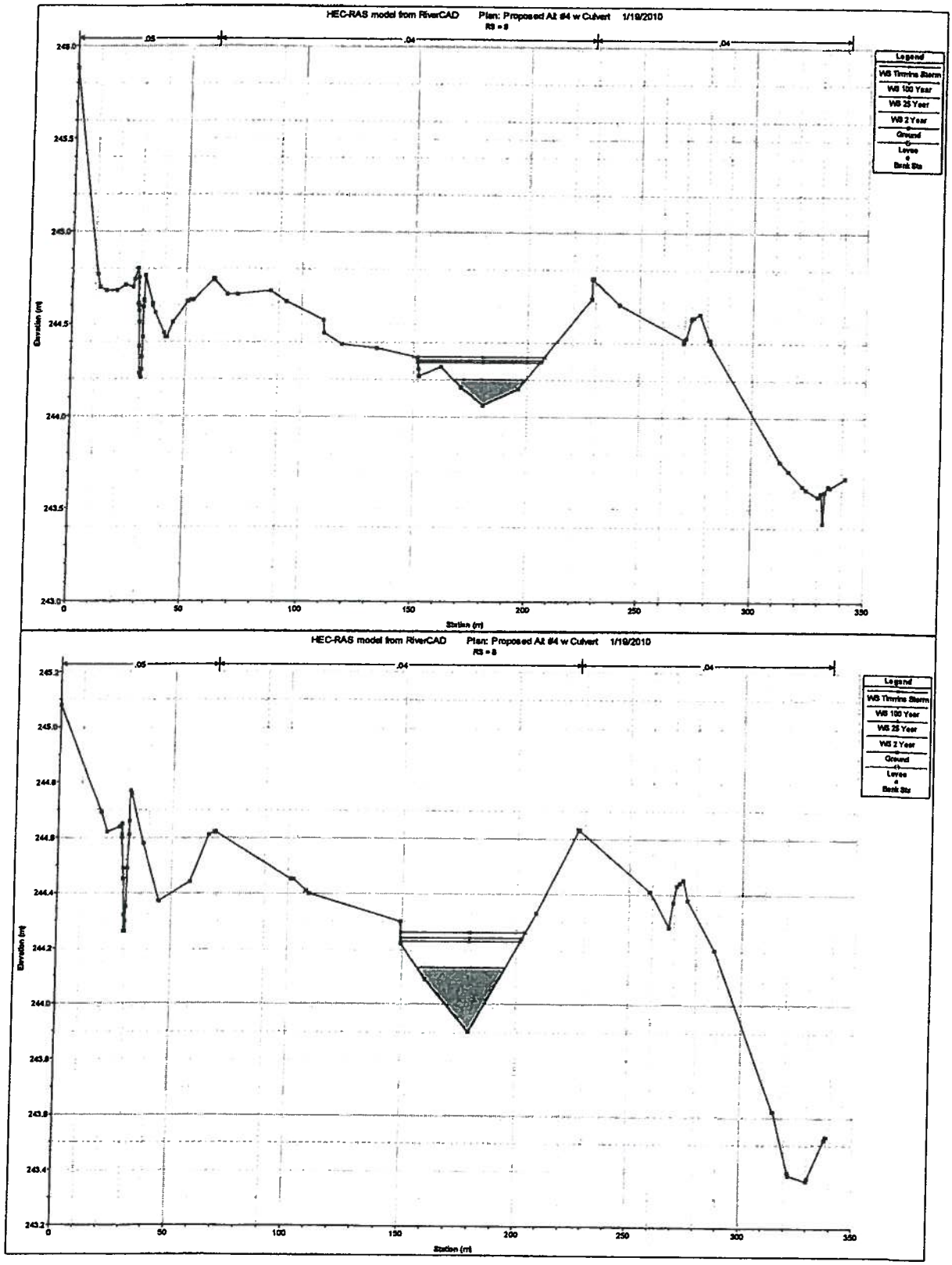
HEC-RAS Geometry Output – Alternative #4






HEC-RAS model from RiverCAD Plan: Proposed Alt #4 w Culvert 1/19/2010
RS = 8.5 Culv
.05
.04
.035
Legend
WS Timms Storm
WS 100 Year
WS 25 Year
WS 2 Year
Ground
Levee
Inef
Bank Sta
Elevation (m)
Station (m)


HEC-RAS model from RiverCAD Plan: Proposed Alt #4 w Culvert 1/19/2010
RS = 8.5 Culv
.05
.04
.04
Legend
WS 100 Year
WS 25 Year
WS Timms Storm
WS 2 Year
Ground
Levee
Bank Sta
Elevation (m)
Station (m)


HEC-RAS model from RiverCAD Plan: Proposed Alt #4 w Culvert 1/19/2010
RS = 8
.05
.04
.04
Legend
WS Timms Storm
WS 100 Year
WS 25 Year
WS 2 Year
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
HEC-RAS model from RiverCAD Plan: Proposed Alt #4 w Culvert 1/19/2010
RS = 8
.05
.04
.04
Legend
WS Timms Storm
WS 100 Year
WS 25 Year
WS 2 Year
Ground
Levee
Bank Sta
Elevation (m)
Station (m)

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A4 – Cost Estimate

Alternative #4 Capital Cost Estimation

BURNSIDE
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Project Name:	Creemore Drainage Study
Project Number:	MCG 107700
Client:	Towship of Clearview
Date:	June 15, 2010

A. Site Grading

	Item	Description	Unit	Quantity	Unit Price	Estimated Cost
A1	County Road 9 Ditching Cleanout	Mary St. to Alliance	m	450	$12.00	$5,400.00
A2	Edward Street Ditching	Concession 3 to Edward St. crossing	m^3	3623	$12.00	$43,476.48
A3	Edward Street East Crossing Removal	450mmø CSP	L.S.	1	$1,500.00	$1,500.00
A4	Edward Street East Crossing Removal (replacement in C.)	600mmø CSP	L.S.	1	$2,000.00	$2,000.00
A5	Edward Street East Ditching	Edward Street crossing to Airport Road	m^3	2913	$12.00	$34,957.44
A6	Berm Construction	West of Airport Road Crossing	m^3	493	$12.00	$5,912.38
A7	Airport Road Ditching	East ROW from Airport Road crossing to 6/7 Sideroad	m^3	1982	$12.00	$23,788.80
A8	Elizabeth Street Ditching	Mary Street to Concession 3	m^3	1000	$12.00	$12,000.00
A9	Edward Street Ditching	Mary Street along easement to Concession 3	m^3	1000	$12.00	$12,000.00
A10	Edward Street East Regrading	Concession 3 to Edward Street crossing as required	m	880	$30.00	$26,400.00
A11	George Street Ditching	Mary Street along easement to Concession 3	m^3	840	$12.00	$10,080.00
A12	George Street Crossing Removal	600mmø CSP	L.S.	1	$2,000.00	$2,000.00
A13	Concession 3 Ditching	Alliance outlet to Edward Street	m^3	387	$12.00	$4,641.00
A14	Concession 3 Ditching	Edward Street to George Street easement	m^3	565	$12.00	$6,783.00
A15	Concession 3 Ditching	George Street easement to 6/7 Sideroad	m^3	1309	$12.00	$15,708.00
A16	Concession 3 Ditching	6/7 Sideroad to Mad River	m^3	855	$12.00	$10,260.00

Part A Sub-Total **$216,907.10**

B. Road Crossings

	Item	Description	Unit	Quantity	Unit Price	Estimated Cost
B1	Edward Street Driveway Culverts: Mary St. to Alliance Outlet	600mmø CSP	m	40	$150.00	$6,000.00
B2	Edward Street Road Crossing Removal and Replacement West of Airport Road	Triple 900mmø CSP	m	60	$250.00	$15,000.00
B3	Airport Road Berm Relief Culverts	Twin 600mmø CSP	m	30	$150.00	$4,500.00
B4	George Street Easement Road Crossing	450mmø CSP	m	20	$120.00	$2,400.00
B5	Edward Street East Driveway Crossing	Triple 900mmø CSP	m	18	$250.00	$4,500.00
B6	Concession 3 Driveway Crossings	Triple 900mmø CSP	m	36	$250.00	$9,000.00

Part B Sub-Total **$41,400.00**

Alternative #4 Maintenance Cost Estimation

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Project Name:	Creemore Drainage Study
Project Number:	MCG 107700
Client:	Towship of Clearview
Date:	June 15, 2010

A. Major System Maintenance

	Item	Description	Unit	Quantity	Unit Price	Estimated Cost
A1	Ditching - Arterial Roads	Inspection, removal of culvert obstructions and sedimentation as needed.	m	4986	$0.50	$2,493.00
A1	Ditching - Local Roads	Inspection, removal of culvert obstructions and sedimentation as needed.	m	2565	$0.20	$513.00

Part A Sub-Total **$3,006.00**

B. Minor System Maintenance

	Item	Description	Unit	Quantity	Unit Price	Estimated Cost
B1	Storm Sewer	Annual inspection, clean-out, sediment removals.	L.S.	1	$4,000.00	$4,000.00

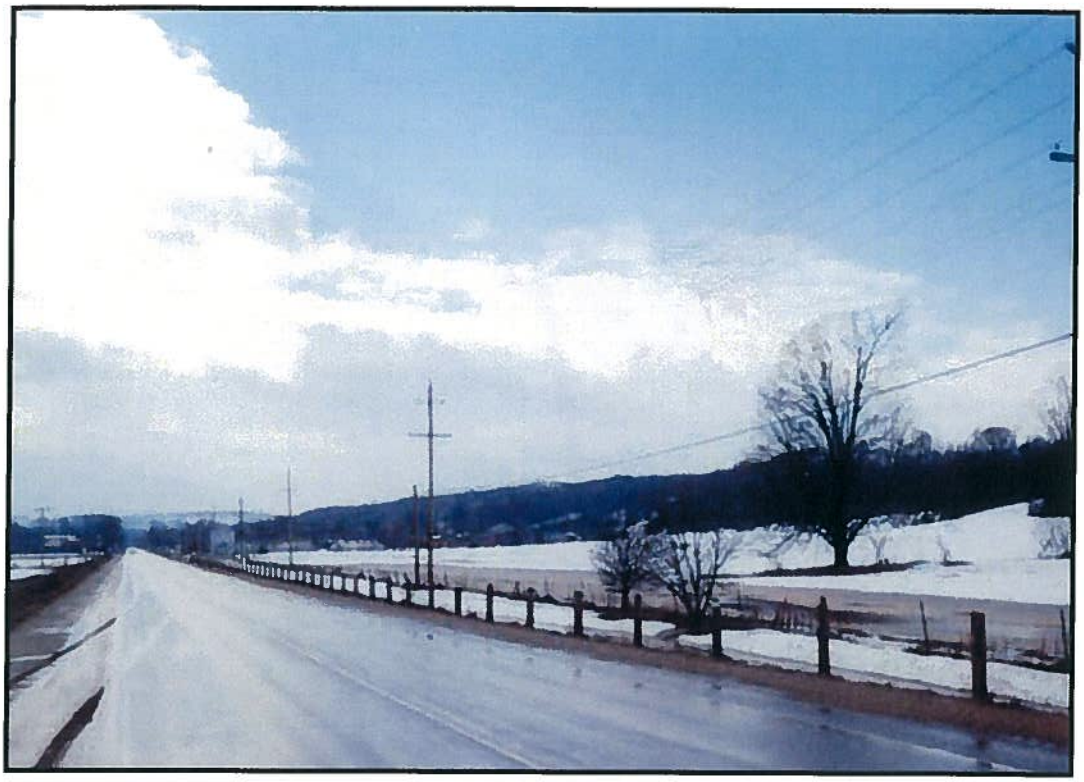
Part B Sub-Total **$4,000.00**

Annual Maintenance Cost **$7,006.00**

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Appendix B
Photographic Inventory



County Road 9 – Looking west towards Creemore



Edward Street – Looking northwest towards County Road 9



Edward Street – Looking west towards Creemore



Edward Street – Looking east to Airport Road



Edward Street – Looking west



Mill Street – Looking south



Fairgrounds Road – Looking north



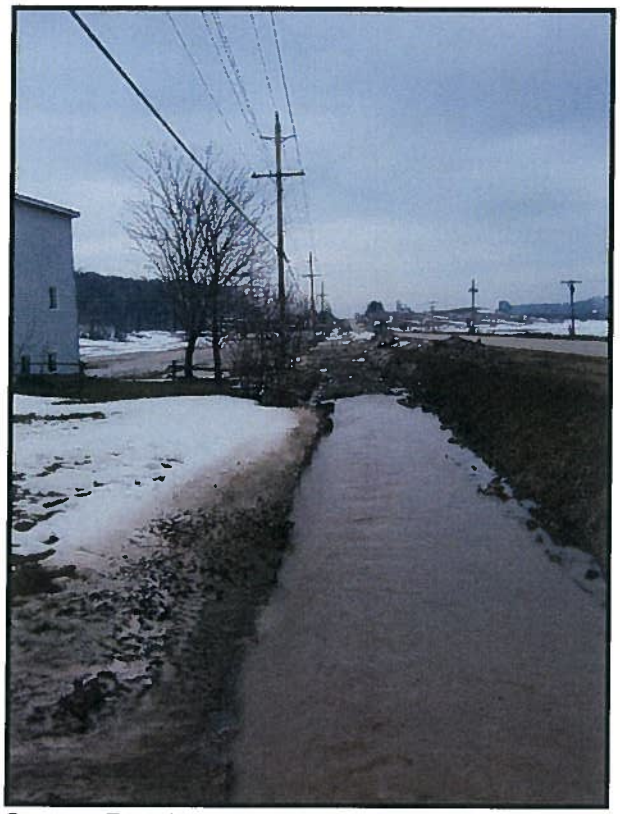
County Road 9 – Looking east from Fairgrounds Road



County Road 9 – Looking east from Fairgrounds



County Road 9 – Looking east from Fairgrounds



County Road 9 – Looking east of Mary Street



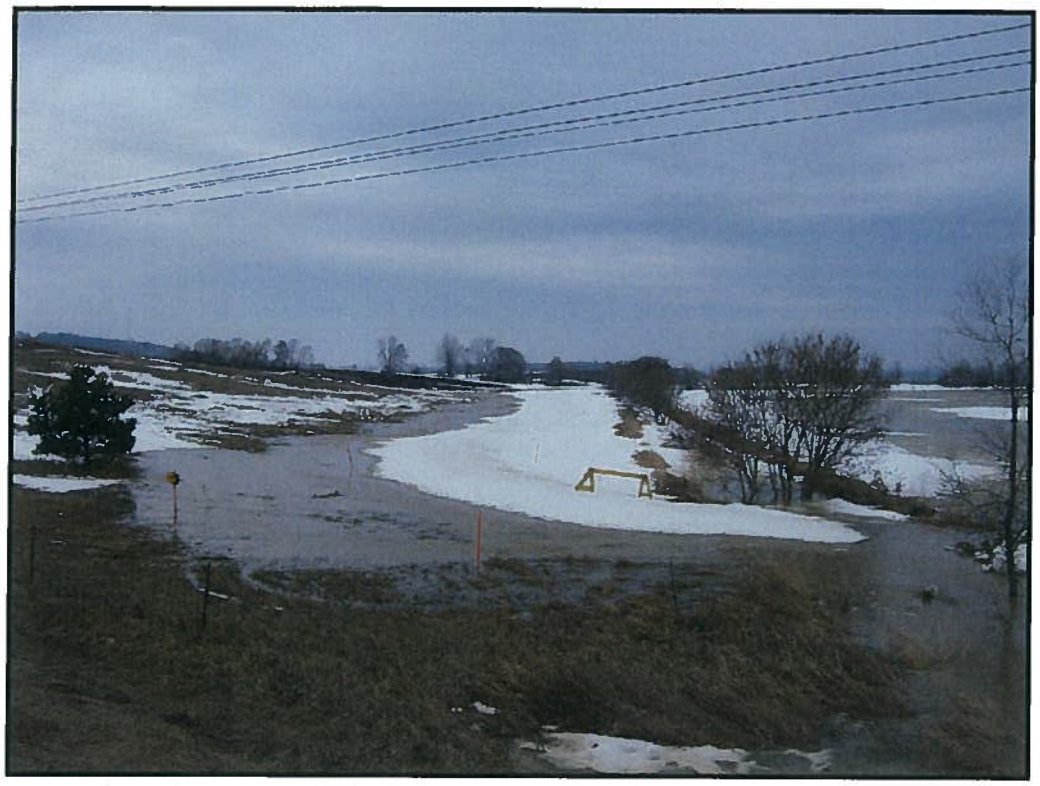
County Road 9 – Looking east of Mary Street



County Road 9 – Looking south across east limits of Alliance Homes Property, snowmobile trail blocking flow



County Road 9 – Looking south across east limits of Alliance Homes Property, snowmobile trail blocking flow



County Road 9 – Looking south across east limits of Alliance Homes Property, snowmobile trail blocking flow



Looking north to County Road 9 from Alliance east limits

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Appendix C
Ontario Breeding Bird Atlas Review Results

	WILDLIFE MASTER SPECIES LIST FOR ONTARIO								
1	Wildlife Survey Conducted by: Ontario Breeding Bird Atlas Square 17NJ32								
1	COMMON NAME	SCIENTIFIC NAME	SRANK	NRANK	SARA Status	SARA Schedule	OESA Status	AREA	Area Sensitive	COMMENTS
1	BIRDS	99								
1	Veery	*Catharus fuscescens*	S4B,SZN	N5B				> 10 ha	Yes	Forest
1	Hairy Woodpecker	*Picoides villosus*	S5	N5				4 - 8 ha	Yes	Forest
1	White-breasted Nuthatch	*Sitta carolinensis*	S5	N5				> 10 ha	Yes	Forest
1	American Redstart	*Setophaga ruticilla*	S5B,SZN	N5B				> 100 ha	Yes	Forest
1	Black-and-white Warbler	*Mniotilta varia*	S5B,SZN	N5B				> 100 ha	Yes	Forest
1	Black-throated Blue Warbler	*Dendroica caerulescens*	S5B,SZN	N5B				> 100 ha	Yes	Forest
1	Black-throated Green Warbler	*Dendroica virens*	S5B,SZN	N5B				30 ha	Yes	Forest
1	Brown Creeper	*Certhia americana*	S5B,SZN	N5				> 30 ha	Yes	Forest
1	Canada Warbler	*Wilsonia canadensis*	S5B,SZN	N5B			SC	> 30 ha	Yes	Forest
1	Hermit Thrush	*Catharus guttatus*	S5B,SZN	N5B,NZN					Yes	Forest
1	Least Flycatcher	*Empidonax minimus*	S5B,SZN	N5B				> 100 ha	Yes	Forest
1	Ovenbird	*Seiurus aurocapillus*	S5B,SZN	N5B				> 70 ha	Yes	Forest
1	Pine Warbler	*Dendroica pinus*	S5B,SZN	N5B				15 - 30 ha	Yes	Forest
1	Red-breasted Nuthatch	*Sitta canadensis*	S5B,SZN	N5				> 10 ha	Yes	Forest
1	Scarlet Tanager	*Piranga olivacea*	S5B,SZN	N5B				> 20 ha	Yes	Forest
1	Sharp-shinned Hawk	*Accipiter striatus*	S5B,SZN	N5B,N5N				> 30 ha	Yes	Forest
1	Winter Wren	*Troglodytes troglodytes*	S5B,SZN	N5				> 30 ha	Yes	Forest
1	Yellow-bellied Sapsucker	*Sphyrapicus varius*	S5B,SZN	N5B				2 - 5 ha	Yes	Forest
1	Northern Harrier	*Circus cyaneus*	S4B,SZN	N5B,N4N				>30 ha	Yes	Marsh/ Water
1	Bobolink	*Dolichonyx oryzivorus*	S4B,SZN	N5B				> 50 ha	Yes	Open Country
1	Grasshopper Sparrow	*Ammodramus savannarum*	S4B,SZN	N4B				> 10 ha	Yes	Open Country
1	Eastern Meadowlark	*Sturnella magna*	S5B,SZN	N5B				> 10 ha	Yes	Open Country
1	Savannah Sparrow	*Passerculus sandwichensis*	S5B,SZN	N5B,NZN				> 50 ha	Yes	Open Country
1	Wild Turkey	*Meleagris gallopavo*	S4	N3N4						
1	Black-billed Cuckoo	*Coccyzus erythropthalmus*	S4B,SZN	N5B						
1	Clay-coloured Sparrow	*Spizella pallida*	S4B,SZN	N5B						
1	Eastern Towhee	*Pipilo erythrophthalmus*	S4B,SZN	N4B,NZN						
1	Golden-winged Warbler	*Vermivora chrysoptera*	S4B,SZN	N4B	THR	1	SC			
1	Green Heron	*Butorides virescens*	S4B,SZN	N4B,NZN						
1	Northern Mockingbird	*Mimus polyglottos*	S4B,SZN	N3N4						
1	Turkey Vulture	*Cathartes aura*	S4B,SZN	N4N5B, NZN						
1	Vesper Sparrow	*Pooecetes gramineus*	S4B,SZN	N5B						
1	Eastern Bluebird	*Sialia sialis*	S4S5B,SZN	N5B,NZN						
1	Black-capped Chickadee	*Poecile atricapillus*	S5	N5						
1	Blue Jay	*Cyanocitta cristata*	S5	N5B,N5N						
1	Common Raven	*Corvus corax*	S5	N5						
1	Downy Woodpecker	*Picoides pubescens*	S5	N5						
1	Eastern Screech Owl	*Otus asio*	S5	N5						
1	Northern Cardinal	*Cardinalis cardinalis*	S5	N5						
1	Alder Flycatcher	*Empidonax alnorum*	S5B,SZN	N5B						
1	American Crow	*Corvus brachyrhynchos*	S5B,SZN	N5B,N5N						
1	American Goldfinch	*Carduelis tristis*	S5B,SZN	N5B,N5N						
1	American Kestrel	*Falco sparverius*	S5B,SZN	N5B,N5N						
1	American Robin	*Turdus migratorius*	S5B,SZN	N5B,N?N						
1	American Woodcock	*Scolopax minor*	S5B,SZN	N5B,NZN						
1	Baltimore Oriole	*Icterus galbula*	S5B,SZN	N5B,NZN						
1	Bank Swallow	*Riparia riparia*	S5B,SZN	N5B						
1	Barn Swallow	*Hirundo rustica*	S5B,SZN	N5B						
1	Belted Kingfisher	*Ceryle alcyon*	S5B,SZN	N5B,N5N						
1	Blue-winged Teal	*Anas discors*	S5B,SZN	N5B,N5N						
1	Brown Thrasher	*Toxostoma rufum*	S5B,SZN	N5B						
1	Brown-headed Cowbird	*Molothrus ater*	S5B,SZN	N5B,NZN						
1	Canada Goose	*Branta canadensis*	S5B,SZN	N5B,N5N						
1	Cedar Waxwing	*Bombycilla cedrorum*	S5B,SZN	N5						

1	Chestnut-sided Warbler	*Dendroica pensylvanica*	S5B,SZN	N5B						
1	Chipping Sparrow	*Spizella passerina*	S5B,SZN	N5B						
1	Cliff Swallow	*Petrochelidon pyrrhonota*	S5B,SZN	N5B						
1	Common Grackle	*Quiscalus quiscula*	S5B,SZN	N5B,NZN						
1	Common Yellowthroat	*Geothlypis trichas*	S5B,SZN	N5B						
1	Dark-eyed Junco	*Junco hyemalis*	S5B,SZN	N5						
1	Eastern Kingbird	*Tyrannus tyrannus*	S5B,SZN	N5B						
1	Eastern Phoebe	*Sayornis phoebe*	S5B,SZN	N5B						
1	Eastern Wood-pewee	*Contopus virens*	S5B,SZN	N5B						
1	Field Sparrow	*Spizella pusilla*	S5B,SZN	N5B						
1	Gray Catbird	*Dumetella carolinensis*	S5B,SZN	N5B						
1	Great Crested Flycatcher	*Myiarchus crinitus*	S5B,SZN	N5B						
1	Horned Lark	*Eremophila alpestris*	S5B,SZN	N5B,N5N						
1	House Wren	*Troglodytes aedon*	S5B,SZN	N5B						
1	Indigo Bunting	*Passerina cyanea*	S5B,SZN	N5B						
1	Killdeer	*Charadrius vociferus*	S5B,SZN	N5B,NZN						
1	Mallard	*Anas platyrhynchos*	S5B,SZN	N5B,N5N						
1	Mourning Dove	*Zenaida macroura*	S5B,SZN	N5						
1	Mourning Warbler	*Oporornis philadelphia*	S5B,SZN	N5B						
1	Nashville Warbler	*Vermivora ruficapilla*	S5B,SZN	N5B						
1	Northern Flicker	*Colaptes auratus*	S5B,SZN	N5B,N?N						
1	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S5B,SZN	N5B						
1	Northern Waterthrush	*Seiurus noveboracensis*	S5B,SZN	N5B						
1	Purple Finch	*Carpodacus purpureus*	S5B,SZN	N5B,N5N						
1	Red-eyed Vireo	*Vireo olivaceus*	S5B,SZN	N5B						
1	Red-tailed Hawk	*Buteo jamaicensis*	S5B,SZN	N5B,N5N						
1	Red-winged Blackbird	*Agelaius phoeniceus*	S5B,SZN	N5B,NZN						
1	Rose-breasted Grosbeak	*Pheucticus ludovicianus*	S5B,SZN	N5B						
1	Ruby-throated Hummingbird	*Archilochus colubris*	S5B,SZN	N5B						
1	Song Sparrow	*Melospiza melodia*	S5B,SZN	N5						
1	Spotted Sandpiper	*Actitis macularia*	S5B,SZN	N5B,NZN						
1	Swamp Sparrow	*Melospiza georgiana*	S5B,SZN	N5B,NZN						
1	Tree Swallow	*Tachycineta bicolor*	S5B,SZN	N5B						
1	Warbling Vireo	*Vireo gilvus*	S5B,SZN	N5B						
1	White-throated Sparrow	*Zonotrichia albicollis*	S5B,SZN	N5B,NZN						
1	Willow Flycatcher	*Empidonax traillii*	S5B,SZN	N5B						
1	Wood Duck	*Aix sponsa*	S5B,SZN	NZN,N5B						
1	Wood Thrush	*Hylocichla mustelina*	S5B,SZN	N5B						
1	Yellow Warbler	*Dendroica petechia*	S5B,SZN	N5B						
1	Yellow-rumped Warbler	*Dendroica coronata*	S5B,SZN	N5B,NZN						
1	European Starling	*Sturnus vulgaris*	SE	NE						
1	Gray Partridge	*Perdix perdix*	SE	NE						
1	House Finch	*Carpodacus mexicanus*	SE	N5						
1	House Sparrow	*Passer domesticus*	SE	NE5						
1	Rock Dove	*Columba livia*	SE	NE						

1	**Rank Definitions**
1	
1	**SRANK**
1 **SX**	**Presumed Extirpated**—Species or community is believed to be extirpated from the nation or state/province.
1 **SH**	**Possibly Extirpated (Historical)**—The NH or SH rank is reserved for species for which some effort has been made to relocate occurrences.
1 **S1**	**Critically Imperiled**—Extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation.
1 **S2**	**Imperiled**—Due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation.
1 **S3**	**Vulnerable**—Due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
1 **S4**	**Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
1 **S5**	**Secure**—Common, widespread, and abundant in the nation or state/province.
1 **SNR**	**Unranked**—Nation or state/province conservation status not yet assessed.
1 **SU**	**Unrankable**—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

1	**SNA**	**Not Applicable** —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
1	**S#S#**	**Range Rank** —Used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
1	**C**	**Captive/Cultivated;** existing in the province only in a cultivated state; introduced population not yet fully established and self-sustaining.
1	**S?**	**Not Ranked Yet;** or if following a ranking, Rank Uncertain (e.g. S3?). S? species have not had a rank assigned.
1	**SA**	**Accidental;** of accidental or casual occurrence in the province; far outside its normal range; some species may occasionally breed in the province.
1	**SAB**	**Breeding accidental.**
1	**SAN**	**Non-breeding accidental.**
1	**SE**	**Exotic;** not believed to be a native component of Ontario's flora.
1	**SR**	**Reported for Ontario,** but without persuasive documentation which would provide a basis for either accepting or rejecting the report.
1	**SRF**	**Reported falsely from Ontario.**
1	**SX**	**Apparently extirpated from Ontario,** with little likelihood of rediscovery. Typically not seen in the province for many decades, despite searches at known historic sites.
1	**SZ**	Applies to long distance migrants, winter vagrants, and eruptive species, too transitory in their occurrence(s) to be reliably mapped; most are non-breeders, however, some may occasionally breed.
1	**SZB**	**Breeding migrants/vagrants.**
1	**SZN**	**Non-breeding migrants/vagrants.**
1		
1		***OESA Status***
1	**END**	**Endangered**. Any native species that is at risk of extinction or extirpation throughout all or a significant portion of its Ontario range if the limiting factors are not reversed. Protected under the Endangered Species Act.
1	**EXP**	**Extirpated**. Any native species no longer existing in the wild in Ontario, but existing elsewhere in the wild.
1	**EXT**	**Extinct**. Any species formerly native to Ontario that no longer exists.
1	**IND**	**Indeterminate**. Any native species for which there is insufficient scientific information on which to base a status recommendation.
1	**NIAC**	**Not In Any COSSARO Category**. Any native species evaluated by COSSARO which does not currently meet criteria for assignment to a provincial risk category.
1	**THR**	**Threatened**. Any native species that is at risk of becoming endangered throughout all or a significant portion of its Ontario range if the limiting factors are not reversed.
1	**VUL**	**Vulnerable**. Any native species that, on the basis of the best available scientific evidence, is a species of special concern in Ontario, but is not a threatened or endangered species.
1		
1		***SARA Status***
1	**END**	**Endangered**. A species facing imminent extirpation or extinction throughout its range.
1	**EXP**	**Extirpated**. A species no longer existing in the wild in Canada, but occurring elsewhere in the wild.
1	**EXT**	**Extinct**. A species that no longer exists.
1	**IND**	**Indeterminate**. A species for which there is insufficient information to support a status designation.
1	**NAR**	**Not At Risk**. A species that has been evaluated and found to be not at risk.
1	**SC**	**Special Concern**. A species of special concern particularly sensitive to human activities or natural events. Does not include an extirpated, endangered or threatened species.
1	**THR**	**Threatened**. A species likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

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Appendix D
Public Consultation

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Appendix D1
Agency Contact List

Administration
217 Gideon Street
P.O. Box 200
Stayner, Ontario
L0M 1S0

CLEARVIEW TOWNSHIP
Established 1994

Phone (705) 428-62
Web site www.clearviewtwp.on.
Fax (705) 428-02

May 19, 2009

Via: Mail

«Company»
«Address1»
«Address2»
«City», «Province» «Postal_Code»

Attention: **Chief and Council**

Re: **Township of Clearview Class Environmental Assessment**
Creemore East Drainage Study
File No. MCG 10770

Dear Chief and Council,

The Township of Clearview has retained R.J. Burnside & Associates Limited to undertake a Class Environmental Assessment ("Class EA") to undertake a master drainage study of the Eastern Lands of Creemore. The Township wishes to update you on the status of this Class EA project, and provide you with the opportunity to comment.

The Class EA has been completed to the end of Phase 1 of the Municipal Class EA process. The Township has identified 3 storm catchment areas within the Eastern lands that are being studied.

The first area is for the provision of a storm sewer in Mary Street taking those lands mainly between Mill Street and Mary Street.

The second area is Alliance Development/Gordon Farm and this is to be drained by means of a Storm Water Management Pond with a relief storm sewer to the Mad River. This relief storm sewer will also provide positive drainage for the residential units on Edward Street and George Street (east of Mary Street).

The third area is for the drainage that originates on the north side of Creemore that is directed by the roadside ditch on County Road 9 to the east of Creemore where it then flows in a south then a south eastern direction.

Beausoleil First Nation
1 Ogema Street
Christian Island , ON L0K 1C0
Attention: Chief and Council

Chippewas of Georgina Island
R.R. 2
P.O. Box N-13
Sutton West, ON L0E 1R0
Attention: Chief and Council

Chippewas of Mnjikaning First Nation (Rama)
5884 Rama Road
Suite 200
Rama, ON L0K 1T0
Attention: Chief and Council

Chippewas of Nawash First Nation
R.R. #5
Wiarton, ON N0H 2T0
Attention: Chief and Council

Curve Lake First Nation
22 Winookeeda Road
Curve Lake, ON K0L 1R0
Attention: Chief and Council

Hiawatha First Nation
123 Paudash Street
Hiawatha, ON K0L 2G0
Attention: Chief and Council

Mississaugas of Scugog Island First Nation
22521 Island Road
R.R. # 5
Port Perry, ON L9L 1B6
Attention: Chief and Council

Moose Deer Point First Nation
3719 Twelve Mile Bay Rd.
P.O. Box 119
Mactier, ON P0C 1H0
Attention: Chief and Council

Saugeen First Nation
No.29 Highway #21
R.R. #1
Southampton, ON NOH 2LO
Attention: Chief and Council

Wahta Mohawk Territory
P.O. Box 260
Bala, ON P0C 1A0
Attention: Chief and Council

Wasauksing First Nation
P.O. Box 250
Parry Sound, ON P2A 2X4
Attention: Chief and Council

Address1	Address2	City	Province	Postal Code	Work Phone	Fax phone	Email
Ogema Street		Christian Island	ON	L0K 1C0	(705) 247-2051		
. 2	PO Box N-13	Sutton West	ON	L0E 1R0	(705) 437-1337		
84 Rama Road	Suite 200	Rama	ON	L0K 1T0	(705) 325-3611		
. 5		Wiarton	ON	N0H 2T0	(519) 534-1689		
Winookeeda ad		Curve Lake	ON	K0L 1R0	(705) 657-8045		
3 Paudash reet		Hiawatha	ON	K0L 2G0	(705) 295-4421		
521 Island ad	RR# 5	Port Perry	ON	L9L 1B6	(905) 985-3337		
19 Twelve le Bay Rd.	PO BOX 119	Mactier	ON	P0C 1H0	(705) 375-5209		
.29 Highway 1	R.R. #1	Southampton	ON	N0H 2L0	(519) 797-2781		
BOX 260		Bala	ON	P0C 1A0	(705) 756-2354		
Box 250		Parry Sound	ON	P2A 2X4	(705) 746-2531		

R.J. Burnside & Associ[illegible] Limited 3 Ronell Crescent Collingwood ON L9Y [illegible]6 Canada
telephone (705) 446-0515 fax (705) 446-2399 web www.rjburnside.com

MCG 10770

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May 13, 2009

Via: Mail

Aboriginal Relations and Ministry Partnerships Division
Ministry of Aboriginal Affairs
9th Flr, 160 Bloor St E
Toronto ON M7A2E6

Re: Environmental Assessment – First Nations Consultation
Township of Clearview Class Environmental Assessment
Creemore East Drainage Study
File No. MCG 10770

To Whom It May Concern,

The Township of Clearview has retained R.J. Burnside & Associates Limited to undertake a Class Environmental Assessment ("Class EA") to undertake a master drainage study of the Eastern Lands 9 of Creemore. The following First Nation bands have been contacted for their input:

Beausoleil First Nation
Chippewas of Georgina Island
Chippewas of Mnjikaning First Nation (Rama)
Chippewas of Nawash First Nation
Curve Lake First Nation
Hiawatha First Nation
Mississaugas of Scugog Island First Nation
Moose Deer Point First Nation
Saugeen First Nation
Wahta Mohawk Territory
Wasauksing First Nation

Sample contact letters are enclosed. The contact list was received from the Indian and Northern Affairs Canada Specific Claims Branch.

If you have any questions about the Class EA, or know of any additional First Nation bands that should be included in the circulation, please contact Mr. Dan Miller (dan.miller@rjburnside.com) at (705) 446-0515 x 392, or Mr. Richard Spraggs (rspraggs@clearviewtwp.on.ca) at (705) 428-6230 x 243.

Yours truly,

R.J. Burnside & Associates Limited

Daniel Miller, P.Eng.
Enc. Sample Letter
Key Plan
Detailed Project Plan

cc: Richard Spraggs, P.Eng, Director of Public Works

090513 FN letter MOAA - Creemore East Drainage Study.doc
2009-05-13 12:54 PM

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 Canada
telephone (705) 446-0515 fax (705) 445-2399 web www.rjburnside.com

MCG10770

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May 13, 2009

Via: Mail

Environmental Unit
Indian and Northern Affairs Canada
25 St. Clair Avenue East, 8th Floor
Toronto, Ontario M4T 1M2

Re: Environmental Assessment – First Nations Consultation
Township of Clearview Class Environmental Assessment
Creemore East Drainage Study
File No. MCG 10770

To Whom It May Concern,

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Yours truly,

R.J. Burnside & Associates Limited

Daniel Miller, P.Eng.
Enc. Sample Letter
Key Plan
Detailed Project Plan

cc: Richard Spraggs, P.Eng, Director of Public Works

090513 FN letter INAC - Creemore East Drainage Study.doc
2009-05-13 12:55 PM

Creemore East Drainage - Agency Contact List
Clearview Township
Project No. MCG 107700

	Agency/Organization	Title	First Name	Last Name	Position	Address	Contact Information	Notes	Comments Received	Response Given
1.	Ministry of Environment – Environmental Assessment and Approvals Branch	Mr.	D. Jeffrey	Dea	Project Officer – EA Project Coordination Section	2 St. Clair Avenue West, 14th Floor Toronto, ON M4V 1L5	Tel: 416-314-7213 Tel : 800-461-6290 Fax: (416) 314-8452 E-Mail: MEA.NOTICES.EAAB@ontario.ca			
	June 1, 2010 – Notice of Commencement letter sent									
2.	Ministry of Environment – Central Region	Ms.	Chunmei	Liu	Environmental Assessment and Planning Coordinator	5775 Yonge Street, 8th Floor North York, ON M2M 4J1	Tel: (416) 326-4886 Fax: (416) 325-6347 E-mail: Chunmei.Liu@ontario.ca			
	June 1, 2010 – Notice of Commencement letter sent									
3.	Ontario Ministry of Natural Resources – Midhurst District Office	Ms.	Kathryn	Woeller	District Planner	2284 Nursery Rd. Midhurst, ON L0L 1X0	Tel: (705) 725-7546 Fax: (705) 725-7584 E-mail: Kathryn.Woeller@ontario.ca			
	June 1, 2010 – Notice of Commencement letter sent									
4.	Ministry of Transportation – Provincial and Environmental Planning Office	Ms.	Linda	McAusland	Director	777 Bay St, Suite 3000 Toronto, ON M7A 2J8	Tel: (416) 585-7177 Fax: (416)585-7204 E-mail: linda.mcausland@ontario.ca			
	June 1, 2010 – Notice of Commencement letter sent									
5.	Ministry of Culture	Mr.	Alejandro	Cifuentes	Heritage Planner	400 University Ave., 4th Floor Toronto, ON M7A 2R9	Tel : (416) 314-7159 Fax: (416) 212-1802 E-mail: Alejandro.Cifuentes@ontario.ca			
	June 1, 2010 – Notice of Commencement letter sent									
6.	Ministry of Energy and Infrastructure – Places to Grow	Mr.	Trevor	Bingler	Manager, Energy and Infrastructure	Ontario Growth Secretariat 777 Bay Street, 4th Floor Toronto, ON M5G 2E5	Phone: (416) 325-5794 Fax: (416) E-mail: Trevor.Bingler@ontario.ca			
	June 1, 2010 – Notice of Commencement letter sent									
7.	Ministry of Municipal Affairs and Housing Central Municipal Services Office	Mr.	David	Sit	Manager	2nd Floor, 777 Bay Street Toronto, ON M5G 2E5	Tel: (416) 585-585-6583 Fax: (416) 585-6882 E-mail: David.Sit@ontario.ca]			
	June 1, 2010 – Notice of Commencement letter sent									
8.	Ministry of Municipal Affairs and Housing Central Municipal Services Office	Mr.	Victor	Doyle	Manager – Community Planning and Development	2nd Floor, 777 Bay Street Toronto, ON M5G 2E5	Tel: (416) 585-585-6109 Fax: (416) 585-6882 E-mail: victor.doyle@ontario.ca]			
	June 1, 2010 – Notice of Commencement letter sent									
9.	Ministry of Education - Capital Programs Branch	Mr.	Steven	Mitchell	Architect	21st Floor Mowat Block, 900 Bay St. Toronto, ON M7A 1L2	Tel: (416) 325-3015			
	June 1, 2010 – Notice of Commencement letter sent									
10.	Ministry of Agriculture, Food and Rural Affairs	Ms.	Colleen	Fitzgerald-Hubble	Manager, Innovation Engineering And Program Delivery, Eastern Region	1 Stone Rd. W. 3rd Floor Environmental Management Branch Guelph, ON N1G 4Y2	Tel: (519) 826-3560 Fax: (519) 826-3259			
	June 1, 2010 – Notice of Commencement letter sent									
11.	Ontario Provincial Police	Mr.	Mike	Armstrong	Regional Commander - Central Region	777 Memorial Avenue, 3rd Floor Orillia, ON L3V 7V3	Tel: (705) 329-7400 Fax: (705) 329-7407			
	June 1, 2010 – Notice of Commencement letter sent									

	Agency/Organization	Title	First Name	Last Name	Position	Address	Contact Information	Notes	Comments Received	Response Given
12.	Niagara Escarpment Commission	Mr.	Ken	Whitbread	Manager	232 Guelph Street Georgetown, ON L7G 4B1	Tel: (905) 877-4026 Fax: (905) 873-7452 E-mail: ken.whitbread@ontario.ca			
	June 1, 2010 – Notice of Commencement letter sent									
13.	Environment Canada	Ms.	Sheila	Allan	Head EA Section, Ontario Region	P.O. Box 5050 867 Lakeshore Road Burlington, ON L7R 4A6	Phone: (905) 336-4948 Fax: (905) 336-8901 E-mail: Sheila.allan@ec.gc.ca			
	June 1, 2010 – Notice of Commencement letter sent									
14.	Fisheries and Oceans Canada	Mr.	Paul	Savoie	Impact Assessment Biologist, Fish Habitat Management	District Office 3027 Harvester Road, Unit 304 Burlington, ON L7R 4K3	Phone: (905) 639-6378 Fax: (905) 639-3549 E-mail: savoiep@dfo-mpo.gc.ca			
	June 1, 2010 – Notice of Commencement letter sent									
15.	County of Simcoe	Mr.	Mark	Aitken	Chief Administrative Officer	1110 Highway 26 Midhurst, ON L0L 1X0	Tel: (705) 726-9300 Ext. 1257 / (866) 893-9300 Fax: (905) 825-8273 E-mail: CAO@simcoe.ca			
	June 1, 2010 – Notice of Commencement letter sent									
16.	County of Simcoe	Mr.	Rick	Newlove	General Manager of Corporate Services	1110 Highway 26 Midhurst, ON L0L 1X0	Tel: (705) 726-9300 Ext. 1349 / (866) 893-9300 Fax: (905) 825-8273			
	June 1, 2010 – Notice of Commencement letter sent									
17.	County of Simcoe	Ms.	Cathy	Clark	Manager of Emergency Planning	1110 Highway 26 Midhurst, ON L0L 1X0	Tel: (705) 726-9300 Ext. 1155 / (866) 893-9300 Fax: (905) 825-8273			
	June 1, 2010 – Notice of Commencement letter sent									
18.	County of Simcoe	Mr.	Ian	Bender	Director of Planning	1110 Highway 26 Midhurst, ON L0L 1X0	Tel: (705) 726-9300 Ext. 1371 / (866) 893-9300Fax: (905) 825-8273			
	June 1, 2010 – Notice of Commencement letter sent									
19.	County of Simcoe	Mr.	Rob	McCullough	Environmental Services Manager	1110 Highway 26 Midhurst, ON L0L 1X0	Tel: (705) 726-9300 Ext. 1192 / (866) 893-9300Fax: (905) 825-8273			
	June 1, 2010 – Notice of Commencement letter sent									
20.	Ministry of Aboriginal Affairs - Policy and Relationships Branch	Mr.	Alan	Kary	Deputy Director	720 Bay Street, 4th Floor Toronto, ON M5G 2K1	Fax: (416) 326-4017 E-mail: Alan.Kary@ontario.ca			
	June 1, 2010 – Notice of Commencement letter sent									
21.	Nottawasaga Valley Conservation Authority	Ms.	Patti	Young	Senior Planner	John Hix Conservation Administration Centre 8195 8th Line Utopia, ON LOM 1TO	Tel: (705) 424-1479 X 231 Fax: (705) 424-2115 E-mail : pyoung@nvca.on.ca			
	June 1, 2010 – Notice of Commencement letter sent									

	Agency/Organization	Title	First Name	Last Name	Position	Address	Contact Information	Notes	Comments Received	Response Given
22.	Simcoe Muskoka District Health Unit	Dr.	Charles	Gardner	Medical Health Officer	15 Sperling Dr. Barrie, ON L4M 6K9	Tel: (705) 721-7520 Fax : (705) 721-1495			
	June 1, 2010 – Notice of Commencement letter sent									

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Appendix D2
Notice of Commencement Letter to Agencies

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 Canada
telephone (705) 446-0515 **fax** (705) 446-2399 **web** www.rjburnside.com

BURNSIDE
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CELEBRATING 1970-2010 40 YEARS

June 1, 2010

Via: Mail

«Title» «First_Name» «Last_Name»
«Position»
«AgencyOrganization»
«Address»

Dear «Title» «Last_Name»:

Re: Notice of Study Commencement
Township of Clearview, East Creemore Drainage Study
Schedule B Class Environmental Assessment Study
File No.: MCG107700

The Township of Clearview has initiated a Class Environmental Assessment for drainage improvements for existing residential and future development lands to the Mad River in Creemore. The study area is located in east Creemore from Mill Street to Airport Road, originating in the headwater area north of Creemore, south to the Mad River. The study will identify existing drainage areas, patterns, conditions, localized poorly draining areas, and evaluate alternatives to improve drainage on municipal streets and available drainage outlets to the Mad River. The study is being carried out in accordance with the planning and design process for Schedule 'B' projects as outlined in the Municipal Class Environmental Assessment (October 2000, as amended in 2007).

A key component of the study will and have been in consultation with stakeholders (public and agencies). Input and comments received from public and agencies will be incorporated into the planning and design of this project.

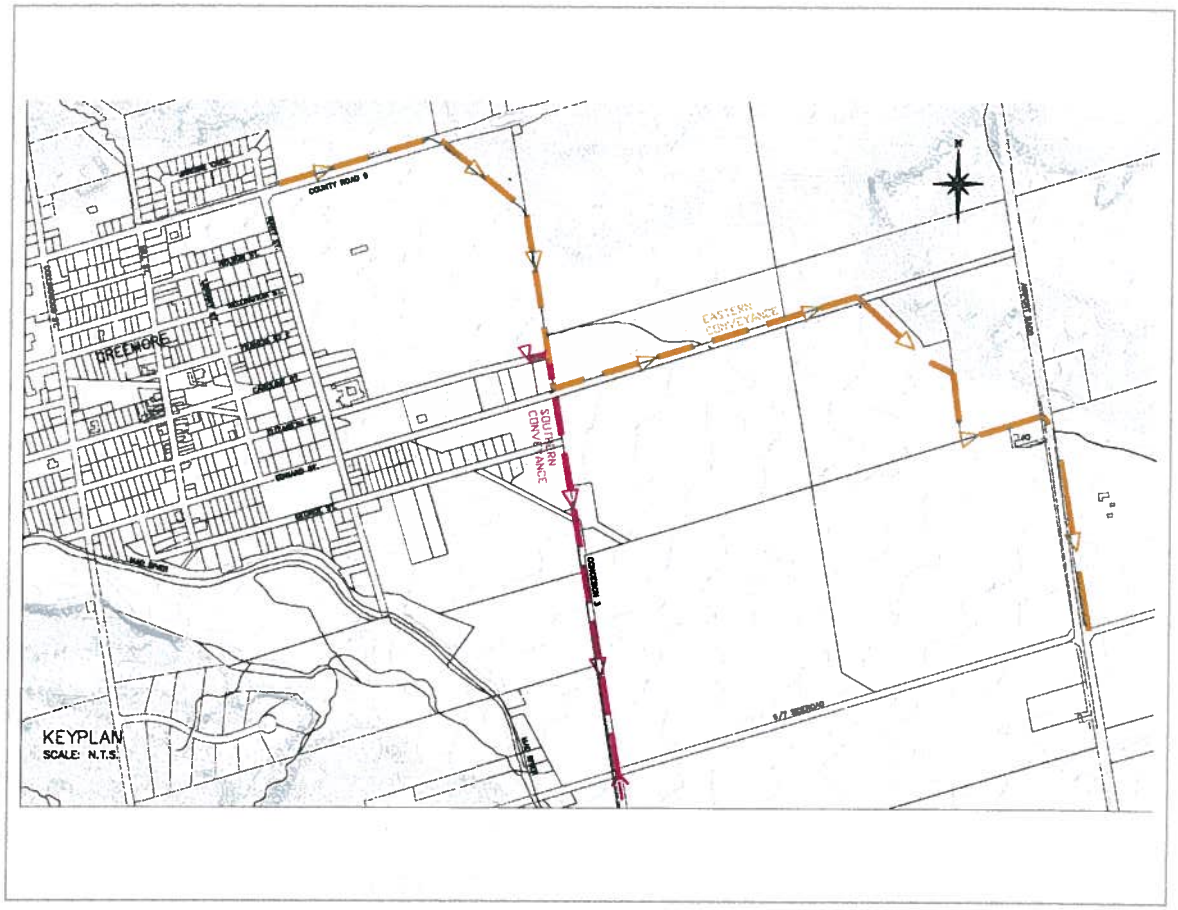
Public Information Centres (PICs) were held on September 28, 2006 and June 28, 2007 at the Creemore Arena and Community Centre. The purpose of the PIC is to review the problem statement, the planning alternatives, the results of studies being undertaken and the evaluation of the alternatives based on the identified study criteria.

With regards to information gained by the public at the PIC and prior to going to agencies on such a vast area drainage scheme, the Township has undertaken the preliminary works so that the draft preferred solution would physically work:

i) The Township has had meetings with the NVCA and County with regards to overall drainage concepts and possible outlets.

ii) The Town has also undertaken topographic surveys as portions of the lands in the catchment area are relatively flat and any alternative solution is dependent on minimal grades.

iii) The Township also had several meetings with property owners along the Edward Street conveyance as this conveyance would affect agriculture lands especially from Edward Street southeast to the County Road 42 (Airport Road) outlet.



As shown above, the preferred alternative proposed by R.J. Burnside & Associates Limited directs storm water runoff from the Southern Conveyance to the Mad River via Concession 3. The majority of this drainage will be piped, with the remainder conveyed by ditching along the right-of-way. The Eastern Conveyance drains a portion of external drainage from the north easterly along Edward Street to outlet at the existing Airport Road crossing. Any excess external drainage will be redirected south to the Southern Conveyance. This alternative maintains drainage along road right-of-ways, minimizes drainage easements, and minimizes discharge rates of proposed developments. By constructing a storm sewer and ditching along Concession 3, this additional capacity accepts additional spill flows from Airport Road drainage in excess of the 25-year storm to prevent uncontrolled spills across private property.

The Township is now requesting your agency provide comments on the proposed project. R.J. Burnside & Associates Limited is seeking information on:

- Policies, positions or guidelines implemented or administered by your agency that may affect implementation of the construction and operational phases of the project;
- Background information that is pertinent to the compilation of an environmental inventory of the general area of study;
- Any preliminary comments or concerns that your agency has on the proposed projects; and,
- Other projects proposed within or near the general area of study.

It is essential to the success of this project that the concerns of your agency, and other stakeholders, are identified in a timely manner, such that the appropriate environmental protection measures are incorporated into the overall project design. Your input and questions are encouraged. For further information please contact Dan Miller at (705) 446-0515 / (888) 240-4508 or by email at Dan.Miller@rjburnside.com.

Your input via email, fax or letter is appreciated by **July 9, 2010.** If we have not received comment from your agency by this date, it will be assumed your agency does not have interest in the project. All interested stakeholders will be kept up-to-date on project status by means of future mailings, or other means as deemed appropriate.

Upon completion of the study, a Project File Report (PFR) will be prepared for public review and comment, and placed on public record for a period of 30 days. Subject to comments received and the receipt of necessary approvals, the Township of Clearview intends to proceed with the detailed design and construction of this project.

At this stage of the process, R.J. Burnside & Associates Limited is requesting that your agency provide comments on the proposed project. Your participation in this study is much appreciated.

Yours truly,

R.J. Burnside & Associates Limited



Daniel R. Miller, P.Eng.
Senior Water Resources Engineer and Manager
DRM:sj

cc: Fiona Christiansen, R.J. Burnside & Associates Limited
Richard Spraggs, Township of Clearview

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Appendix D3

Notice of Commencement/PIC Ad

→ MCG 107

CREEMORE
ECHO
Sept. 15/6
& Sept. 8

CLEARVIEW TOWNSHIP

NOTICES

East Creemore Drainage Study

Township of Clearview East Creemore Drainage Study
Municipal Class Environmental Assessment (EA)
Notice of Study Commencement and Public Information Centre

The Township of Clearview has identified that there are a number of existing drainage issues in the eastern portion of Creemore from Mill Street to Airport Road, south to the Mad River and originating in the headwaters area north of Creemore. The drainage plan will identify the existing drainage area, patterns and conditions, localized wet areas and alternatives to improve drainage on municipal streets to the Mad River and to the tributary of the Mad River toward Airport Road. The drainage study will identify and evaluate alternative solutions under existing and future land use scenarios. The project is being planned as a Schedule 'B' project under the Municipal Class Environmental Assessment, an approval under the Ontario *Environmental Assessment Act* for all municipal projects of this nature.

No decisions have yet been made on this project and your input is important. Public input and comments are now invited to incorporate into the planning and design of this project. For further information on this project or to make comments, please contact the individuals at the addresses provided below. Please provide your comments by October 20, 2006.

Subject to the comments received, and in consultation with Nottawasaga Valley Conservation Authority, the Township of Clearview intends to continue developing the East Creemore Drainage Study in late Fall 2006.

A Public Information Centre has also been scheduled to provide the community with background information on the study and to discuss the issues and alternatives for drainage improvements. The Public Information Centre will be held on:

Thursday, September 28, 2006, from 4:00 p.m. to 8:00 p.m.
Creemore Arena and Community Centre
220 Collingwood Street
Creemore, Ontario

This Public Information Centre will be a drop-in format with representatives from the Township of Clearview and the consulting firm being available to receive your input, to discuss the project and answer questions on a one to one basis.

If you wish to comment on the study or obtain additional information, please contact:

Mr. Don McNalty, P.Eng.,
R. J. Burnside & Associates Limited
3 Ronell Crescent
Collingwood, ON L9Y 4J6
Tel: 705-446-0515
Fax: 705-446-2399
Email: dmcnalty@rjburnside.com

Mr. Richard Spraggs, P.Eng.
Township of Clearview
Box 200, 217 Gideon Street
Stayner, Ontario L0M 1S0
Tel: 705-428-6230 x 243
Fax: 705-428-0288
Email: rspraggs@clearviewtwp.on.ca

Dated September 8, 2006

TO: Dorothy
446-2399

Cost to publish in Stayner Sun June 20 + 21 is $351.00 + GST

FAXED June 13 07

Please review & advise. Ok

Thank You,

Rebecca

Tel: 705-721-4350
Fax: 705-721-8859

JUN 13 2007

R.J. BURNSIDE & ASSOCIATES
GEO...

CLEARVIEW TOWNSHIP

The Township of Clearview
East Creemore Drainage Study
Municipal Class Environmental Assessment (EA)
Notice of Public Information Centre #2

The Township of Clearview has identified that there are a number of existing drainage issues in the eastern portion of Creemore from Mill street to Airport Road, south to the Mad River and originating in the headwater area north of Creemore. The drainage plan will identify the existing drainage area, patterns and conditions, localized wet areas and alternatives to improve drainage on municipal streets to the Mad River and to the tributary of the Mad River towards Airport Road. The drainage study will identify and evaluate alternative solutions under existing and future land use scenarios.

The project is being planned as a Schedule 'B' project under the Municipal Class Environmental Assessment, an approval under the Ontario *Environmental Assessment Act* for all municipal projects of this nature.

Alternatives and preliminary findings will be presented at this second Public Information Centre. Further public input and comments are now invited to incorporate into finalizing the alternatives and design of this project. For further information on this project or to make comments, please contact the individuals at the addresses provided below. Please provide your comments by July 20, 2007.

Subject to the comments received, and in consultation with Nottawasaga Valley Conservation Authority, the Township of Clearview intends to finalize the East Creemore Drainage Study in late Fall 2007.

The Second Public Information Centre has been scheduled to provide the community with background information on the study and to discuss the issues, findings and alternatives for drainage improvements. The Public Information Centre will be held on:

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Creemore, Ontario

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Mr. Don McNalty, P. Eng.
R.J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, ON, L9Y 4J6
Tel: 705-446-0515 Fax: 705-446-2399
Email: dmcnalty@rjburnside.com

Mr. Richard Spraggs, P. Eng.
Township of Clearview
Box 200, 217 Gideon Street, Stayner, ON, L0M 1S0
Tel: 705-428-6230 x 243 Fax: 705-428-0288
Email: rspraggs@clearviewtwp.on.ca

This notice posted June 13, 2007.

Confirmation Report – Memory Send

Time : Jun-13-07 04:36pm
Tel line : 705-446-2399
Name : RJBURNSIDE and ASSOCIATES

Job number	:	393
Date	:	Jun-13 04:36pm
To	:	#3397218859
Document pages	:	01
Start time	:	Jun-13 04:36pm
End time	:	Jun-13 04:36pm
Pages sent	:	01
Status	:	OK

Job number : 393 *** SEND SUCCESSFUL ***

Jun.13. 2007 3:56PM BARRIE ADVANCE No.4998 P. 1

>: Dorothy
Ko-2399

Cost to publish in Stayner Sun June 20 + 27 MCG1077
is $351.00 + GST

JUN 13 2007

R.J. BURNSIDE & ASSOCIATES
GEOGRAPHIC INFORMATION SYSTEMS

The Township of Clearview
East Creemore Drainage Study
Municipal Class Environmental Assessment (EA)
Notice of Public Information Centre #2

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If you wish to comment on the study or obtain additional information, please contact:

Mr. Don Mahaffy, P. Eng.
R.J. Burnside & Associates Limited
8 Ronell Crescent, Collingwood, ON, L9Y 4J6
Tel: 705-445-0515 Fax: 705-446-2399
Email: dmahaffy@rjburnside.com

Mr. Richard Scraggs, P. Eng.
Township of Clearview
Box 200, 217 Gideon Street, Stayner, ON, L0M 1S0
Tel: 705-428-6230 x 243 Fax: 705-428-0288
Email: rscraggs@clearviewtwp.on.ca

This notice posted June 13, 2007.

Please review & advise. OK

Thank You,

Rebecca

Tel: 705-721-4350
Fax: 705-721-8859

R. J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J6 Canada
telephone (705) 446-0515 fax (705) 446-2399 web www.rjburnside.com

DRFT
MCG 10770

BURNSIDE

FAXED June 13/07

Fax Transmission

	DATE June 13, 2007	FILE No. MCG 10770	
	RE Notice of Public Information Centre #2		
To	ATTENTION Rebecca	LOCATION	
	COMPANY Stayner Sun	FAX NUMBER 721-8859	
From	NAME Daniel R. Miller		
	SENT BY Dorothy Smart	ORIGINAL TO BE SENT 2	
	FAX CC'S		
	NUMBER OF PAGES INCLUDING COVER 2		

Comments

Attached please find Notice of Public Information Centre for the Township of Clearview. Please post this in the June 20th and 27th editions of the Stayner Sun.

070613Stayner Sun.doc
2007-06-13 1:59 PM

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CLEARVIEW TOWNSHIP
Established 1994

Township of Clearview
East Creemore Drainage Study
Municipal Class Environmental Assessment (EA)

Notice of Public Information Centre #2

The Township of Clearview has identified that there are a number of existing drainage issues in the eastern portion of Creemore from Mill Street to Airport Road, south to the Mad River and originating in the headwater area north of Creemore. The drainage plan will identify the existing drainage area, patterns and conditions, localized wet areas and alternatives to improve drainage on municipal streets to the Mad River and to the tributary of the Mad River towards Airport Road. The drainage study will identify and evaluate alternative solutions under existing and future land use scenarios.

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Subject to the comments received, and in consultation with Nottawasaga Valley Conservation Authority, the Township of Clearview intends to finalize the East Creemore Drainage Study in late Fall 2007.

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Creemore Arena and Community Centre
220 Collingwood Street
Creemore, Ontario

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If you wish to comment on the study or obtain additional information, please contact:

Mr. Don McNalty, P.Eng.,
R.J. Burnside & Associates Limited
3 Ronell Crescent
Collingwood, ON L9Y 4J6
Tel: 705-446-0515 Fax: 705-446-2399
Email: dmcnalty@rjburnside.com

Mr. Richard Spraggs, P.Eng.
Township of Clearview
Box 200, 217 Gideon Street
Stayner, Ontario L0M 1S0
Tel: 705-428-6230 x 243 Fax: 705-428-0288
Email: rspraggs@clearviewtwp.on.ca

This notice posted June 13, 2007.

Confirmation Report – Memory Send

Time : Jun-13-07 02:10pm
Tel line : 705-446-2399
Name : RJBURNSIDE and ASSOCIATES

Job number	:	386
Date	:	Jun-13 02:09pm
To	:	#5517218859 ✓
Document pages	:	02
Start time	:	Jun-13 02:09pm
End time	:	Jun-13 02:10pm
Pages sent	:	02
Status	:	OK

Job number : 386 *** SEND SUCCESSFUL ***

R. J. Burnside & Associates Limited 3 Roneil Crescent Collingwood ON L9Y 4J6 Canada
telephone (705) 446-0515 fax (705) 446-2386 web www.rjburnside.com

BURNSIDE

Fax Transmission

	DATE: June 13, 2007	FILE No.: MCG 10770	
	RE: Notice of Public Information Centre #2		
To	ATTENTION: Rebecca	LOCATION:	
	COMPANY: Stayner Sun	FAX NUMBER: 721-8869	
From	NAME: Daniel R. Miller		
	SENT BY: Dorothy Smart	ORIGINAL TO BE SENT: 2	
	FAX CC'D:		
	NUMBER OF PAGES INCLUDING COVER: 2		

Comments

Attached please find Notice of Public Information Centre for the Township of Clearview. Please post this in the June 20th and 27th editions of the Stayner Sun.

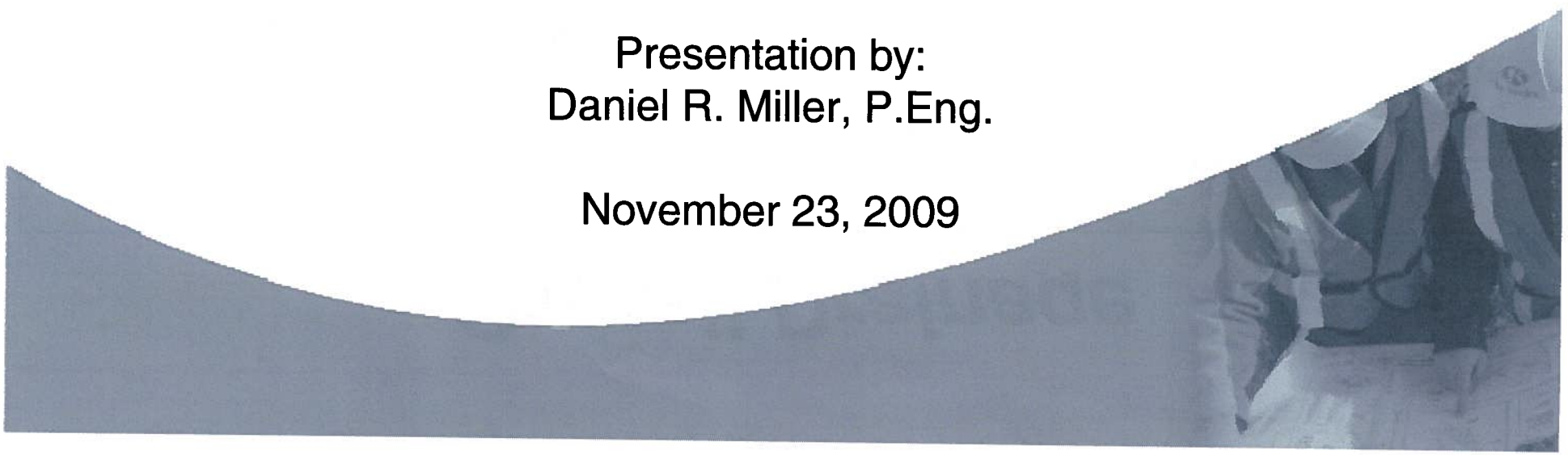
070613Stayner Sun.doc
2007-06-13 1:58 PM

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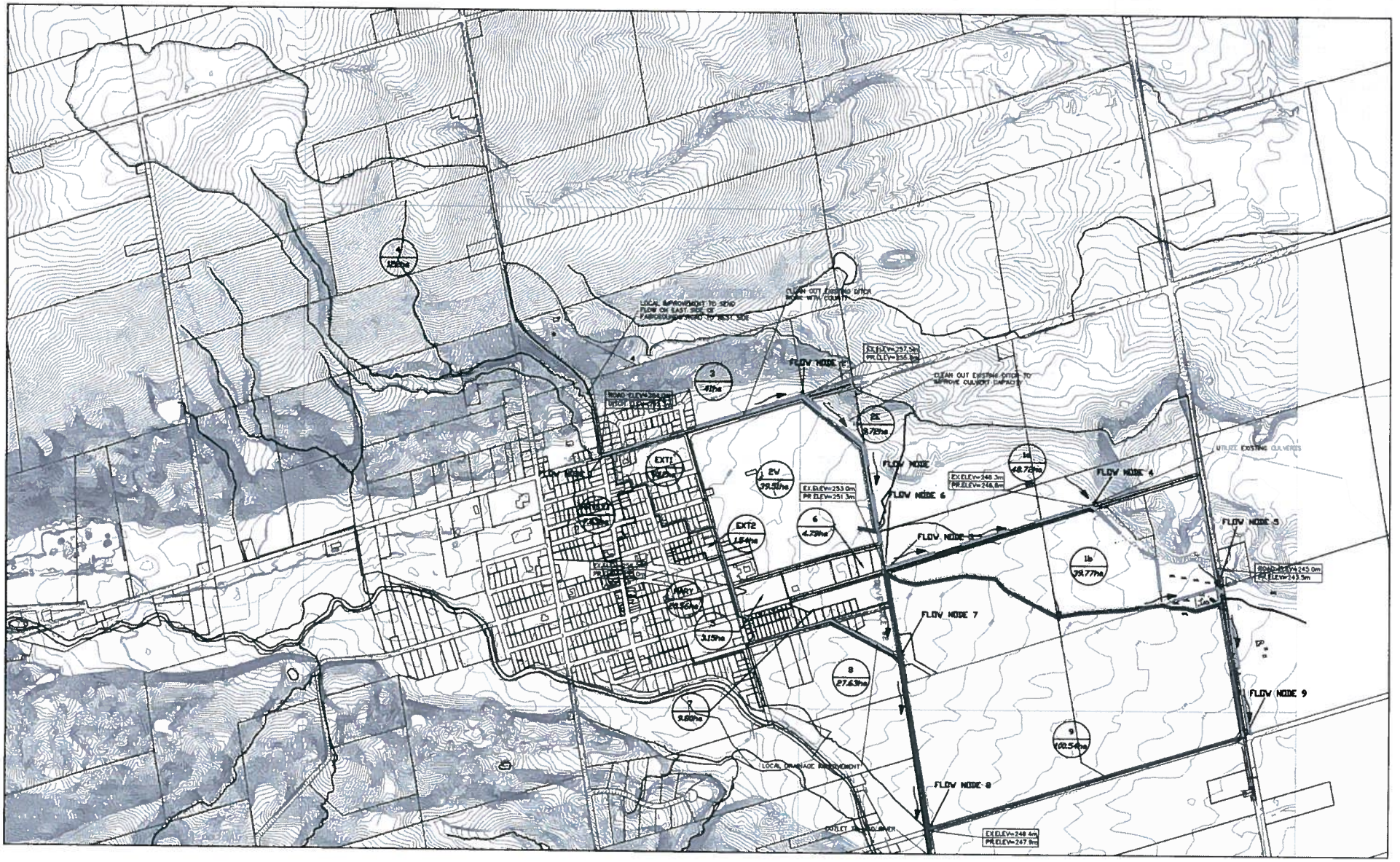
Creemore East
EA and Drainage Report

Presentation by:
Daniel R. Miller, P.Eng.

November 23, 2009



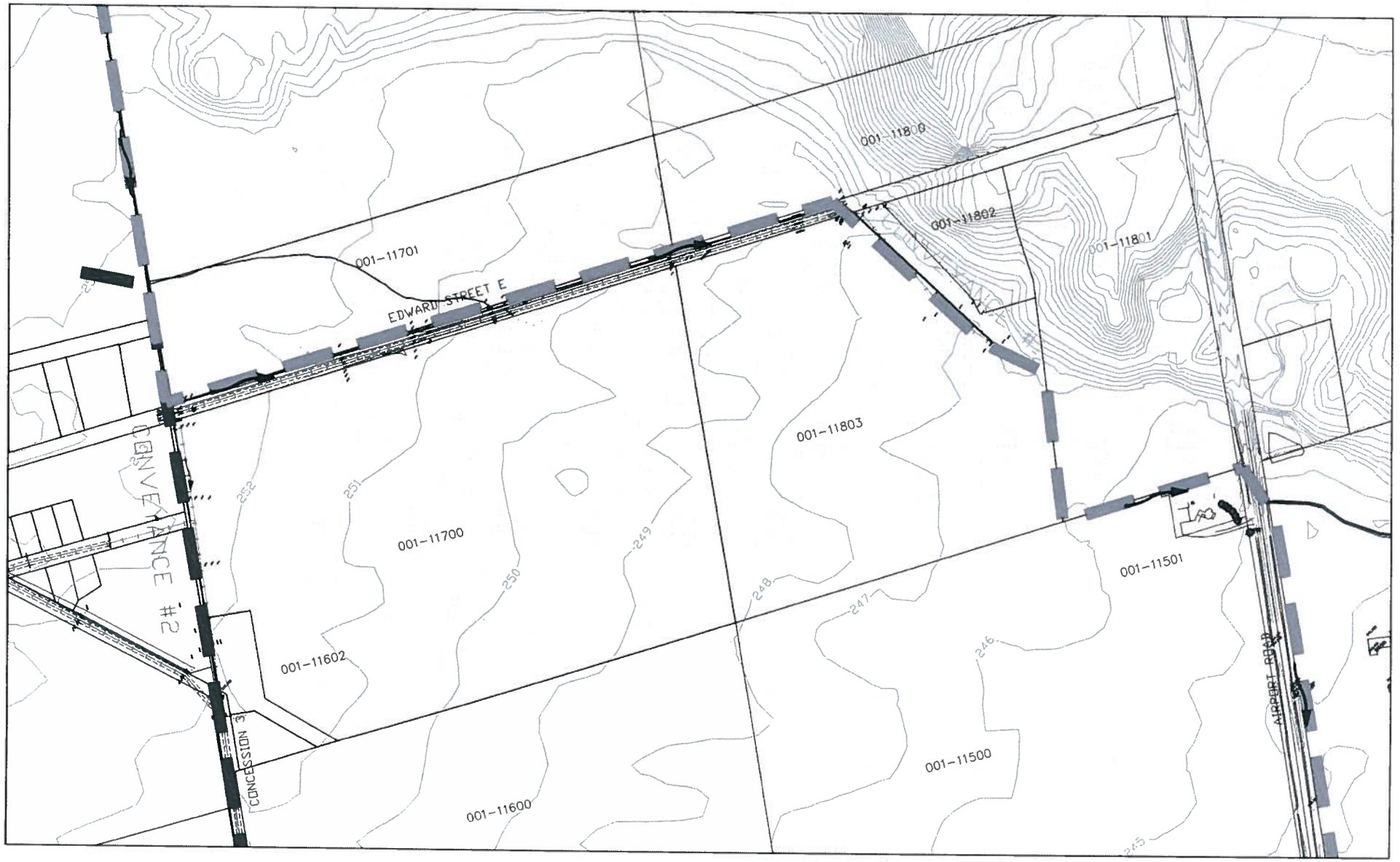
Overall Drainage



Overall Drainage (aerial)



Airport Road Crossing



Airport Road Crossing (aerial)



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Appendix D4
Agency Correspondence

DRM

Niagara Escarpment Commission

P.O. Box 308, 99 King Street East
Thornbury, ON N0H 2P0
Tel: 519-599-3340
Fax: 519-599-6326
www.escarpment.org

Commission de l'escarpment du Niagara

p.o.b. 308, 99, rue King est
Thornbury, ON N0H 2P0
No de tel. 519-599-3340
Télécopieur 519-599-6326
www.escarpment.org

Ontario

Ontario's Niagara Escarpment

Ontario's Niagara Escarpment
A World Biosphere Reserve

June 14, 2010

DATE RECEIVED

JUN 18 2010

R.J. BURNSIDE & ASSOCIATES
GEORGIAN BAY OFFICE

Daniel R. Miller, P. Eng.
R.J. Burnside & Associates Limited
3 Ronell Cresent
Collingwood, ON L9Y 4J6

Dear Mr. Miller:

Re: Notice of Study Commencement
Township of Clearview, East Creemore Drainage Study
Schedule B Class Environmental Assessment Study

Thank you for providing our office with notification of the commencement of the Class Environmental Assessment study.

The location for the proposed eastern conveyance and southern conveyance of storm water shown on the map included with the notice is not within the boundaries of the Niagara Escarpment Plan (NEP) or the Niagara Escarpment area of Development Control.

It is not clear from the information provided where the proposed drainage works are to outlet into the Mad River and whether the storm water is to be treated. The Mad River forms the boundary of the eastern extent of the NEP area south of Creemore and is designated **Escarpment Natural Area**. Transportation and utility facilities are a permitted use within the NEP subject to satisfying the relevant Development Criteria (Part 2) of the NEP. However, within the Escarpment Natural Area designation, only "essential" transportation and utility facilities are permitted. Essential is defined in the NEP *as "that which is deemed necessary to the public interest after all alternatives have been considered"*. (See attached map).

The Niagara Escarpment Commission has an interest in what measures will be incorporated to ensure the water quality of the receiving water body is not adversely impacted during the construction of the storm sewer and open ditching and upon completion of the drainage works.

We will provide additional comments once we receive the Project File Report (PFR). The Niagara Escarpment Commission requests to be consulted for review and comments throughout the Class EA process.

Please call me at (519) 599-3464, if you have any questions.

Yours truly,

J Rhodes-Munk

Judy Rhodes-Munk
Planner
c: Ken Whitbread Manager, NEC



Niagara Escarpment Plan

Owner/Applicant Name
File Number

Plan Designations

- Escarpment Natural Area
- Escarpment Protection Area
- Escarpment Rural Area
- Mineral Resource Extraction Area
- Escarpment Recreation Area
- Urban Area
- Minor Urban Centre (Boundary Undefined)
- Minor Urban Centre
- Public Land (in Parks and Open Space System)

NOTE. The Niagara Escarpment Plan designation boundaries shown on this map are approximate and subject to confirmation through site inspection and the application of the "Interpretation of Boundaries" section of the Niagara Escarpment Plan.
The Niagara Escarpment Plan maps are approved at 1:50,000 scale, and that is the scale at which this data should be interpreted.

Map Features Legend

Scale 1:15,000

0 120 240 360 480

Metres

Printed on Jun 14, 2010

This map is illustrative only. Do not rely on it as being a precise indicator of routes, location of features, nor as a guide to navigation. Base derived from the Ontario Digital Topographic Database, Scale 1:10,000
Map compiled and produced by the Geographic Information Systems (GIS) Department of the Niagara Escarpment Commission, Ministry of Natural Resources

Ontario

© 2008 Queen's Printer for Ontario

N

Map Created by: browncs3

Ministry of the Environment
5775 Yonge Street
8th Floor
North York ON M2M 4J1

Technical Support
Central Region

Ministère de l'Environnement
5775, rue Yonge
8e étage
North York ON M2M 4J1

àppui technique
Règion du Centre

Tel: (416) 326-6700
Fax: (416) 325-6345

IC ~~DRH~~

Ontario

June 22, 2010

DATE RECEIVED
JUN 25 2010
R.J. ... ASSOCIATES
... BAY OFFICE

File: EA05-07-05

Richard Spraggs
Director of Public Works
Township of Clearview
Box 200, 217 Gideon Street
Stayner, ON L0M 1S0

RE: East Creemore Drainage Study
Township of Clearview
Class Environmental Assessment
Notice of Study Commencement

The Ministry of the Environment (MOE) has received your Notice of Study Commencement for the above noted Environmental Assessment (EA) undertaking. This response acknowledges that the study is following the approved environmental planning process for a Schedule B project under the *Municipal Engineers Association Municipal Class Environmental Assessment* (Class EA).

Based on the information submitted, we are providing the general comments to assist you and your project team members in effectively addressing the following issues:

- Ecosystem Protection and Restoration
- Surface Water and Groundwater
- Dust and Noise
- Servicing and Facilities
- Waste Materials and Spills
- Mitigation and Monitoring
- Planning and Policy
- Class EA Process
- Aboriginal Peoples Consultation

Ecosystem Protection and Restoration

Any impacts to ecosystem form and function must be avoided where possible. The Project File report should describe any proposed mitigation measures and how project planning will protect and enhance the local ecosystem.

All natural heritage features should be identified and described in detail to assess potential impacts and to develop appropriate mitigation measures. The MOE's records confirm that watercourses and Escarpment Natural and Protection Areas are located within or adjacent to the study area.

The Project File report must include a sufficient level of information to demonstrate that there will be no negative impacts on these environmental features. We also recommend consulting with the Ministry of Natural Resources (MNR), Fisheries and Oceans Canada (DFO) and your local conservation authority to determine if special measures or additional study will be necessary to preserve and protect these sensitive features.

The County of Simcoe and the Township of Clearview Official Plan policies related to ecosystem protection within the study area should be referenced to ensure that all environmental protection policies are satisfied. The Project File should also discuss the levels of growth proposed for the area, and how this proposal addresses those levels of growth.

Surface Water and Groundwater

The Project File report must include a sufficient level of information to demonstrate that there will be no negative impacts on the natural features or ecological functions of any watercourses within the study area. Measures should be included in the planning and design process to ensure that any impacts to watercourses from construction or operational activities (e.g. spills, erosion, and pollution) are mitigated as part of the proposed undertaking. The MOE's Guideline B-6, *Evaluating Construction Activities Impacting on Water Resources* should be used to plan and construct this project.

Strategies to address potential water quality related to stormwater draining into the watercourses should be described in the Project File report and these should ensure that adequate (enhanced) water quality is maintained. The Project File report should integrate existing background information including sub-watershed information, existing drainage conditions, future drainage conditions, stormwater management options, information on erosion and sediment control during construction; and should include information on maintenance and monitoring commitments. The MOE's *Stormwater Management Planning and Design Manual* (2003) should be referenced in the Project File report and utilized when designing stormwater control methods.

The status of, and potential impacts to, any well water supplies should be addressed. If the project involves groundwater takings or changes to drainage patterns, the quantity and quality of groundwater may be affected due to drawdown effects or the redirection of existing contamination flows. In addition, project activities may infringe on existing wells such that they must be reconstructed or sealed and abandoned. Appropriate information to define existing groundwater conditions should be included in the Project File report.

If the potential construction or decommissioning of water wells is identified as an issue, the Project File report should refer to Ontario Regulation 903, Wells, under the *Ontario Water Resources Act*.

Potential impacts to groundwater-dependent natural features should be addressed. Any changes to groundwater flow or quality from groundwater taking may interfere with the ecological processes of streams, wetlands or other surficial features. In addition, discharging contaminated or high volumes of groundwater to these features may have direct impacts on their function. Any potential effects should be identified, and appropriate mitigation measures should be recommended. The level of detail required will be dependent on the significance of the potential impacts.

Any potential approval requirements for groundwater taking or discharge should be identified in the Project File report. In particular, a Permit to Take Water (PTTW) under the *Ontario Water Resources Act* will be required for any water takings that exceed 50,000 litres per day. A PTTW application must be accompanied by an assessment of potential effects as noted above, and may require a higher level of detail than what is provided in the Project File report. Please note that when significant long-term water taking is proposed, the maximum rate identified in the Project File report must not be exceeded in any subsequent PTTW applications. For more information on the application and approval process, we suggest that you refer to the MOE *Permit to Take Water Manual* (April 2005).

Dust and Noise

Dust and noise control measures should be addressed and included in the construction plans to ensure that nearby residential and other sensitive land uses within the study area are not adversely affected during construction activities. If dust suppressants are proposed to be used, we recommend the use of non-chloride based compounds to protect water quality.

Servicing and Facilities

Any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste must have a Certificate of Approval before it can operate lawfully. Please consult with the Environmental Assessment and Approvals Branch to determine whether a new or amended Certificate of Approval will be required for any proposed infrastructure.

We recommend referring to the MOE's "D-Series" guidelines – *Land Use Compatibility* to ensure that all applicable procedures are followed in planning for any infrastructure or facilities related to wastewater, pipelines, landfills or industrial uses.

Reference to the following MOE's documents is recommended in the Project File report to ensure that all applicable Ministry procedures are followed in planning for this water and sewer infrastructure:

- Procedure F-5-5, *Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewer Systems*; and
- Guideline B-1-5, *Deriving Receiving- Water Based, Point-Source Effluent Requirements for Ontario Waters* (July 1994).

Waste Materials and Spills

All waste generated during construction must be disposed of in accordance with the MOE's requirements.

Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping should be undertaken. If the soils are contaminated, you must determine how and where they are to be disposed of, consistent with Part XV.1 of the *Environmental Protection Act* (EPA) and Ontario Regulation 153/04, Records of Site Condition, which details the new requirements related to site assessment and clean up. The MOE recommends contacting the MOE's Barrie District Office for further consultation if contaminated sites are present.

Any current or historical waste disposal sites should be identified in the Project File report. The status of these sites should be determined to confirm whether approval pursuant to Section 46 of the *Environmental Protection Act* may be required for land uses on former disposal sites.

The Project File report should identify any underground transmission lines in the study area. The owners should be consulted to avoid impacts to this infrastructure, including potential spills.

The location of any underground storage tanks should be included in the Project File report. Measures should be identified to ensure the integrity of these tanks and to ensure an appropriate response in the event of a spill. The MOE Spills Action Centre in the Barrie District must be contacted in such an event.

Mitigation and Monitoring

Design and construction reports and plans should be based on a best management approach that centres on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of any impacted areas.

Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met. Mitigation measures should be clearly referenced in the Project File report and regularly monitored during the construction stage of the project. In addition, we encourage you to conduct post-construction monitoring to ensure all mitigation

measures have been effective and are functioning properly. The construction and post-construction monitoring plans should be documented in the Project File report.

Planning and Policy

The 2005 *Provincial Policy Statement* contains policies that protect Ontario's Natural Heritage. Applicable policies should be referenced in the Project File report, and you should demonstrate how this proposed project is consistent with these policies.

The *Places to Grow Plan* contains policies which guide decisions on a range of issues such as infrastructure planning and land-use planning to ensure that stronger and more prosperous communities are built in the Greater Golden Horseshoe. The Project File report should demonstrate how this project adheres to the relevant policies of the *Places to Grow Plan*, including Section 3, which contain policies for Infrastructure to Support Growth.

Class EA Process

The Project File report should provide clear and complete documentation of the planning process in order to allow traceability of decision-making. It must also demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all public consultation efforts undertaken during the planning process. Additionally, it should identify all concerns that were raised and how they have been addressed throughout the planning process. You should include copies of any comments submitted on the project by interested stakeholders, and your responses to these comments.

The Class EA requires the consideration of the effects of each alternative on all aspects of the environment. The Project File report should include a level of detail (e.g. hydrogeological investigations, terrestrial and aquatic assessments) such that all potential impacts can be identified and appropriate mitigation measures can be developed. Any supporting studies conducted during the Class EA process should be referenced and included as part of the Project File report.

Please include in the Project File report a list of all subsequent permits or other approvals that may be required for the implementation of the preferred alternative, including Permits to Take Water, Certificates of Approval or other ministerial approvals, approval under the *Canadian Environmental Assessment Act* (CEAA), and conservation authority permits.

Please note that the MOE's guidelines and other information related to the issues noted above are available at www.ene.gov.on.ca under the publications link. We encourage you to review all the available guides and to reference any relevant information in the Project File report.

Aboriginal Peoples Consultation

Please note that as part of the required stakeholder and agency consultation, you are advised to contact the Ministry of Aboriginal Affairs and the Department of Indian and Northern Affairs to determine potentially affected Aboriginal Peoples in the project area. Please refer to the website http://www.ene.gov.on.ca/en/eaab/aboriginal-resources.php for a list of appropriate government contacts.

Once identified, you are advised to provide notification directly to the Aboriginal Peoples who may be affected by the project and provide them with an opportunity to participate in any planned public consultation sessions and comment on the project.

Thank you for the opportunity to comment on this project. Please ensure that the MOE's Central Region, **EA and Planning Coordinator**, is placed on the project mailing list and forward us the Notice of Completion and the Project File report for our review and comment when completed.

Should you or any members of your project team have any questions regarding the above, please feel free to contact me at (416) 326-4886 or via an email: Chunmei.Liu@ontario.ca.
Yours truly,

Chunmei Liu
Environmental Assessment and Planning Coordinator
Air, Pesticides and Environmental Planning

c. C. Hood, Manager, Barrie District Office, MOE
Central Region EA File
A & P File

Fw: Notice of Study Commencement - East Creemore Drainage Study MCG10770
Dan Miller
to:
Ivan Chan, Don McNalty, Richard Spraggs
06/22/2010 02:43 PM
Cc:
"FileCollingwood@rjburnside.com"
Show Details

Fyi

May need to address this in the text of main report

Dan

From: "Meile, Christian" [Christian.Meile@simcoe.ca]
Sent: 06/22/2010 03:48 PM GMT
To: Dan Miller
Subject: Notice of Study Commencement - East Creemore Drainage Study

Hello Dan,

This is in response to your notice sent to Mr. Rick Newlove here at the County of Simcoe with respect to the notice of study commencement of a Schedule B Class EA for the East Creemore Drainage Area.

We do have a policy with respect to drainage directed towards a County Road allowance that post development stormwater quantity must be equal to or less than pre existing conditions. The County does maintain both County Road 9 as well as County Road 42 (Airport Road) in this area. We suspect this would not be a concern as additional flows appear to be directed south along Concession 3. We would want to ensure both existing cross culverts on County Road 9 and County Road 42 would have the capacity to handle a 25-year storm into the future.

We would want to understand the impact to the community of Avening located along County Road 42. As I am sure you are aware we have had significant flooding concerns in this area in the past.

Finally, we have a concern with respect to future maintenance of these proposed conveyances. Will they become municipal drains? If not, who will be responsible for the portion over the future development lands?

Please forward any future correspondence to the undersigned.

Thanks

Christian Meile, P.Eng.
Director, Transportation Maintenance
County of Simcoe
Phone 705-726-9300 Ext. 1178

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix D5
Public Information Centre Display Boards, PowerPoint Presentation, and Comments PIC #1

WELCOME TO THE

PUBLIC INFORMATION CENTRE

EAST CREEMORE DRAINAGE STUDY

CLASS ENVIRONMENTAL ASSESSMENT

"PRELIMINARY PUBLIC CONSULTATION"

You can participate in this project through the following activities:

- Please sign the attendance register.
- Review the displays for the project.
- Ask questions of the Township Staff/Consultant present.
- Let us know your opinion about this proposed project
- Submit any comments you may have regarding the information presented (comment sheets are provided).

BURNSIDE

CLEARVIEW TOWNSHIP
Established 1994

CLASS ENVIRONMENTAL ASSESSMENT (CLASS EA)

What is a Class EA?

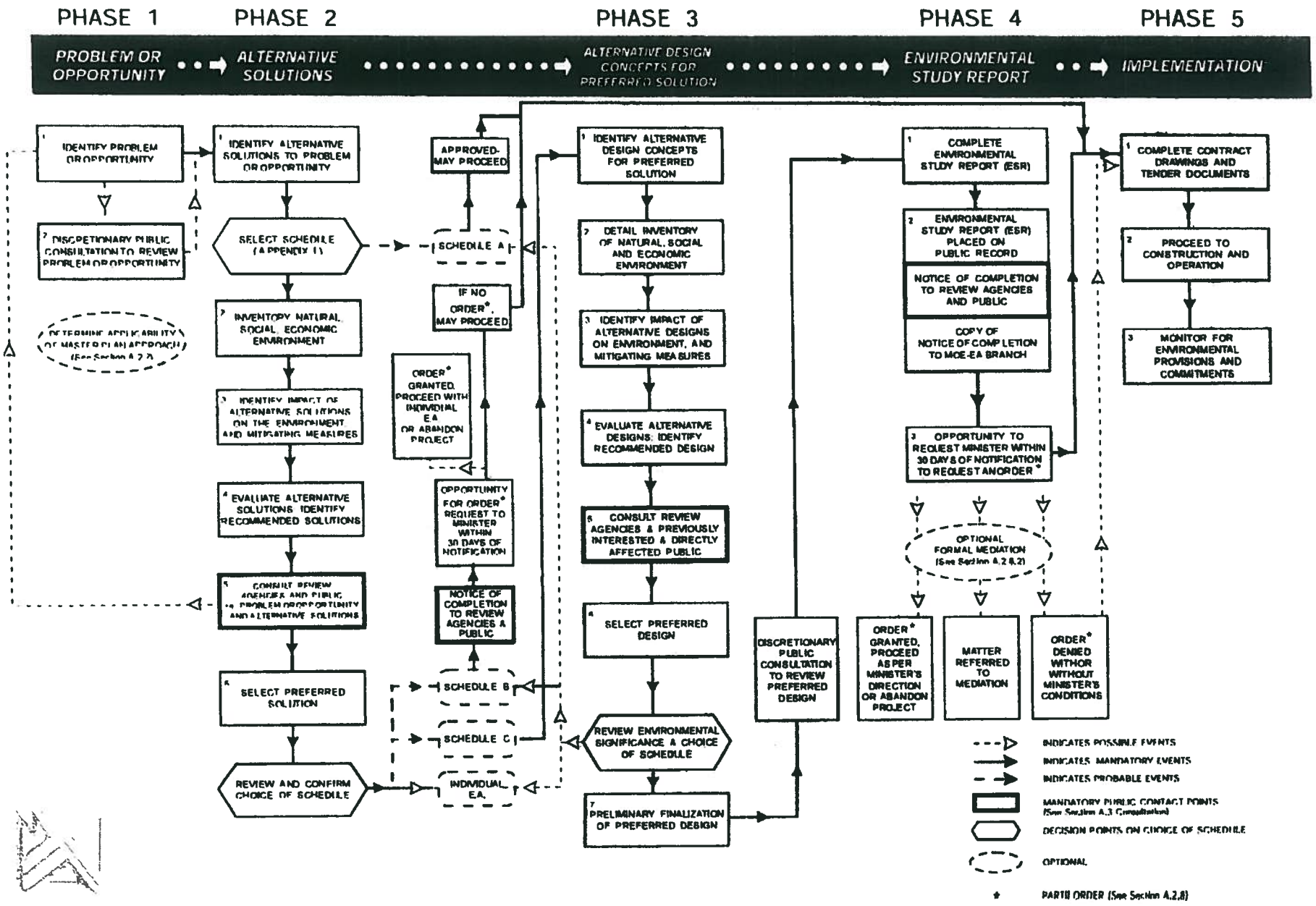
- A planning and design process to compare and evaluate all feasible alternative solutions to an identified problem.
- It applies to a group or class of similar or related projects, such as municipal road construction, water, wastewater and drainage projects.
- It considers all aspects of the environment: natural, social, cultural, economic, and technical.

How does the Class EA process work?

- It has five phases (see the flow chart, Exhibit A.2).
- It includes public involvement and input throughout the process.
- The public can review the Environmental Study Report (ESR).
- After the ESR is reviewed and accepted, the project is implemented and the preferred solution can be constructed.

EXHIBIT A.2 MUNICIPAL CLASS EA PLANNING AND DESIGN PROCESS

NOTE: This flow chart is to be read in conjunction with Part A of the Municipal Class EA



EAST CREEMORE DRAINAGE STUDY

IDENTIFICATION OF PROBLEM

- A number of existing drainage problems/issues have been identified in the eastern portion of Creemore.

- A comprehensive drainage plan is required to address existing drainage issues and future drainage needs.

F:\10770\DOCS\MISC\PIC#1\Exhibit 04, Problem ID - 8.5x11.doc

EAST CREEMORE DRAINAGE STUDY

SCOPE OF STUDY

- Identify existing drainage area, patterns and conditions, localized areas of concern and alternatives to improve drainage.
- Establish alternatives for improving the drainage outlet(s) for the area.
- Consider the design criteria (eg. urban vs semi urban) for future drainage work.
- Provide a long term strategy to address future drainage infrastructure for East Creemore.

EAST CREEMORE DRAINAGE STUDY
CLASS ENVIRONMENTAL ASSESSMENT

PUBLIC INFORMATION CENTRE NO. 1
SEPTEMBER 28, 2006

SIGN IN

NAME (Please Print)	ADDRESS	TELEPHONE NUMBER	Follow up
[illegible]	28 NELSON ST CREEMORE	466-6748	✓
Robert Walkin	Stayner Clearview Ward 5	428 3335	✓
MICHAEL DICKINSON	101 EDWARD ST E	428-0488	✓ message
GERRY BLACKBURN	43 ELIZABETH W	466-2629	✓ "
DAVID WILSON	3067 CON 3, S. NOTT.	466-5223	✓
GEOFF MARNIE SAVAGE	68 GEORGE ST. CREEMORE	466-3613	✓
BRAD HOLDEN	180-2 MILL ST.	466-2972	✓ mess
Karen Lococo	85 Edward St E.	466 6790	✓
Anthony Lococo	85 Edward St E.	4666790	✓
Noel Bates	8483 County Rd 9	446-2656	✓ mess
GREG MAREK	1110 HWY 26 MIDHURT LOLIXO	726-9300 x 1362	✓ mess
Sue McLeigh	Clearview		✓

EAST CREEMORE DRAINAGE STUDY
CLASS ENVIRONMENTAL ASSESSMENT

PUBLIC INFORMATION CENTRE NO. 1
SEPTEMBER 28, 2006

SIGN IN

NAME (Please Print)	ADDRESS	TELEPHONE NUMBER	
COUNCILLOR WARD 4 FRANK AWENDER	28 CAROLINE ST E	466 3035	✓ mess
Jana Smith	5 Hagback N.L.	424-1065	✓ mes
Fran Sandberg	6 Nelson St	466-2095	✓ BUSY
Joy MacLeith	10 EDWARD ST	466-246	✓ BUSY
	New Lowell	424-3473	✓ mess
PAUL VORSTERMANS	113 MILL	466-2756	✓
ED STEWART	98 GEORGE ST	466-3530	✓ mess
EARL BROWNFIELD	62 GEORGE ST	466-3591	✓ mess
Gordon Miller	RR#1 Stayner	466-3044	✓ mess
THOM PATERSON	79 EDWARD ST E	466 6321	✓ mess
JACQUIE PATERSON	79 EDWARD STE	466-6321	✓
Neil Rowbotham	24 Nelson	466-3195	✓ mess

EAST CREEMORE DRAINAGE STUDY
CLASS ENVIRONMENTAL ASSESSMENT

PUBLIC INFORMATION CENTRE NO. 1
SEPTEMBER 28, 2006

SIGN IN

NAME (Please Print)	ADDRESS	TELEPHONE NUMBER	FOLLOW UP
BOB CORRUTHERS	RR 3 CREEMORE	466-5931	✓
Cliff Weston	R1 Stayner	4665324	✓

COMMENT SHEET

PUBLIC INFORMATION CENTRE No. 1

East Creemore Drainage Study

Township of Clearview

September 28, 2006

NAME: (Please Print) Karen Lococo

ADDRESS: 85 Edward St E.

TELEPHONE: ( ) 466 6790 **EMAIL:** _____

COMMENTS: (if necessary, please use the back of the page)

Each Spring for the past 3 years, #75 Edward St E home has been pumping water (using 3 submersible sized pumps) from March-May non stop. The builder/developer poured several inches of concrete into the basement thinking this will solve the water problem for this house. This was done this summer. The owners have now moved out of this home. So, we as neighbours are wondering what will

Your comments are encouraged and appreciated. If you are unable to complete your comments at this time, please mail, fax or email them by October 20, 2006 to:

Don McNalty, P.Eng.
R.J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, ON L9Y 4J6
Phone: 705-446-0515
Fax: 705-446-2399
E-mail: dmcnalty@rjburnside.com

Richard Spraggs, P.Eng.
Township of Clearview
Box 200, 217 Gideon Street, Stayner, ON L0M 1S0
Phone: 705-428-6230 Ext. 243
Fax: 705-428-0288
E-mail: rspraggs@clearviewtwp.on.ca

Comments and information regarding this study are being collected to assist the Township of Clearview in meeting the requirements of the Environmental Assessment Act. They will be maintained on file for use during the study and may be included in study documentation. With the exception of personal information, all comments will become part of the public record.

COMMENT SHEET

PUBLIC INFORMATION CENTRE No. 1

East Creemore Drainage Study

Township of Clearview

September 28, 2006

NAME: (Please Print) BOB CARRUTHERS

ADDRESS: RR 3 CREEMORE

TELEPHONE: (705) 466-5931 **EMAIL:** _____

COMMENTS: (if necessary, please use the back of the page)

I farm lots 6 & 7 in third Con. I am concerned about tile drains on the land.

Your comments are encouraged and appreciated. If you are unable to complete your comments at this time, please mail, fax or email them by October 20, 2006 to:

Don McNalty, P.Eng.
R.J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood. ON L9Y 4J6
Phone: 705-446-0515
Fax: 705-446-2399
E-mail: dmcnalty@rjburnside.com

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COMMENT SHEET

PUBLIC INFORMATION CENTRE No. 1

East Creemore Drainage Study

Township of Clearview

September 28, 2006

NAME: (Please Print) NORM NORDSTROM

ADDRESS: 28 NELSON ST

TELEPHONE: (705) 466-6748 **EMAIL:** NORMNORD@SOLWIFI.CA

COMMENTS: (if necessary, please use the back of the page)

See attached map.

I live at 28 Nelson st. until the Louisa st. ditch was widened the house, which I acquired in 2001 didn't have a problem with water. Now, every time the water rises above 2 ft deep in the Louisa ditch - I pump water. For example, this year I pumped water at 60 gals per min from mid March until the end of may.

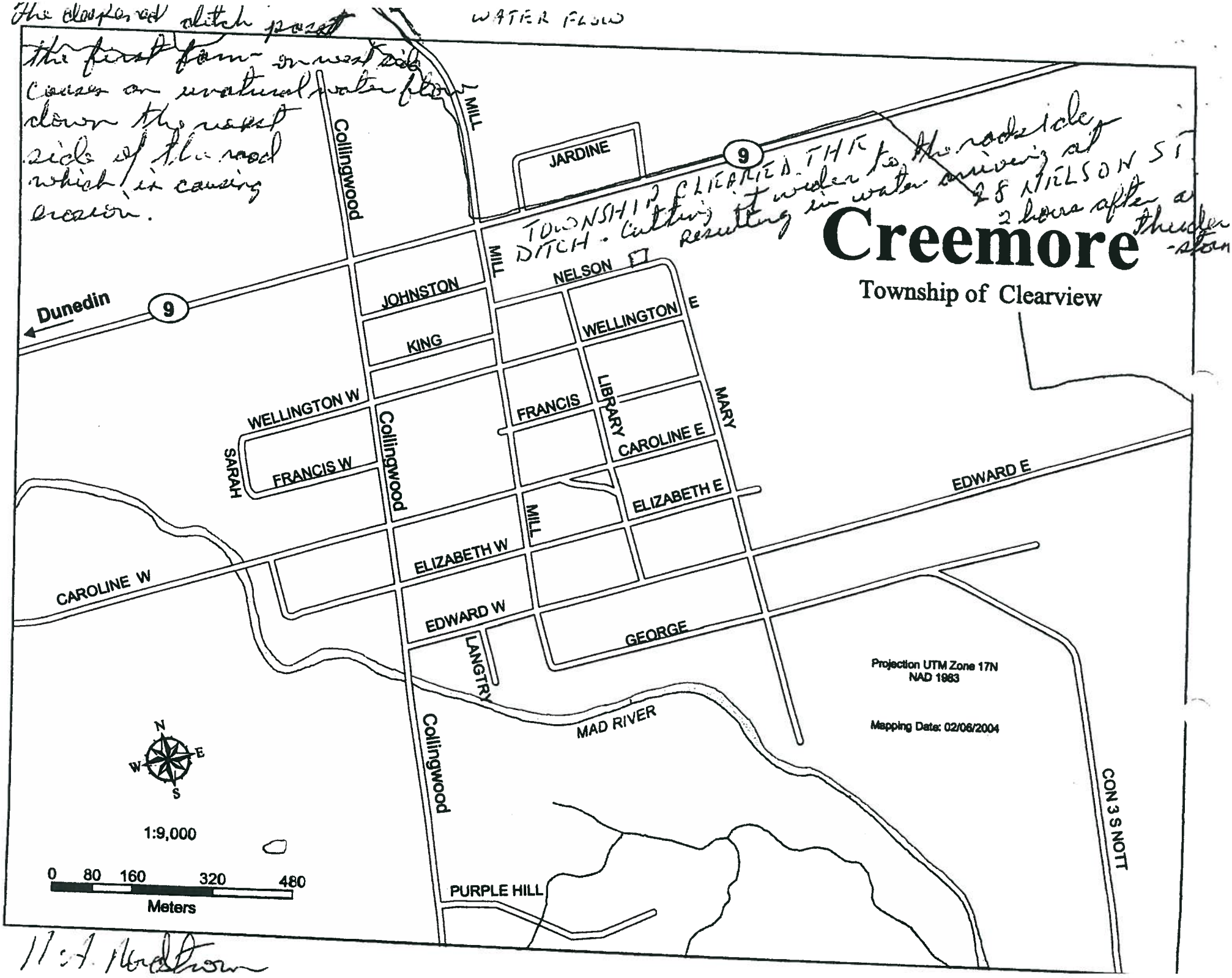
Your comments are encouraged and appreciated. If you are unable to complete your comments at this time, please mail, fax or email them by October 20, 2006 to:

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Feel free to call or EMAIL me at anytime


The clogged ditch past the first farm on west side causes an unnatural water flow down the west side of the road which is causing erosion.
WATER FLOW
TOWNSHIP CLEARED THE ROADSIDE DITCH - Cutting it wider to the road resulting in water arriving at 25 NELSON ST 2 hours after a thunder -storm
Creemore
Township of Clearview
Dunedin
9
JARDINE
MILL
Collingwood
JOHNSTON
KING
NELSON
WELLINGTON E
WELLINGTON W
FRANCIS
LIBRARY
MARY
CAROLINE E
SARAH
FRANCIS W
EDWARD E
ELIZABETH E
ELIZABETH W
CAROLINE W
EDWARD W
GEORGE
LANGTRY
MAD RIVER
PURPLE HILL
CON 3 S NOTT
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0 80 160 320 480
Meters
Projection UTM Zone 17N
NAD 1983
Mapping Date: 02/06/2004

11:4 Nov 2nd

COMMENT SHEET

PUBLIC INFORMATION CENTRE No. 1

East Creemore Drainage Study

Township of Clearview

September 28, 2006

NAME: (Please Print) MICHAEL DICKINSON / HASKETON VENTURES

MAILING ADDRESS: P.O. BOX 1010 / 6.7 ACRES 101 EDWARD ST.

TELEPHONE: (705) 428-0488 **EMAIL:** DICKINSON24@HOTMAIL.COM

CELL: (416) 568-6914

COMMENTS: (if necessary, please use the back of the page)

IT WOULD BE VERY HELPFUL IF I COULD HAVE A COPY OF THE MATERIAL THAT WAS DISPLAYED HERE TODAY (I AM PREPARED TO PAY FOR IT) SO THAT I MIGHT UNDERSTAND BETTER WHAT IS GOING ON. I WOULD ALSO LIKE TO GET A COPY OF FUTURE MATERIAL AS IT BECOMES AVAILABLE. MY CONCERNS ARE RELATIVE TO MY PROPERTY WHICH MAY BE ADVERSELY AFFECTED BY WATER, SURFACE OR GROUNDFROM PROPOSED DEVELOPMENT WITHIN THIS AREA. I WOULD ALSO LIKE TO DEVELOP THIS PROPERTY AT...

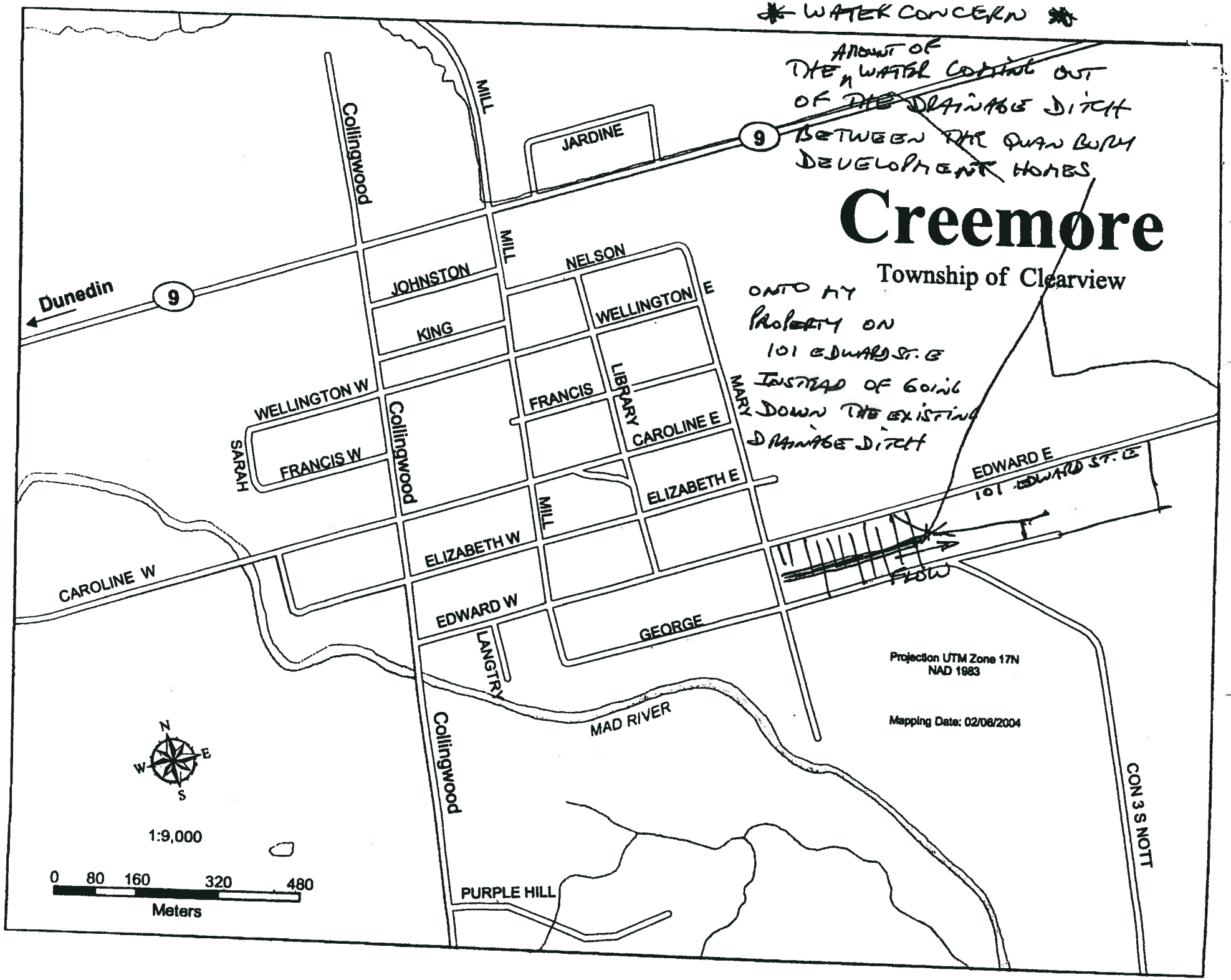
OVER.

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3 Ronell Crescent, Collingwood, ON L9Y 4J6
Phone: 705-446-0515
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WATER CONCERN
AMOUNT OF THE WATER COMING OUT OF THE DRAINAGE DITCH BETWEEN THE QUAN BURN DEVELOPMENT HOMES
Creemore
Township of Clearview
ONTO MY PROPERTY ON 101 EDWARD ST. E INSTEAD OF GOING DOWN THE EXISTING DRAINAGE DITCH
Dunedin
9
JARDINE
MILL
Collingwood
JOHNSTON
KING
NELSON
WELLINGTON E
WELLINGTON W
FRANCIS
FRANCIS W
SARAH
LIBRARY
MARY
CAROLINE E
ELIZABETH E
ELIZABETH W
EDWARD E
101 EDWARD ST. E
FLOW
CAROLINE W
EDWARD W
GEORGE
LANGTRY
MAD RIVER
PURPLE HILL
CON 3 S NOTT
Projection UTM Zone 17N
NAD 1983
Mapping Date: 02/06/2004
N
E
S
W
1:9,000
0 80 160 320 480
Meters

COMMENT SHEET

PUBLIC INFORMATION CENTRE No. 1

East Creemore Drainage Study

Township of Clearview

September 28, 2006

NAME: (Please Print) DAVID WILSON

ADDRESS: 3067 CON 3, S. NOTTAWASAGA

TELEPHONE: (705) 466-9223 - 5199 **EMAIL:** david@milltech.ca

COMMENTS: (if necessary, please use the back of the page)

EVERY SPRING (MID MARCH TO END OF APRIL) THERE IS "EXCESSIVE" GROUND WATER COMING IN FROM THE DRAINS AROUND OUR FOOTINGS. ANYTHING THAT CAN BE DONE TO REDUCE OR ELIMINATE THIS FLOW WOULD BE GREATLY APPRECIATED. PLEASE COME BY TO SEE OUR LOCATION. IF YOU WOULD LIKE TO BE NOTIFIED WHEN THIS HAPPENS PLEASE LET ME KNOW WHO TO CONTACT.

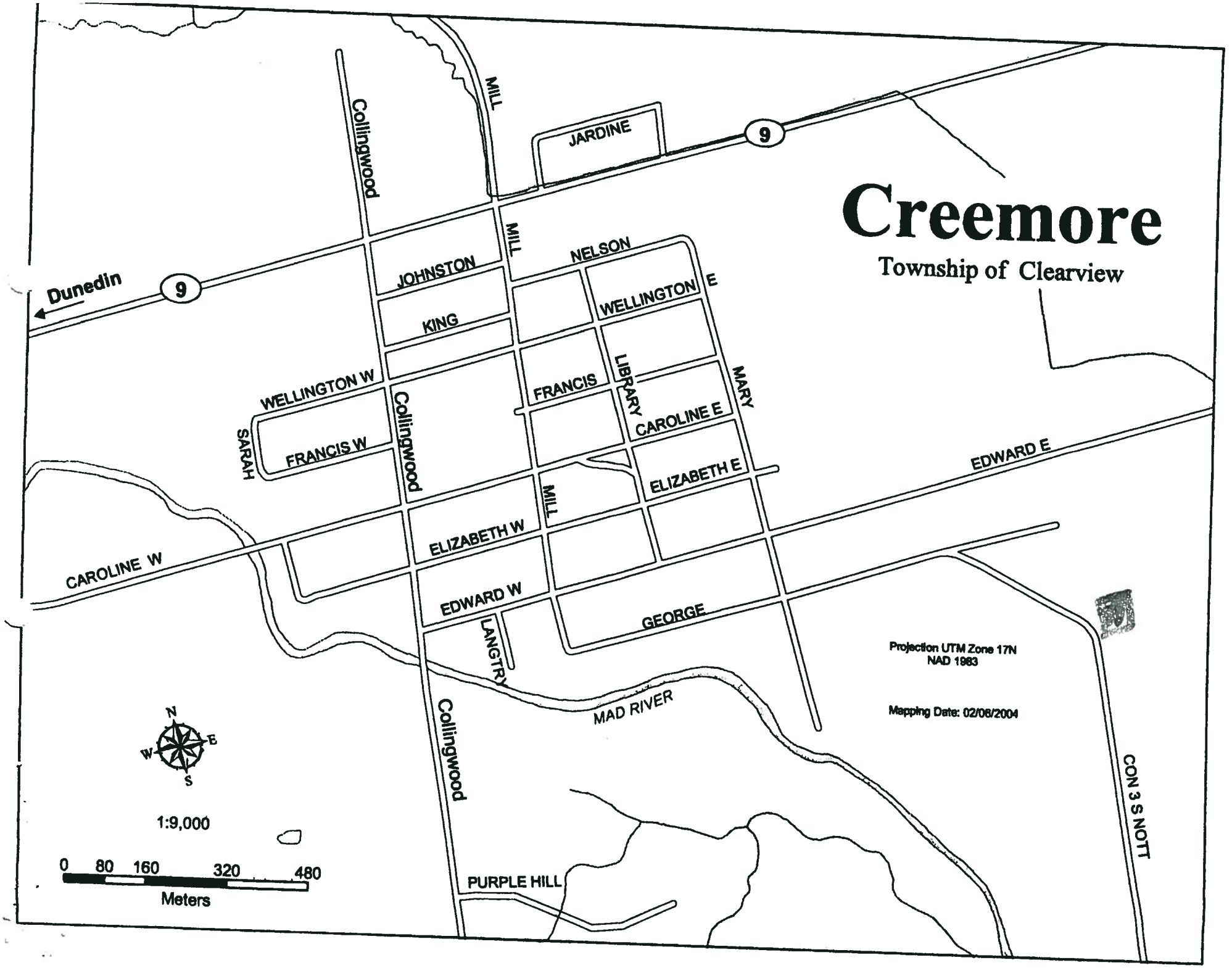
SINCERELY David Wilson

Your comments are encouraged and appreciated. If you are unable to complete your comments at this time, please mail, fax or email them by October 20, 2006 to:

Don McNalty, P.Eng.
R.J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, ON L9Y 4J6
Phone: 705-446-0515
Fax: 705-446-2399
E-mail: dmcnalty@rjburnside.com

Richard Spraggs, P.Eng.
Township of Clearview
Box 200, 217 Gideon Street, Stayner, ON L0M 1S0
Phone: 705-428-6230 Ext. 243
Fax: 705-428-0288
E-mail: rspraggs@clearviewtwp.on.ca

Comments and information regarding this study are being collected to assist the Township of Clearview in meeting the requirements of the Environmental Assessment Act. They will be maintained on file for use during the study and may be included in study documentation. With the exception of personal information, all comments will become part of the public record.


Creemore
Township of Clearview
Dunedin
9
JARDINE
MILL
Collingwood
JOHNSTON
NELSON
KING
WELLINGTON E
WELLINGTON W
FRANCIS
LIBRARY
MARY
CAROLINE E
SARAH
FRANCIS W
Collingwood
MILL
ELIZABETH E
EDWARD E
ELIZABETH W
CAROLINE W
EDWARD W
GEORGE
LANGTRY
MAD RIVER
Collingwood
PURPLE HILL
CON 3 S NOTT
Projection UTM Zone 17N
NAD 1983
Mapping Date: 02/06/2004
N
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E
S
1:9,000
0 80 160 320 480
Meters

MCG10-38

DATE RECEIVED

OCT 26 2006

R.J. BURNSIDE & ASSOCIATES
GEORGIAN BAY OFFICE

CLEARVIEW TOWNSHIP

FAX TRANSMITTAL
FROM: JOANNE BLACK, PUBLIC WORKS CLERK

Box 200 217 Gideon St Stayner ON L0M 1S0
(705) 428 6230 ext 229 Fax (705) 428 0288

TO:	**RJ Burnside & Associates**
DATE:	**Oct 26th, 2006**
FAX NUMBER:	**705 446 2399**
ATTENTION:	**Dan Miller**

Dan,

Please find attached a copy of correspondence and reply regarding East Creemore Drainage Study.

Thanks
Joanne

October 20, 2006

Mr. Richard Spraggs, P. Eng.
Township of Clearview
Box 200, 217 Gideon Street
Stayner, Ontario
L0M 1S0

Fax: (705) 428-0288

Re: East Creemore Drainage Study – Municipal Class Environmental Assessment

Richard, I was unable to make it out to the Public Information Centre held on September 28th to view the documents proposed. I am sure that your department along with the consultants have everything under control, but I need to know were the County fits into this Study.

The last time a clean out of the main drainage ditch along the north side of County Road # 9 took place, the Township stopped in front of Jardine Subdivision and claimed that anything East of that point was the responsibility of the County.

As you know, we 911253 Ontario Limited, are the registered owners of the 50 acres Designated for Residential along the north side of County Rd. # 9, which has been effected many times by spring run-off backing up because the culvert crossing under County Rd. # 9, directing the water south, is to small or plugged with debri.

I applaud the work that your department did on the fourth line (Fairgrounds Road) to control run-off, and if the County is going to put the same effort into working with Clearview, then there should be no concerns.

You can fax me at (705) 466-3385.

And as a taxpayer, I thankyou for the good work you and your department do for our Township.

David W. Kennedy

General Administration
217 Gideon Street
P.O. Box 200
Stayner, Ontario
L0M 1S0

CLEARVIEW TOWNSHIP
Established 1994
www.clearviewtwp.on.ca

Administration (705) 428-6230
Direct Line (705) 428-6238
Fax (705) 428-0288
E-mail administration@clearviewtwp.on.ca

October 26th, 2006

David W Kennedy
Fax (705) 466-3385

Dear Mr Kennedy:

RE: East Creemore Drainage Study

The County will be consulted through the Municipal Class Environmental Assessment process, and as we go through establishing solutions (alternate and preferred) it is envisaged that the County will be part of implementing the actual physical solution on their County Road 9 right of way.

Yours truly,

Richard J Spraggs, P.Eng.
Director of Public Works

RJS/jb

Cc: Dan Miller, RJ Burnside and Associates (446-2399)

FORWARD TO
DAN MILLER
RJB (fax & mail

COMMENT SHEET

PUBLIC INFORMATION CENTRE No. 1

East Creemore Drainage Study

Township of Clearview

September 28, 2006

DATE RECEIVED
OCT 11/06

R.J. BURNSIDE & ASSOCIATES
GEORGIAN BAY OFFICE

NAME: (Please Print) CLIFF WESTON

ADDRESS: Stayner R.1 L0M1S0

TELEPHONE: (705) 4665324 **EMAIL:** _____

COMMENTS: (if necessary, please use the back of the page)

please keep drainage ditches on municipal right of ways or on municipal roadside not through private property

Your comments are encouraged and appreciated. If you are unable to complete your comments at this time, please mail, fax or email them by October 20, 2006 to:

Don McNalty, P.Eng.
R.J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, ON L9Y 4J6
Phone: 705-446-0515
Fax: 705-446-2399
E-mail: dmcnalty@rjburnside.com

Richard Spraggs, P.Eng.
Township of Clearview
Box 200, 217 Gideon Street, Stayner, ON L0M 1S0
Phone: 705-428-6230 Ext. 243
Fax: 705-428-0288
E-mail: rspraggs@clearviewtwp.on.ca

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BURNSIDE

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Appendix D6
Public Information Centre Display Boards, PowerPoint Presentation, and Comments – PIC #2

EAST CREEMORE DRAINAGE STUDY
CLASS ENVIRONMENTAL ASSESSMENT

PUBLIC INFORMATION CENTRE NO. 2
July 28, 2007

SIGN IN

NAME (Please Print)	ADDRESS	TELEPHONE NUMBER
A.J. Lococo	85 EDWARD ST E	466-6790
K.S. Lococo	"	"
S. MISTIC	STANTEC 7270 WOODBINE AVE MARKHAM, ON	905.474-0455
[illegible]	80 EDWARD ST	705-466-5246
DAVID WILSON	3063 CON 3.	705-466-5223
THOM PATERSON	79 EDWARD ST E	466 6321
Neil Rowbotham	24 Nelson	4663895
NORM NORDSTROM	28 NELSON ST.	466-6748-
FRANK AWENDER	28 CAROLINE E ST	466 3035
Myrtle & Bob Carruthers	R.R.3 Creemore, Ont L0M1G0	466-5931
John Crispo.	8 Purple Hill Lane	466 5115

COMMENT SHEET

PUBLIC INFORMATION CENTRE No. 2

East Creemore Drainage Study

Township of Clearview

July 28, 2007

NAME: (Please Print) Todd Jardine

ADDRESS: RR-1 Stayner

TELEPHONE: (705) 466-3155 **EMAIL:** _____

COMMENTS: (if necessary, please use the back of the page)

Please send me a plan of the final preferred solution - the one that the Notice of Completion will support

Your comments are encouraged and appreciated. If you are unable to complete your comments at this time, please mail, fax or email them by July 20, 2007 to:

Don McNalty, P.Eng.
R.J. Burnside & Associates Limited
3 Ronell Crescent, Collingwood, ON L9Y 4J6
Phone: 705-446-0515
Fax: 705-446-2399
E-mail: dmcnalty@rjburnside.com

Richard Spraggs, P.Eng.
Township of Clearview
Box 200, 217 Gideon Street, Stayner, ON L0M 1S0
Phone: 705-428-6230 Ext. 243
Fax: 705-428-0288
E-mail: rspraggs@clearviewtwp.on.ca

Comments and information regarding this study are being collected to assist the Township of Clearview in meeting the requirements of the Environmental Assessment Act. They will be maintained on file for use during the study and may be included in study documentation. With the exception of personal information, all comments will become part of the public record.

General Administration
217 Gideon Street
P.O. Box 200
Stayner, Ontario
L0M 1S0

CLEARVIEW TOWNSHIP
Established 1994

www.clearview.ca

EA File
MC

Administration (705) 428-62
Fax (705) 428-02
Email administration@clearview.

July 21st, 2009

Santo Trotta
Lindo Antonio Manual Demelo
c/o Franco Trotta
RR 4 Station Main
Bradford ON
L3Z 2A6

Dear Sir/Madame:

RE: Township of Clearview
Creemore East Drainage Study

Further to your enquiry to Councillor Paterson with regards to the Creemore East Drainage Study and the Alliance (Gordon Zands) Subdivision, this is to advise:

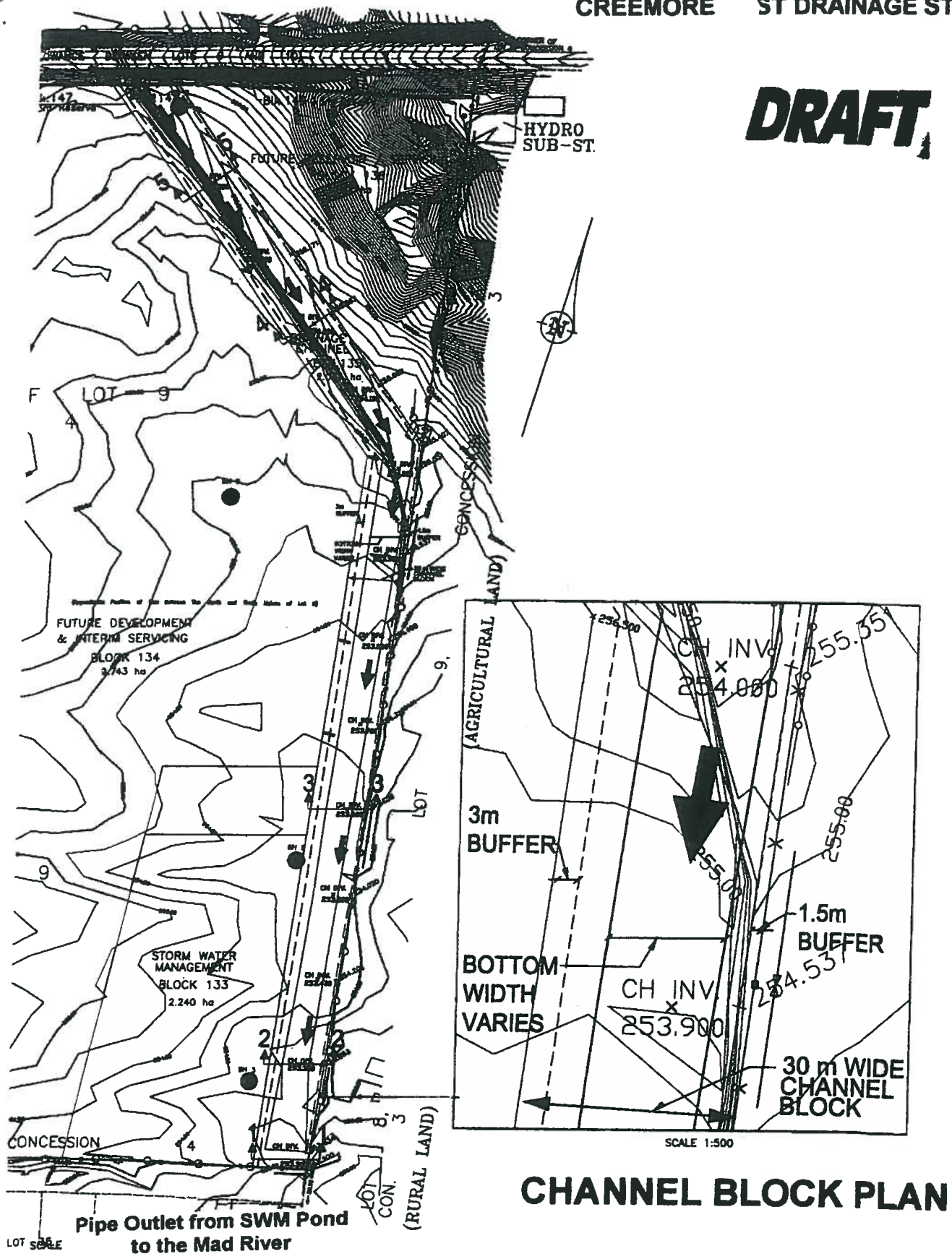
1. That the storm water runoff for the Alliance Subdivision lands will be contained within their boundaries of the subdivision and directed to a Storm Water Management pond. There will be an outlet pipe directed down the 3rd Concession to the Mad River.

2. The Storm Water Management pond will also be designed to infiltrate some of the water into the ground. This is still in preliminary concept design stage.

3. The County Road No. 9 Drainage and area to the north are to flow down the east side of the Alliance Property in a 30 meter wide channel block that will include a low flow channel plus detention areas to reduce the peak runoff from heavy rainfall storms. This storm water runoff is the same storm water that is presently directed to Edward Street East and then to the Airport Road Culvert Crossing.

....2/

DRAFT



CHANNEL BLOCK PLAN

Pipe Outlet from SWM Pond to the Mad River

V:\01608\Active\160620968\Drawing\XParty\Werlan\3719-A3-Draft Plan July 12_06.dwg
2006-08-31 11:56AM By: sgainer

August 2006
1 608 20968

Stantec Consulting Ltd.
300, 7270 Woodbine Ave.
Markham ON Canada
L3R 489
Tel. 905.474.0455
Fax. 905.474.9889
www.stantec.com

Legend

DRAFT

Client/Project
ALLIANCE HOMES
ADULT LIFESTYLE
CREEMORE, TOWNSHIP OF CLEARVIEW

Figure No.
FIG 2.0

Title
HEC RAS SECTION LOCATION PLAI

MCG 10 7 10



"Richard Spraggs" <rspraggs@clearviewtwp.on.ca>
13/Aug/2007 06:21 PM

To "Don McNalty" <Don_McNalty@rjburnside.com>, "Dan Miller" <Dan_Miller@rjburnside.com>
cc
Subject FW: drainage study

From: Noel Bates [mailto:landplan@rogers.com]
Sent: Wednesday, August 08, 2007 12:47 PM
To: Richard Spraggs
Subject: drainage study

Please find my client's comments on the draft of the East drainage study for Creemore

Noel Bates BA JD MCIP RPP
Land Plan Inc. - Senior Planner
PO Box 1029
143 Mill Street
Creemore, ON., Canada
L0M 1G0
705.466 2220

Confidentiality Warning: This message and any attachments are intended only for the use of the intended recipient(s), are confidential, and may be privileged. If you are not the intended recipient, you are hereby notified that any review, retransmission, conversion to hard copy, copying, circulation or other use of this message and any attachments is strictly prohibited. If you are not the intended recipient, please notify the sender immediately by return e-mail, and delete this message and any attachments from your system. Thank you.

--
This message has been scanned for viruses and
dangerous content by **VPNetworks(1)**, and is
believed to be clean.



This memorandum is a first response by Hasketon Ventures Inc.doc

This memorandum is a response by Hasketon Ventures Inc. to the proposed drainage plan submitted by RJBurnside to the Township of Clearview dated June 25 2007. The comments are not set forth in any particular priority.

BOUNDARY ISSUE

1. The Catchment ID boundaries, with one exception (#4), appear in some manner to reflect either partial or complete lot-line boundaries. The rational for the boundaries are obvious in some cases, others are not. In all cases but one (#2w) it also appears the Official Plan designations have been implicitly acknowledged. Since it is clear that 2w is the most import catchment area. The official plan, if followed in the case of 2W, would have reduced its size by 50% because the east have is designated Future Development and designation recognized when drawing boundary for #6.

REQUIRED: A justification from an engineering perspective for the decision not to respect the current Official Plan boundaries in catchment area 2w.

MAPPING CURRENCY

2. The Topographic Map purports to reflect data as of September 2006 yet it is obvious is is not current, because no buildings for the Quanbury subdivision are shown. It was built starting in 2003. Therefore maps are three years out of date.

REQUIRED: A current topographic map or in the alternative a properly dated topgraphic map with explanation as to why is it not current.

DOES LABELLING DISCLOSE A BIAS?

3. The Alternatives set forth in the SWM3 drawing showing the flow schematic refer to "post-development" SWM alternatives. Other than post MacIntosh developement (Mac catchment area) and Hasketon (it has been "approved" for 10 units in the OMB order dealing with MacIntosh and is shown in catchment 9 and part of 6) what "development" is referred to? Is it not premature but contrary to good planning principles to prepare a drainage plan which presupposes a development which may never occur? And to provide for SWM design given the OP designations favored by the applicant for that contested development?

IS THE DESIGN TOO CONVULUTED AND TOO EXPENSIVE?

4. The proposed drainage plan appears to accept a design that doesn't work well, ie. Along N side of County Rd # 9 then along east boundary of Gordon lands. That drainage pattern was to accommodate agricultural use of land. The proposed route does not follow topography, but rather seems designed to accommodate: (1) an drainage ditch of questionable engineering design, built to accommodate agriculture operations (Gordon Farm) which today is not good planning (2) a development which has never been scrutinized by an independent planning assessment and (3) a much more expensive instalation.

FAILURE TO SHOW ALL SWM PONDS APPROVED AND PROPOSED

5. Are SWM ponds not proposed by MacIntosh and by Alliance – why are they not shown?

DETAILS OF THE CHANNELIZATION ROUTING

6. One whose property will channels locate?

IMMEDIATE/SHORTTERM REMEDIAL ACTION

7. My client is concerned that the drainage solutions offered fails to address or propose a solution to the immediate problem of seasonal flooding created by the absence of adequate municipal planning in dealing with the subdivision to the west of its property and also the assurance that an acknowledgement that a better standard will be adopted this time.

R. J. Burnside & Associates Limited 3 ...ell Crescent Collingwood ON L9Y 4J6 Canada
...elephone (705) 446-0515 fax (705) 446-2399 we... www.rjburnside.com

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

September 19, 2008

Via: Regular Mail

Santo Trotta &
Lindo Antonio Manual Demelo
c/o Franco Trotta
R.R. #4, Station Main
Bradford, ON L3Z 2A6

Attention: **Property Owner**

Re: **Township of Clearview**
Creemore East Drainage, Review of Three Options
164 Edward St W., Roll #010 001 11701
File No. MCG10770

Dear Madame/Sir,

As you aware R.J Burnside and Associates Limited has been retained by the Township of Clearview, to undertake a master drainage study of the Eastern Lands of Creemore. As discussed at the site meeting held on June 10, 2008 at ¾ Sideroad, we are currently in the process of assessing drainage alternatives within the land adjacent to, within and south of the Edward Street Right-of-way. The purpose of this letter is to provide commentary outlining the proposed benefits and challenges associated with each alternative to the affected property owners within the Eastern limits of Creemore. This letter also provides recommendations for the "Preferred Drainage Solution" based on a detailed analysis of the alternatives.

The drainage alternatives being considered will consist of a grassed/armored channel to convey the spring freshet base flow (2-year peak flow) away from the eastern limits of Creemore. The intention is to provide relief for the spring freshet flows and allow the major system flows (≥2-year flows) to continue to overtop the channel banks and infiltrate naturally into the adjacent fields. Flow depths in this case would be minimal as runoff would be allowed to "fan out" over a large area.

The proposed channel will have a constant bottom width of 1.0m and 1:1 side slopes. The design depth of the channel will be 1.0m minimum. Due to the natural topography of the eastern lands, there is sufficient fall from the central portions of Edward Street to Airport Road. The natural gradient of the lands produces smaller shallower channel cross sections at the upstream portion of the drainage system and larger deeper cross sections at the downstream areas. The top width of the channel will vary depending on the depth of cut through any rises in topography such as small hills.

The preferred alternative will ultimately convey spring freshet floodwaters of the eastern portion of Creemore to the Airport Road right of way and further downstream to the Mad River.

There are a total of three alternatives being considered at this time, please refer to **Figure 16** for details. Each alternative considered has been surveyed using a total station to determine existing ground elevations along the proposed centerline of channel. These elevations have been further used to determine grading and conveyance benefits and challenges for each alternative. Average required easement widths for the installation of the proposed channel have been shown on Figure 16.

Alternative #1- Channel Alignment

- Channel alignment will convey flows easterly through the Edward Street right of way and further to Airport Road through the Jardine and Nash properties. The current culvert outlet location at Airport Road will be maintained. A review of the culvert capacity at Airport Road is ongoing.

Benefits

- Maintains current general drainage path
- Contains spring freshet flood waters within the Edward Street right-of-way and protects residential housing on the southern limits of Edward Street
- Minimal grading required as Edward Street would act as a flow barrier.
- Existing topography favors positive drainage to the outlet.
- Minimal amount of private land would be needed to construct this alternative.

Challenges

- Possible hydro utility relocation
- An average easement width of 4.5m would be required to convey flows south of Edward Street to Airport Road through the Nash Property.
- The channel cross section to convey the two-year storm will be contained within the Edward Street right-of-way at the upstream end, while requiring minimal drainage easement width acquisition at the downstream end.
- A culvert upgrade would be required at the Edward Street crossing location to convey flows safely under Edward Street.
- Outlet location at Airport Road will require further investigation to determine conveyance containment without spill to the south.
- The Trotta lands would not have a direct outlet for stormwater management, and would still require an outlet through Jardine and Nash lands.
- The Jardine, Nash and Simpson properties would prefer that the drainage channel not flow through the centre (Jardine/Nash) or along the frontage (Simpson) of their properties. Jardine and Nash have requested that the channel be located along their southern and western limits.

Alternative #2- Channel Alignment

- Channel Alignment will utilize portions of Alternative #1. This alternative would convey flows easterly through the Edward Street right-of-way, south of Edward Street along the western and eastern limits of the Trotta and Jardine properties respectively, and finally east along the southern limits of the Jardine and Nash properties. The channel is proposed to be located entirely within the Trotta lands along the Trotta/Jardine boundary as Trotta benefits, and through the southern limit if the Jardine/Nash properties. Current culvert outlet location at Airport Road will be maintained. A review of the culvert capacity at Airport Road is ongoing.

Benefits

- Maintains current general drainage path
- Channel alignment would convey flows to open fields to allow for infiltration and remove floodwaters from existing residential housing areas.
- Existing topography generally favours positive drainage to the outlet.
- Provides a future outlet located at the downstream most location of the Trotta, Jardine and Nash lands which allows their entire properties to drain naturally. Allows for a single SWM pond to service each area, or a single combined SWM pond due to best location.

Challenges

- Possible hydro utility relocation for a portion of Edward street, but less than Alternative #1.
- An average easement width of 8.0m would be required to convey flows south of Edward Street and further to Airport Road due to the need to cut through some small hills.
- Outlet location at Airport Road will require further investigation to determine conveyance containment without spill to the south.
- Additional cost to excavate through hills.

Alternative #3- Channel Alignment

- Channel alignment will direct flows away from the Edward Street right-of-way to the western and southern limits of the Trotta/Wilson properties, further through the southern limits of the Trotta, Jardine and Nash properties and ultimately to Airport Road.

Benefits

- Directs flood waters away from the Edward Street right-of-way.

Challenges

- Significant grading and excavations would be required to ensure positive drainage to Airport Road due to several low points throughout the alignment.

Positive drainage to the outlet would result in almost zero gradient throughout the alignment.

- An average easement width of 10.5m wide would be required to convey flows south of Edward Street and further to Airport Road.
- Outlet location at Airport Road will require further investigation to determine conveyance containment without spill to the south.

Each of the three alternatives outlined above reference the flow containment at Airport Road. Flow containment will be addressed further within the final drainage report but has not been intended to be included as part of this letter.

Conclusions and Recommendations

Each of the alternatives considered above represent an overall net benefit to the drainage conveyance of the spring freshet through the eastern limits of Creemore. However, due to the grading implications and easement requirements of Alternative 3, it is not an option, and will no longer be considered. Alternative #1 is the best alternative in terms of minimal grading and ease of construction, however it does not provide a benefit to the Trotta lands as there is no direct outlet for the Trotta lands to the Airport Road outlet. The Trotta lands would still require an approved outlet through the Jardine/Nash lands to completely drain their property under future conditions. Therefore, Alternative #2 is the preferred alternative and recommended to convey runoff to the Airport Road right-of-way and further to the Mad River as it can be constructed, runs along property boundaries, and would be located at the downstream most location of all noted properties.

Please review these alternatives and contact the undersigned should you have any questions or concerns. It is the intention of the Township to hold a meeting in the next two weeks.

Yours truly,

R.J. Burnside & Associates Limited



Daniel R. Miller, P.Eng.
Engineering Manager
TL:sj

cc: Mr. Richard Spraggs, Township of Clearview
Mr. Thom Patterson, Councillor, Township of Clearview

R.J. Burnside & Associates Limited 3 Ronell Crescent Collingwood ON L9Y 4J8 Canada
telephone (705) 446-0515 fax (705) 446-2399 web www.rjburnside.com

BURNSIDE
[THE DIFFERENCE IS OUR PEOPLE]

Transmittal

	DATE	September 22, 2008	FILE No. MCG10770
	RE	Township of Clearview Creemore East Drainage, Review of Three Options	
To	ATTENTION	Property Owners	
	ADDRESS	[See attached list]	
From	NAME	Dan Miller, P.Eng	
	SENT VIA	Regular Mail	

Enclosed items

1	Letter – Township of Clearview Creemore East Drainage, Review of Three Options
1	Figure 16 – Creemore East Drainage Study-Proposed Outlet Alternatives

Comments

Please find enclosed a letter detailing the three drainage outlet alternatives for the properties within the Eastern Limits of Creemore, and corresponding drawing detailing the alternatives.

Daniel R. Miller, P.Eng.
Engineering Manager

cc: Mr. Richard Spraggs, Township of Clearview
Mr. Thom Patterson, Councillor, Township of Clearview

080922 Transmittal-Landowner Letters
2008-09-22 12:42 PM

Santo Trotta &
Lindo Antonio Manual Demelo
c/o Franco Trotta
R.R. #4, Station Main
164 Edward St W., Roll #010 001 11701
Bradford, ON L3Z 2A6

Garry Adam Densmore &
Kathryn Marie Densmore
215 Edward Street East
215 Edward St W., Roll #010 001 11802
Creemore, ON L0M 1G0

Todd Jardine
R.R. #1
187 Edward St W., Roll #010 001 11803
Stayner, ON L0M 1S0

Julie Simpson &
Dana Simpson
196 Edward Street East
Box 498
196 Edward St W., Roll #010 001 11800
Creemore, ON L0M 1G0

Terrance Norman Nash &
Sharon Lena Ann Nash
237 Edward Street East
237 Edward St W., Roll #010 001 11801
Creemore, ON L0M 1G0

Colette Florence Jessop &
David Jessop
3072 County Road 42
3072 County Rd. 42, Roll #010 001 11501
Creemore, ON L0M 1G0

Richard Spraggs

From: Richard Spraggs
Sent: Friday, November 27, 2009 11:57 AM
To: Clearview Planning Coalition Inc - Art McIlwain, President
Subject: RE: East Creemore Drainage MCEA

Attachments: Creemore East Drainage Council Update Power Point Nov 23 09.pdf



Creemore East Drainage Council...

Attached is the power point presentation.

-----Original Message-----
From: Clearview Planning Coalition Inc - Art McIlwain, President [mailto:clearplan@bellnet.ca]
Sent: Thursday, November 26, 2009 3:08 PM
To: Richard Spraggs
Subject: East Creemore Drainage MCEA

Clearview Township
Richard Spraggs, Director of Public Works by e-mail

You anticipated presenting an update to Council on Monday November 23. If you did that, please provide a copy of the preferred alternative you presented there.

Thanks

Clearview Planning Coalition Inc
per
Art McIlwain
President
clearplan@bellnet.ca
✓ Please consider the environment before printing this email.

(2)

Richard Spraggs

From: Richard Spraggs
Sent: Friday, November 27, 2009 4:23 PM
To: Dan Miller
Cc: Don McNalty
Subject: FW: East Creemore Drainage MCEA

Dan
Can you reply and place both in the Project File Report.
Richard

-----Original Message-----
From: Clearview Planning Coalition Inc - Art McIlwain, President
[mailto:clearplan@bellnet.ca]
Sent: Friday, November 27, 2009 3:26 PM
To: Richard Spraggs
Subject: East Creemore Drainage MCEA

Clearview Township
Richard Spraggs by e-mail

Confirming receipt of the PowerPoint presentation for your November 23, 2009 Council Update and thank you.

You refer to Purple Hill drainage and I wonder if you meant "Ten Hill" because Purple Hill is not within the light blue outline drainage area. Please advise.

You refer to Conveyance 2 draining the pink outline drainage area being conveyed by storm sewer along Concession 3 and the pink outline area includes the OMB-approved MacIntosh and Alliance Homes projects but connecting them to Concession 3 will require taking private land on the south side of Edward Street (Hasketon Ventures as I recall) and the south side of the unopened George Street road allowance. Please advise.

Your drawing shows an area that is not pink or light blue but is dark blue and that is the land on the north side of Concession 6/7 and the east side of Concession 3 that by memory is OP designated for industrial use and you make no mention of how this land is to be drained. Please advise how it is to be drained.

Please advise the estimated capital cost of the project you are planning.

Please advise the estimated annual operating cost of the project you are planning.

Please advise if the municipality will secure access rights for maintenance of Conveyance One that is planned for the east side of the Alliance Lands on lands it owns.

Please advise if the municipality will pay for the capital cost of constructing Conveyance One on the east side of the Alliance Lands.

Please advise if the municipality will construct Conveyance One on the east side of the Alliance Lands if that project has not proceeded at the time you implement the balance of Conveyance One.

Please advise if you will construct Conveyance One if Alliance has not constructed the part of it on its lands.

Thank you
November 27, 2009

Clearview Planning Coalition Inc

(3)

per
Art McIlwain
President
clearplan@bellnet.ca
✓ Please consider the environment before printing this email.

Richard Spraggs

From: Clearview Planning Coalition Inc - Art McIlwain, President
Sent: Tuesday, December 08, 2009 11:48 AM
To: Richard Spraggs
Subject: MCEA - East Creemore Stormwater Management Project

Clearview Township
Delivered by e-mail

Richard Spraggs

Please respond to these questions raised in CPCI's November 27th e-mail:

You refer to Purple Hill drainage and I wonder if you meant "Ten Hill" because Purple Hill is not within the light blue outline drainage area. Please advise.

You refer to Conveyance 2 draining the pink outline drainage area being conveyed by storm sewer along Concession 3 and the pink outline area includes the OMB-approved MacIntosh and Alliance Homes projects but connecting them to Concession 3 will require taking private land on the south side of Edward Street (Hasketon Ventures as I recall) and the south side of the unopened George Street road allowance. Please advise.

Your drawing shows an area that is not pink or light blue but is dark blue and that is the land on the north side of Concession 6/7 and the east side of Concession 3 that by memory is OP designated for industrial use and you make no mention of how this land is to be drained. Please advise how it is to be drained.

Please advise the estimated capital cost of the project you are planning.

Please advise the estimated annual operating cost of the project you are planning.

Respectfully submitted
December 8, 2009

(4)

Richard Spraggs

From: Clearview Planning Coalition Inc - Art McIlwain, President
Sent: Tuesday, December 08, 2009 11:40 AM
To: Richard Spraggs
Cc: Don McNalty
Subject: MCEA - East Creemore Drainage Stormwater Management Project

Attachments: A - McNalty Statement.pdf



A - McNalty Statement.pdf (36 ..

Clearview Township
Delivered by e-mail

Richard Spraggs

Clearview is planning a stormwater management project under the Municipal Class Environmental Assessment. The attachment is the September 2007 witness statement of RJ Burnside through its Vice President Don McNalty in the matter of Alliance Homes in Creemore that will open to the page containing this statement about the final stormwater management report:

"A final stormwater management report for the subject lands and development will be prepared in accordance with standard and accepted Municipal and Conservation Authority requirements. That study will include an examination of the site conditions and potential impacts of development, the required measures to appropriately control drainage and the supporting engineering documentation and analysis including the design of any works required. Once the design and documents have been approved they will constitute the basis for establishing the required works and securities to be deposited with the Municipality which will be set out in the Development Agreements which must be entered into prior to any site alteration and development."

RJ Burnside has confirmed in writing that the final stormwater management report for those Alliance lands has not been submitted. Many of Mr.
McNalty's responses to the issues he addresses in the Witness Statement are relevant to the stormwater management project Clearview is planning.

Please respond to these questions CPCI asked in its November 27, 2009 e-mail:

Please advise if the municipality will secure access rights for maintenance of Conveyance One that is planned for the east side of the Alliance Lands on lands it owns.

Please advise if the municipality will pay for the capital cost of constructing Conveyance One on the east side of the Alliance Lands.

Please advise if the municipality will construct Conveyance One on the east side of the Alliance Lands if that project has not proceeded at the time you implement the balance of Conveyance One.

Please advise if you will construct Conveyance One if Alliance has not constructed the part of it on its lands.

Respectfully submitted
December 8, 2009

Clearview Planning Coalition Inc
Per
Art McIlwain, President

(5)

Richard Spraggs

From: Richard Spraggs
Sent: Wednesday, December 09, 2009 2:32 PM
To: Clearview Planning Coalition Inc - Art McIlwain, President; Bob Campbell
Subject: RE: MCEA - East Creemore stormwater management project

Notice of Completion has not been published; Project File Report has not been completed; will send when done.

Richard Spraggs, P. Eng.
Director of Public Works

-----Original Message-----
From: Clearview Planning Coalition Inc - Art McIlwain, President
[mailto:clearplan@bellnet.ca]
Sent: Tuesday, December 08, 2009 11:53 AM
To: Bob Campbell
Cc: Richard Spraggs
Subject: MCEA - East Creemore stormwater management project

Clearview Township
Delivered by e-mail

Bob Campbell, Clerk

Clearview is planning a stormwater management project using the Municipal Class Environmental Assessment, otherwise known as East Creemore Drainage Plan. Please provide a copy of the Notice of Completion and a copy of the project file report by e-mail (preferred to minimize environmental effect) or by mail to:

Clearview Planning Coalition Inc
77 King Street West PO 58
Toronto ON M5K 1E7

Respectfully submitted
December 8, 2009

(6)

Richard Spraggs

From: Atkinson
Sent: Wednesday, January 27, 2010 7:15 PM
To: Richard Spraggs
Subject: RE: Alliance./Creemore

Thank you

At 02:07 PM 1/27/2010, you wrote:
>Tracey Atkinson
>
>Not yet, we are still finalizing
>
>With regards to the East Creemore Drainage Study, the Alliance Property
>Storm Water Management Pond Outlet will have a positive drainage (pipe)
>outlet that goes down 3/4 Sideroad to the Mad River, however the
>determination of the exact location of this pipe between Edward Street
>and the 3/4 Sideroad will not be finalized under the East Creemore
>Drainage Study. We have illustrated the general location; the
>Attachment was shared with Council with regards to Status Update.
>
>Richard
>
>
>
>-----Original Message-----
>From: Atkinson [mailto:atkinson@interhop.net]
>Sent: Wednesday, January 27, 2010 12:53 PM
>To: rspraggs@clearview.ca
>Subject: Alliance./Creemore
>
>Hello Mr. Spraggs,
>
>Hope all is well - a few questions for you.
>
>Is the East Creemore Drainage Study available in a digital format
>(either on the web or through email)?
>
>Also - what is the status of land aquisition for the Alliance project
>and servicing easements, etc? (My client is Hasketon Ventures - so I
>am interested only as such land aquisitions may relate to his lands).
>
>Thank you
>
>Tracey
>ATKINSON
>(705) 424-2879
>5582 Conc. 6 RR1
>New Lowell, Ontario, Canada
>L0M 1N0
>
>This information is directed in confidence solely to the person named
>above and may contain confidential and/or privileged material. This
>information may not otherwise be distributed, copied or disclosed. If
>you receive this e-mail in error, please notify the sender immediately
>via return email and destroy original message. Thank you for your
>cooperation.
>
>Content-Type: application/pdf;
> name="Creemore East Drainage Council Update Power Point Nov
> 23 09.pdf"
>Content-Disposition: attachment;
> filename="Creemore East Drainage Council Update Power Point

(7)

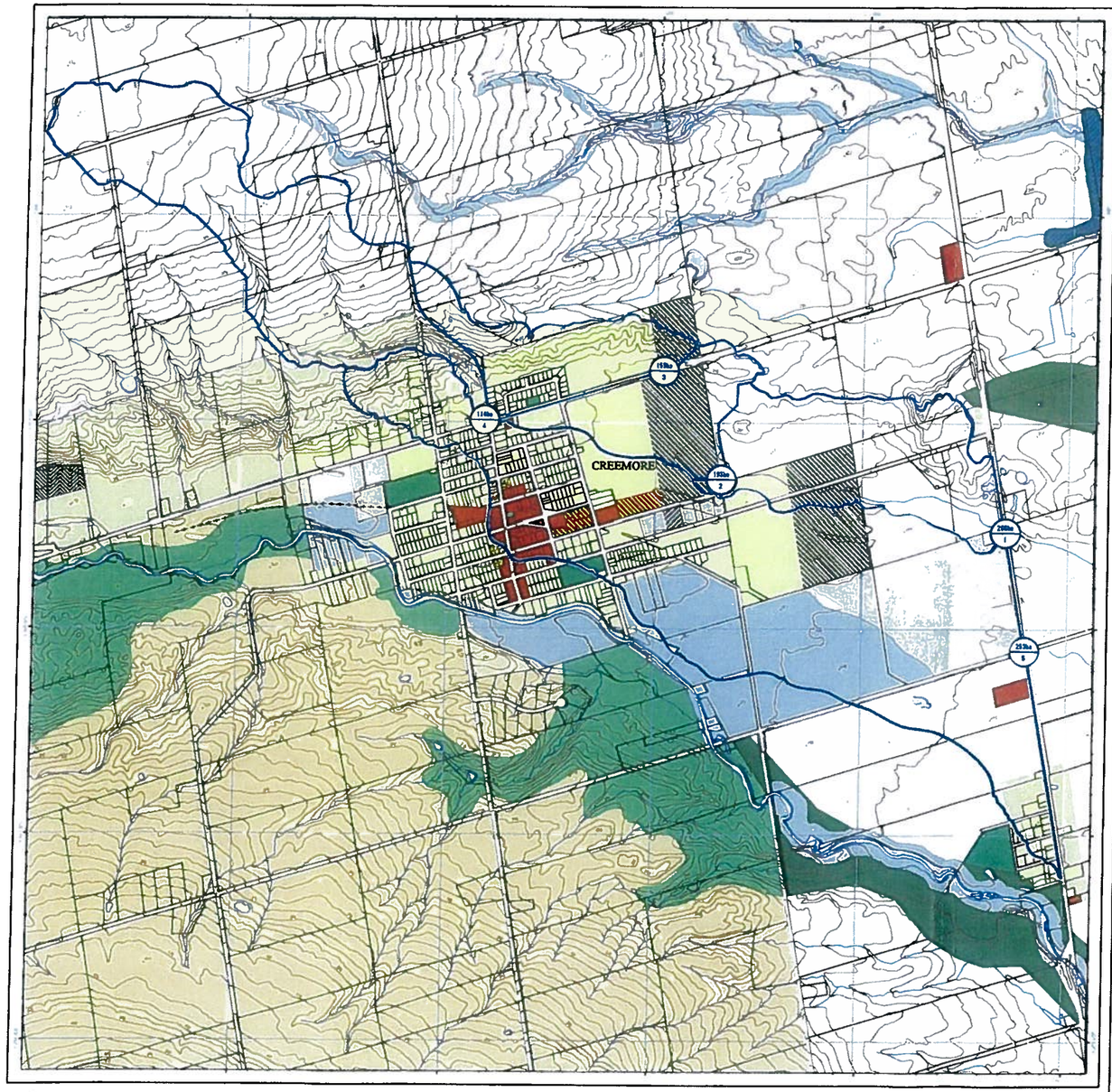
>Nov 23 09.pdf"
>X-Attachment-Id: 0.1

ATKINSON
(705) 424-2879
5582 Conc. 6 RR1
New Lowell, Ontario, Canada
L0M 1N0

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(Northwest



Official Plan

Township of Clearview

CREEMORE

Topographic Features
- Falls
- Rapids
- Rock
- Spot Height
- Spot Height, Vertical Control
- Spot Height, Water
- Tower Unspecified
- Falls
- Rapids
- Drainage Area
- Rail: Active
- Rail: Abandoned
- River/Stream, Seasonal
- River/Stream, Permanent
- Misc Unspecified
- Conservation Authority Land
- Provincial Park
- Waterbody
- Wetland
- Woods

Official Plan
- Escarpment - Natural Area
- Escarpment - Protected Area
- Escarpment - Recreational Area
- Escarpment - Rural Area
- Agriculture
- Rural
- Residential
- Estate Residential
- Special Purpose - Residential
- Commercial
- Commercial Transition Area
- Industrial
- Extractive Industrial
- Mineral Aggregate Resource Area
- Mineral Resource Extraction Area(MRE)
- Waste Disposal Industrial
- Future Commercial
- Future Development
- Open Space
- Greenland - Natural Heritage Area
- Greenland - Natural Land Areas
- Greenland - Wetland Areas

200Bo 1 — Area Catchment ID

Scale: 1 : 10,000
1 cm on the map equals 100 m on the ground
Contour Interval: 5 Metres
Minimum Grid Interval: 1,000 Metres

Datum: North American Datum 1983 (NAD 83)
Projection: Universal Transverse Mercator (UTM) Zone 17

Map Compilation Date: 25 September, 2009

N
Grid North

100 0 100 200 300 400 500 600 700 800 900
Metres

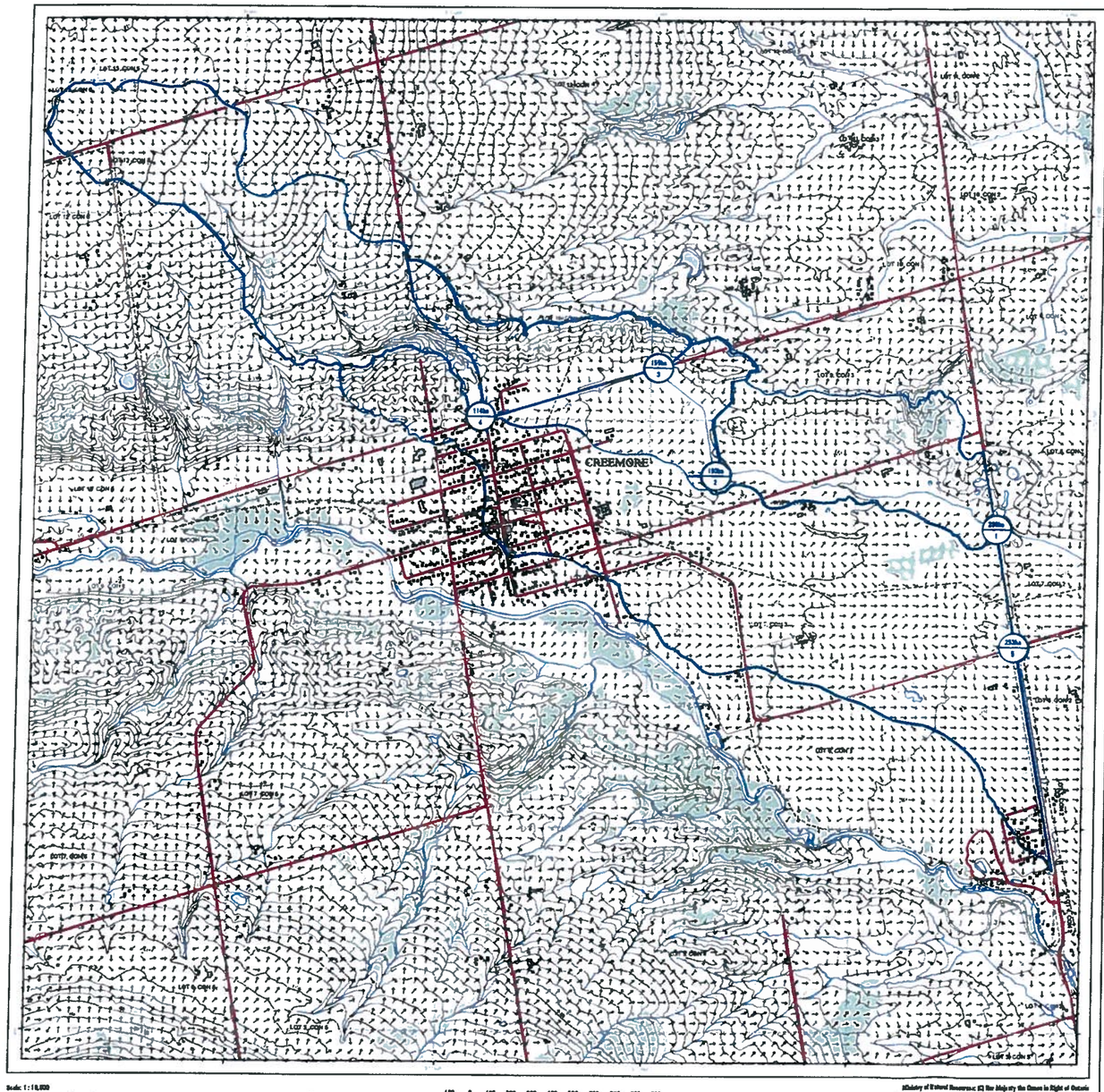
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Yards

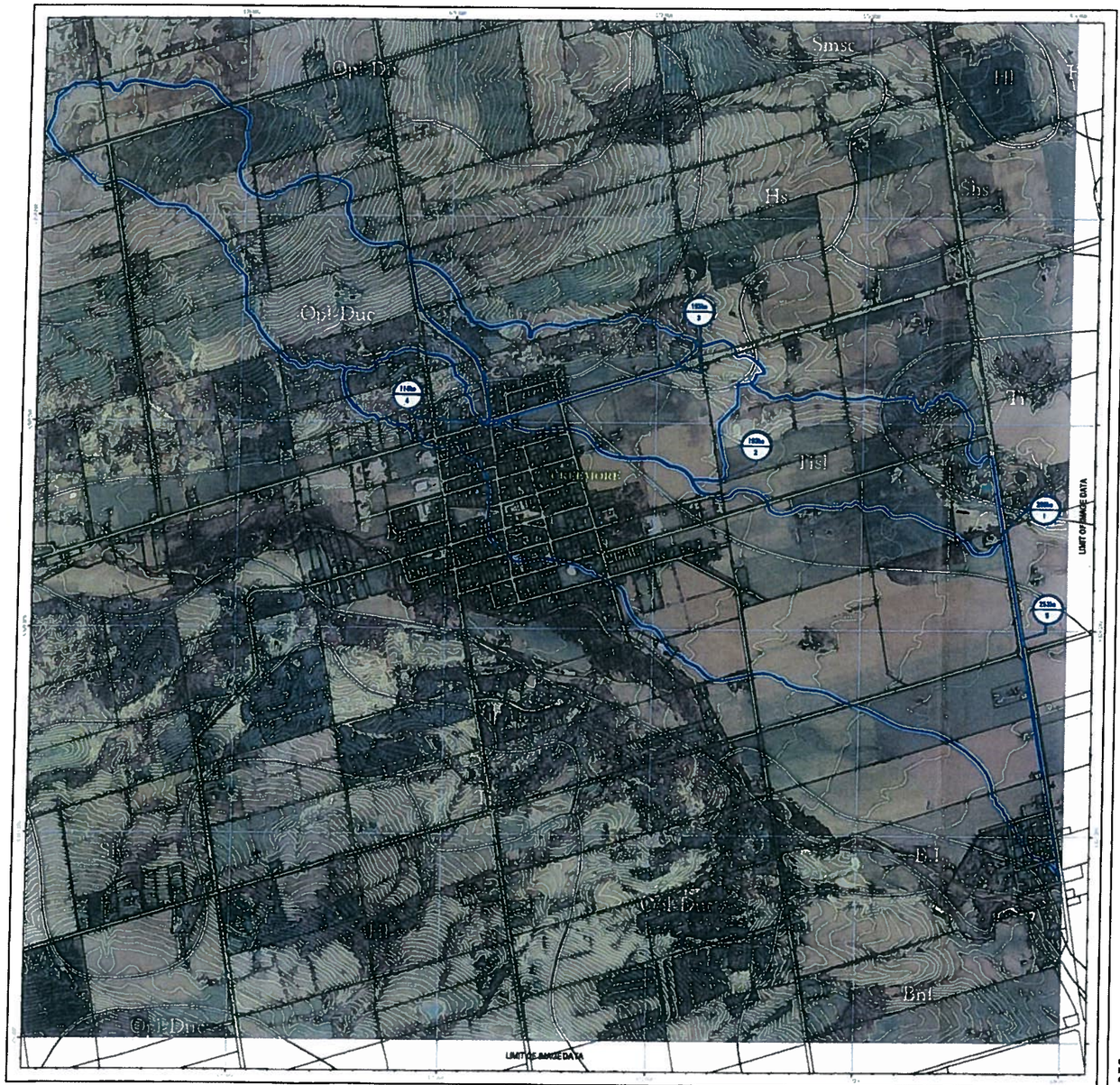
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Agriculture Canada: © Her Majesty the Queen in Right of Canada
Township of Clearview

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R.J. Burnside & Associates Limited · 15 Townline, Orangeville, Ontario, L9W 3R4
Tel: (519) 941-8222 Fax: (519) 941-8120 · www.rjburnside.com


CREEMORE
LOT 4, CON 1
LOT 5, CON 1
LOT 6, CON 1
LOT 7, CON 1
LOT 8, CON 1
LOT 9, CON 1
LOT 10, CON 1
LOT 11, CON 1
LOT 12, CON 1
LOT 13, CON 1
LOT



Orthophoto Map

Township of Clearview

CREEMORE

Topographic Features

Contours (5m Interval)

Delineated Catchment Area

Soil Series Boundary

Parcels

Catchment ID

Generalized Soils Classes

HYD. CODE	SOIL SERIES
	Bondhead
	Dundonald
	Guelph
	Harriston
	Honeywood
	Osprey
	Tioga
	Tiverton
	Toledo
	Waterloo
	Wauseon
	Wyevale

Scale: 1 : 10,000
1 cm on the map equals 100 m on the ground
Contour Interval: 2 Meters
Maximum Grid Interval: 1,000 Metres

Datum: North American Datum 1983 (NAD 83)
Projection: Universal Transverse Mercator (UTM) Zone 17

Map Compilation Date: 22 September, 2006

N

Grid North

Meters: 0 100 200 300 400 500 600 700 800 900

Yards: 100 0 100 200 300 400 500 600 700 800 900

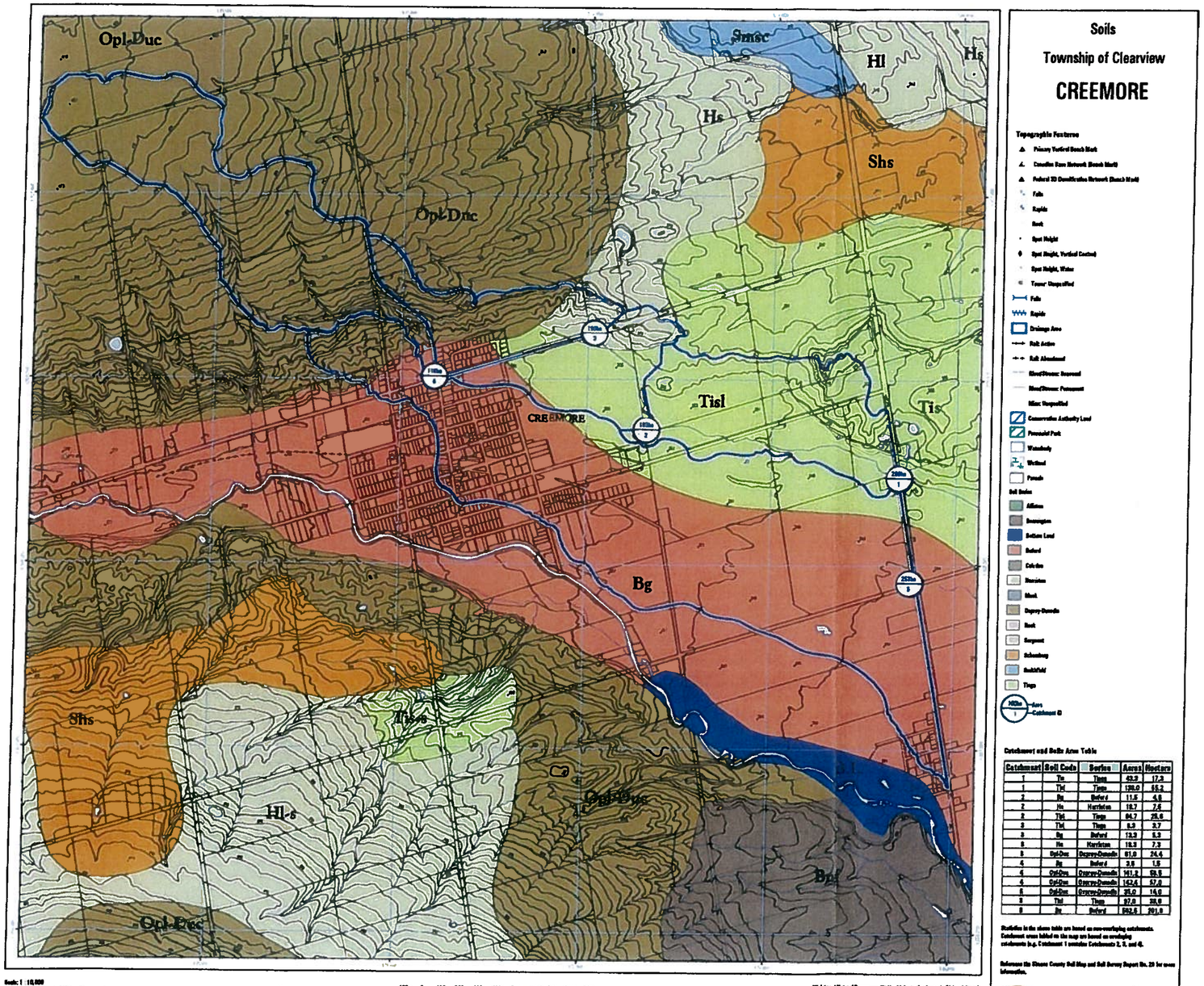
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Township of Clearview

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Orthophotography and Contour data were updated April 2002.
Reference the County of Simcoe Soils Map and Soils Report No. 29 for more detailed soils information.

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Scale: 1 : 10,000
1 cm on the map equals 100 m on the ground
Contour Interval: 5 Metres
Minimum Relief Interval: 1,000 Metres

Datum: North American Datum 1983 (NAD 83)
Projection: Universal Transverse Mercator (UTM) Zone 17

Map Compilation Date: 25 September, 2020

N
Grid North

100 0 100 200 300 400 500 600 700 800 900
Metres

100 0 100 200 300 400 500 600 700 800 900
Yards

Ministry of Natural Resources: (C) Her Majesty the Queen in Right of Ontario
Department of Natural Resources: (C) Her Majesty the Queen in Right of Canada
Agriculture Canada: (C) Her Majesty the Queen in Right of Canada
Township of Clearview

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Soils

Township of Clearview

CREEMORE

Topographic Features

- Primary Vertical Bench Mark
- Canadian Base Network (Bench Mark)
- Federal 3D Densification Network (Bench Mark)
- Falls
- Rapids
- Rock
- Spot Height
- Spot Height, Vertical Control
- Spot Height, Water
- Tower Unspecified
- Falls
- Rapids
- Drainage Area
- Rail: Active
- Rail: Abandoned
- Road/Stream: Seasonal
- Road/Stream: Permanent
- Misc. Unspecified
- Conservation Authority Land
- Provincial Park
- Waterbody
- Wetland
- Forest

Soil Series

- Alliston
- Bennington
- Bottom Land
- Buford
- Caledon
- Harriston
- Muck
- Osprey-Dunedin
- Rock
- Sargent
- Schomberg
- Smithfield
- Tioga

Area
Catchment ID

Catchment and Soils Area Table

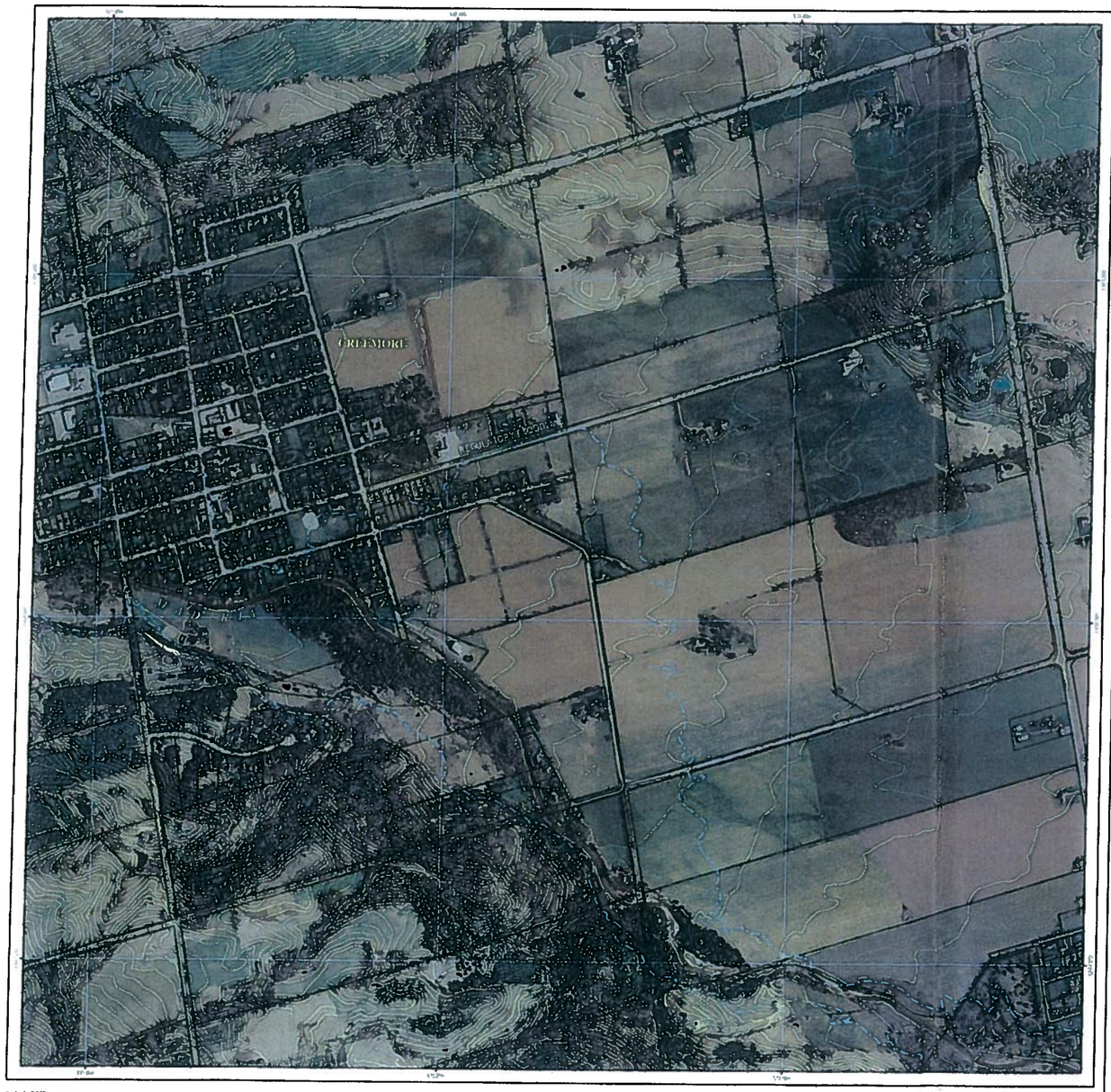
Catchment	Soil Code	Series	Acres	Hectare
1	Tis	Tioga	43.9	17.8
1	Tisl	Tioga	139.0	56.2
2	Bg	Buford	11.5	4.6
2	Hs	Harriston	18.7	7.6
2	Tisl	Tioga	64.7	26.0
3	Tisl	Tioga	6.9	2.7
3	Bg	Buford	12.3	5.3
5	Hs	Harriston	18.3	7.3
5	Opl-Duc	Osprey-Dunedin	61.0	24.4
4	Bg	Buford	2.6	1.0
4	Opl-Duc	Osprey-Dunedin	161.2	64.6
4	Opl-Duc	Osprey-Dunedin	142.4	57.0
5	Opl-Duc	Osprey-Dunedin	35.0	14.0
6	Tisl	Tioga	97.0	38.9
6	Bg	Buford	262.6	70.1

Statistics in the above table are based on non-overlapping catchments. Catchment areas listed on the map are based on overlapping catchments (e.g. Catchment 1 contains Catchments 2, 3, and 4).

Reference the Simcoe County Soil Map and Soil Survey Report No. 25 for more information.

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Regulatory Floodline

Township of Clearview

CREEMORE

Topographic Features

Contours (2m interval)

Regulatory Floodline (SEE NOTE BELOW)

Parcels

Scale: 1 : 6,000
1 cm on the map equals 100 m on the ground
Contour Interval: 2 Meter
Maximum Grid Interval: 1,000 Metres

Datum: North American Datum 1983 (NAD 83)
Projection: Universal Transverse Mercator (UTM) Zone 17

Map Compilation Date: 25 September, 2008

N
Grid North

0 100 200 300 400 500 600 700 800 900 1,000
Meters

0 100 200 300 400 500 600 700 800 900 1,000
Yards

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Department of Natural Resources: © Her Majesty the Queen in Right of Canada
Endowment Funds: © Her Majesty the Queen in Right of Canada
Township of Clearview
Nottawasaga Valley Conservation Authority

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Orthophotography and Contour data were updated April 2002.
Reference the County of Simcoe Data Map and Data Report No. 25 for more detailed data information.

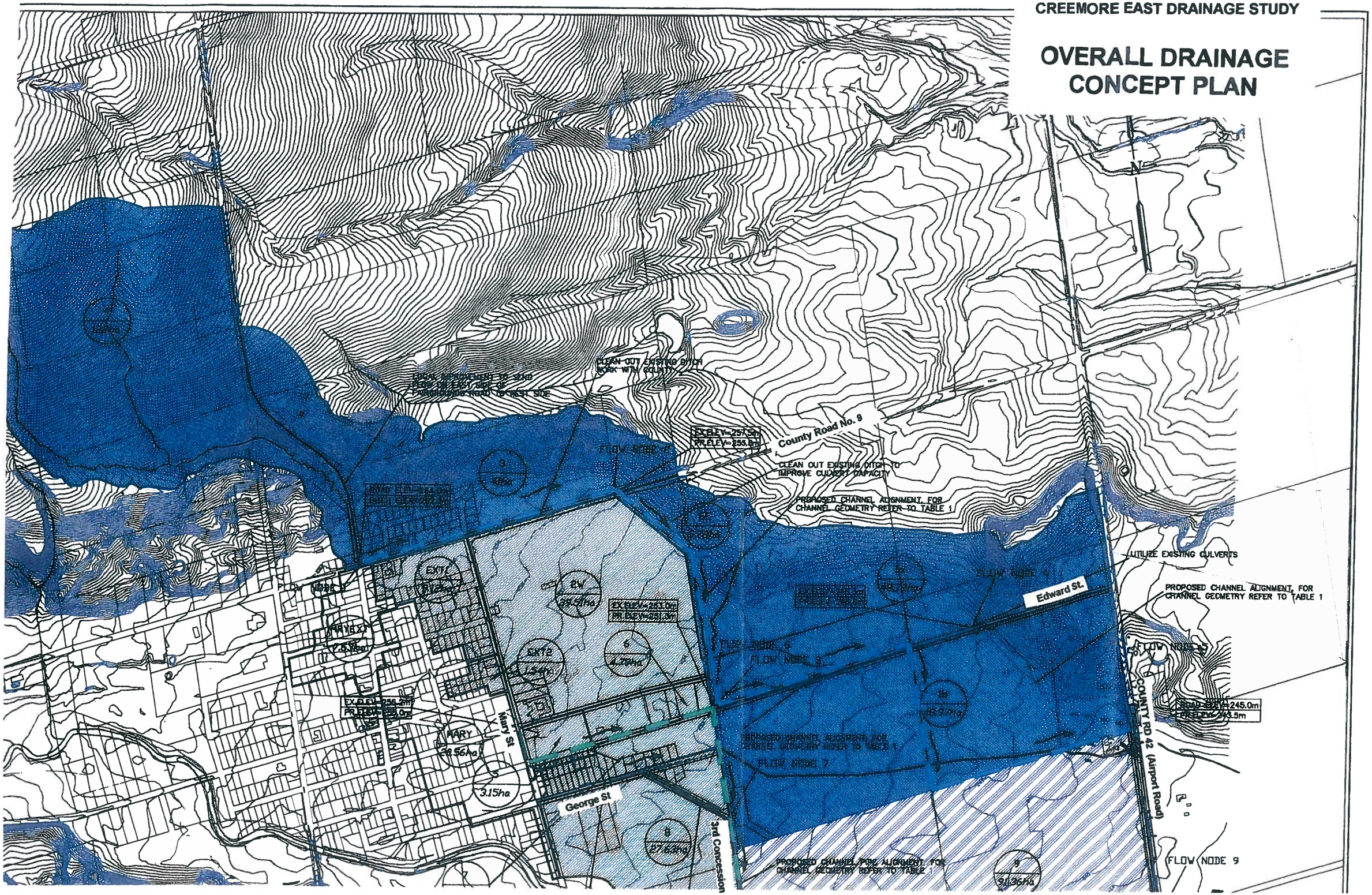
"Floodlines are approximate. Exact locations must be based on the elevations from the Mad River FDRP Flood Risk Study (J.G. Somers Ltd, Surveyors & Cumming Cockburn Ltd, dated January 5th, 1983) and site surveys. "

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CREEMORE EAST DRAINAGE STUDY

OVERALL DRAINAGE CONCEPT PLAN



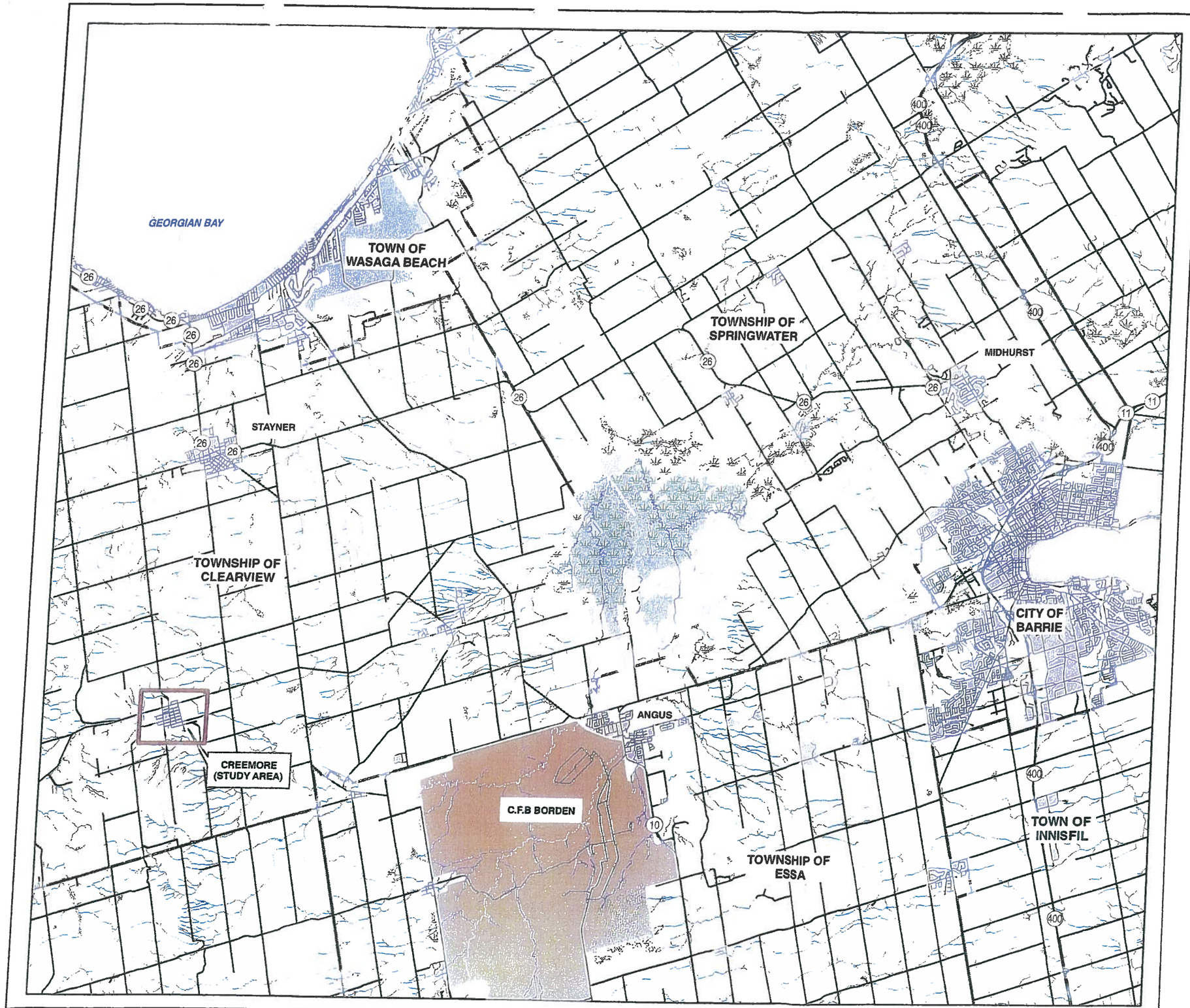


FIGURE 1

TOWNSHIP OF CLEARVIEW

CREEMORE DRAINAGE STUDY

LOCATION PLAN

Legend

- Study Area
- Waterbody: Lake / Pond / River
- Seasonally Flooded Area
- Wetland / Swamp / Bog
- Provincial Park
- Built-Up Area: Urban / Sub-Urban
- National Defence Land

Credit: Base Data Supplied by the Ontario Ministry of The Environment

N

0 5 10

Kilometers

Scale: 1:150,000
Date: May, 2009

Projection: UTM Zone 17
Datum: NAD 83

Project: MCG10770
Prepared By: Anthony Jay

Verified By: Dan Miller

BURNSIDE

F:\GIS\projects\MCG\10770\Map\Cartography\Figure1CreemoreDrainageStudy.mxd



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2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to this office prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.
4. Do not scale the drawings.

No.	Issue / Revision	Date
1	CLIENT REVIEW	MAY 16, 2007
2	PIC#2	JUN 28, 2007
3	LANDOWNER REVIEW	MAY 11, 2008

LEGEND

- PROPOSED CHANNEL AND/OR PIPE
- FLOW DIRECTION
- 3 / 45ha — CATCHMENT ID / DRAINAGE AREA
- TEN HILL DRAINAGE TO AIRPORT ROAD
- REMAINING LANDS DRAINAGE TO AIRPORT ROAD
- ALIANCE HOMES AND CENTRAL DRAINAGE TO MAD RIVER

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Client
TOWNSHIP OF CLEARVIEW
BOX 200
217 GIDEON STREET
STAYNER, ONTARIO
L0M 1S0

Drawing Title
CREEMORE EAST DRAINAGE STUDY
PROPOSED DRAINAGE IMPROVEMENTS

Drawn By	Checked By	Drawing No.
T.L		FIG4
Scale 1:7,500	Project No. MCG 10770	