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3358 Lakefield Road, Township of Selwyn, County of Peterborough

FUNCTIONAL SERVICING & PRELIMINARY STORMWATER MANAGEMENT REPORT

Triple T Holdings Ltd.

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1 Introduction

Tatham Engineering Limited (Tatham) was retained by Triple T Holdings Ltd. to prepare a Functional Servicing and Preliminary Stormwater Management (SWM) Report in support of a Draft Plan of Subdivision for a proposed development located in the Lakefield South Development Area (LSDA).

The preliminary servicing and SWM designs presented herein have been prepared in support of Zoning By-Law and Official Plan Amendment applications and a Draft Plan of Subdivision. The designs are based on extensive consultation with Township of Selwyn (Township), County of Peterborough (County) and Otonabee Region Conservation Authority (ORCA) staff and are coordinated with other studies which have been prepared in conjunction with this report including: a planning rationale report, a geotechnical investigation, an environmental impact assessment, a stage 1 and 2 archaeological assessment, and a traffic study report. A legal and detailed topographic survey have also been prepared for the site.

A pre-consultation meeting was held on March 8, 2018 at the County office. The Record of Pre-Consultation and relevant follow up email correspondence with the Township are attached in Appendix A. A follow up meeting between the Triple T Holdings Ltd., the Township and ORCA was held at the Township office on August 21, 2018. Key discussion points from this meeting are also attached in Appendix A.

1.1 SITE DESCRIPTION

The site consists of approximately 61.3 ha of undeveloped land located in the western portion of the LSDA in the Township of Selwyn, County of Peterborough. The site is bounded by Lakefield Road (County Road 29) and existing residential properties to the north and west, existing residential properties and undeveloped land located in the eastern portion of the LSDA to the east and existing rural residential properties and 7th Line to the south. Rays Creek bisects the western portion of the site and flows north from below Lakefield Road at the west limit of the site discharging across Lakefield Road at the north limit of the site. A key plan illustrating the site location is provided on the drawings included at the back of this report.

1.2 PROPOSED DEVELOPMENT

The proposed development consists of approximately 968 residential units comprised of townhouses (107), detached single family dwellings (281) and apartment units (580). Up to 8,500 m^2 of ground level neighbourhood commercial area is also proposed.

The Draft Plan of Subdivision which was prepared by J.B. Fleguel Surveyors in September 2020 is attached at the back of this report.

The proposed development will be constructed in approximately ten phases as illustrated on the Phasing Plan (Dwg. PH-1), attached at the back of this report.

The site will be serviced by the municipal watermain and sanitary sewers on Tower Road and Murray Street. Four SWM facilities are proposed to control and treat runoff from the future development upstream of the existing site outlets.

Two existing intersections located on Lakefield Road are forecasted to warrant traffic signals by 2029 as a result of the future development. The 7th line corridor of the former Smith Township will also require improvements to support access to the south side of the development. However, there is residual capacity in the existing road network to support some initial site development.

1.3 OBJECTIVES

The primary objectives of this report are to assess the feasibility of the proposed development with respect to servicing and SWM and to ensure satisfactory information is presented to demonstrate that the development can be graded and serviced in context with the overall LSDA and in accordance with the Township, County, Conservation Authority and the Ministry of the Environment, Conservation and Parks (MECP) design criteria.

1.4 GUIDELINES AND BACKGROUND REPORTS

This report was prepared recognizing municipal, provincial and agency guidelines and relevant background documents related to servicing and SWM including the following publications:

- Water Subdivision & Development Requirements (Peterborough Utilities Commission, June 2020);
- Engineering Design Standards, Infrastructure Management Division (City of Peterborough, April 2019);
- Lakefield Sanitary Servicing upgrades Environmental Assessment (D.M.Wills Associates, June 2016);
- Hydrogeological Assessment Submissions, Conservation Authority Guidelines for Development Applications (2013);
- Ontario Building Code (2012);
- Lakefield South Retirement Community Stormwater Management Report (Cole Engineering, December 2011);

- Low Impact Development Stormwater Management Planning and Design Guide (CVC and TRCA, 2010);
- Lakefield South Retirement Community Servicing Options Report (D.M.Wills & Associates Ltd., April 2008);
- Design Guidelines for Drinking Water Systems (MECP, 2008);
- Design Guidelines for Sewage Works (MECP, 2008);
- The Ministry of Environment Stormwater Management Practices Planning and Design Manual (2003);
- Traffic Impact Assessment, Lakefield South Development Area (Dillon Consulting Ltd., 2003);
- Lakefield South Development Plan Infrastructure Assessment (D.M.Wills & Associates, August 2003); and
- Lakefield South Development Area Opportunities and Constraints Study (ORCA, April 2003.

The following background reports pertaining to the site were also reviewed and have been submitted in conjunction with this report:

- Planning Justification Report – Lakefield South Plan of Subdivision, 3358 Lakefield Road (EcoVue Consulting Services Inc., November 2020).
- Tower Road Plan of Subdivision Environmental Impact Assessment (GHD Limited, October 20, 2020);
- Stage 1 and 2 Archaeological Assessment of 3358 Lakefield Road (Northeastern Archaeological Associates Ltd., June 2020);
- Lakefield South Subdivision Traffic Study Report, 3358 Lakefield Road (Tranplan Associates, March 2020);
- Geotechnical Investigation – 3358 Lakefield Road (Cambium Inc., September 18, 2020);
- Geotechnical Investigation – 2036 7th Line (Cambium Inc., March 14, 2017);
- Geotechnical Investigation – 3358 Lakefield Road (Cambium Inc., January 23, 2017); and

A USB containing these background reports is included at the back of this report.

2 Background Information

Information regarding the existing topography, ground cover and drainage patterns was obtained through a review of relevant background studies, detailed topographic survey and base mapping and was confirmed during site visits.

2.1 SITE TOPOGRAPHY

A legal and detailed topographic survey of the site was completed by JBF Surveyors in December 2019. The survey information was used to confirm existing elevations, features, drainage conditions and outlets from the site. Drainage conditions for external areas draining into the site were confirmed using contour information available from the Land Information Ontario database and the County of Peterborough online GIS mapping.

Existing drainage conditions will be described in detail in Section 7.1.

2.2 GEOTECHNICAL

A geotechnical investigation was completed by Cambium Inc. on September 9 and 10, 2019 and documented in their report dated September 18, 2020.

The investigation included a subsurface exploration program by means of excavating 22 test pits dispersed throughout the site. All test pits ended upon refusal of unweathered limestone bedrock at depths ranging from 0.7 to 3.4 metres below ground surface (mbgs). Groundwater seepage was observed only in one test pit at 2.2 mbgs and all the other test pits were dry. The soil encountered in the test pits consisted of 0.2 m to 0.5 m of topsoil underlain with silty sand to sandy till soils which included traces of gravel and clay and occasional cobbles. Several of the test pits revealed a clay layer or a layer consisting of gravel with sand. Weathered bedrock interbedded in the sandy and silty material and having a maximum thickness of 1.2 m was encountered in approximately half of the test pits.

Additional geotechnical investigations for the site were completed by Cambium Inc. in January 2017 and March 2017 which included 14 additional test pits.

Based on the relatively shallow depth to bedrock, the preliminary grading design has been developed to minimize earth cut and fill and rock excavation.

A more detailed account of the existing soil characteristics can be found in the geotechnical investigation reports included on USB at the back of this report.

3 Water Supply and Distribution

The water supply to the site will be provided from the municipal water distribution system. The 300 mm diameter watermain at Tower Road is connected to a 300 mm diameter watermain at Lakefield road to the north and is capped adjacent to the elevated water storage tower to the south. The water tower provides reliable pressure and emergency water storage in the municipal water distribution system. The watermain on Lakefield Road is capped approximately 60 m south of Tower Road.

A connection to the existing 300 mm diameter watermain on Tower Road is proposed to service Phase 1. However, in accordance with Peterborough Utilities Commission Water Subdivision and Development Requirements (June 2020), no more than 50 units are to be constructed before a second redundant feed is provided. This is intended to minimize customer disruption during a watermain repair. We have consulted with the Township and confirm this same design guideline applies to development at the site.

A potential watermain connection exists, through the servicing block between Tower Road and Coyle Crescent to provide a redundant feed to Phase 1 and to enable construction of up to 50 units in Phase 2, in advance of extending the Murray Street watermain to Tower Road. However further review of the Township's water distribution model would need to be completed to confirm the broader effects of this connection.

The Murray Street watermain extension to Tower Road is required for the ultimate development of the AON lands as well as Phase 3 and subsequent phases of development within the site. Currently an existing 200 mm diameter watermain exists at the south limit of Murray Street.

Based on printouts of the Township's water system WaterCAD model provided by D.M. Wills Associates Limited on behalf of the Township, pressures of 65.2 psi, 65.1 psi and 65.0 psi are available at the south limit of Water Tower Road during average day, maximum day and peak hour scenarios respectively, thus confirming sufficient system flow and pressure is available to service the initial phases of development including Phases 1 and 2. The printouts are included in Appendix B.

During the final design stage water demand calculations will be completed to confirm that the watermain sizes, pressures and velocities are in accordance with Peterborough Utilities Commission (PUC) and Ministry of the Environment, Conservation and Parks (MECP) guidelines during all phases of development. An internal WaterCAD model, will be prepared prior to the Murray Street watermain extension to confirm water system parameters under a looped water system configuration. The internal WaterCAD model will be provided to the Township to be

incorporated into the Township's water distribution model in order to analyze the effects of the proposed site demands on the overall water system and vis versa.

3.1 WATER SYSTEM DESIGN

The water system will be designed in accordance with PUC and MECP design criteria including but not limited to the following:

- Average per capita water consumption is estimated to be approximately 340 L/c/day as per the Lakefield Water Supply and Storage Facility – Class Environmental Assessment (Schedule B) Phase 1 and 2 Report (AECOM, 2010). For design purposes, a value of 450 L/c/day is recommended. For comparison purposes, MECP Design Guidelines recommends average daily domestic water demands of 270 to 450 L/c/day. Peaking factors are to be calculated in accordance with PUC and MECP guidelines;
- The minimum watermain size is 150 mm in diameter;
- The minimum depth of watermain and water services is 1.85 m, measured to the top of the pipe;
- Single family and townhouse units will be serviced with an individual 19 mm diameter water service whereas the size of the multi-residential building water services will be determined in the future when additional building details are known and water demands can be calculated for each. In both cases, the service connections will be terminated at the property line with a curb stop valve; and
- Maximum fire hydrant spacing of 150 m measured along the length of the watermain, to ensure a maximum hose length of 75 m to all buildings as per the PUC requirements.

The Preliminary Water Servicing Plan (Dwg. WM-1) illustrating the preliminary internal watermain layout, the potential connection to Coyle Crescent and the Murray Street watermain extension to Tower Road, is included at the back of this report.

4 Sanitary Sewer

The proposed sanitary collection system for the site will consist of internal gravity sewers, a temporary municipal sewage pumping station and forcemain and a trunk sanitary sewer along the east side of Rays Creek.

4.1 BACKGROUND SEWAGE COLLECTION SYSTEM IMPROVEMENTS

Municipal sanitary system upgrades to accommodate future development in the LSDA are advancing in accordance with the preferred alternative of the Lakefield Sanitary System Upgrades Environmental Assessment (2016).

To date the George Street SPS has been replaced and now provides an initial firm rated pumping capacity of approximately 45 L/s (20 L/s allowed for from the LSDA). The George Street SPS design includes provisions for staged increases in capacity up to a future firm rated pumping capacity of approximately 85 L/s (60 L/s allowed for from the LSDA). In addition, a new gravity sewer extension from Bridge Street to George Street and Fraser Street, which will connect the LSDA to the upgraded George Street SPS is scheduled to be tendered in 2020. This new gravity sewer will accommodate sanitary peak flows from the LSDA up to approximately 60 L/s.

Upon completing the new gravity sewer extension, the municipal sanitary sewer infrastructure downstream of the LSDA will have an initial sewage flow capacity of approximately 20 L/s to accommodate initial development in the LSDA. Once peak sewage flows from the LSDA exceed 20 L/s, the following external improvements will be required:

- Twinning of the existing forcemain under the Otonabee River with a new 250 mm diameter forcemain with the existing forcemain remaining to provide system redundancy;
- Replacement of portions of the existing gravity sanitary sewers upstream of the George Street SPS (George Street from Fraser Street to Clementi Street) when peak flows from the LSDA exceed approximately 20 L/s;
- Replacement of portions of existing gravity sewers downstream of the George Street forcemain discharge on Burnham Street (Water Street to Queen Street) and Queen Street (Burnham Street to Albert Street) when pumping capacity from the George Street SPS exceeds approximately 60 L/s or approximately 35 L/s from the LSDA;
- Replacement of portions of existing gravity sewers downstream of the George Street forcemain discharge on Albert Street (Queen Street to Regent Street), Regent Street (Albert Street to Duff Street) and Duff Street (Regent Street to Division Street(when the pumping

capacity from the George Street SPS exceeds approximately 75 L/s or approximately 50 L/s from the LSDA;

- Upgrading of the Lakefield Wastewater Treatment Lagoons when the overall system average daily sewage flows approach 2,070 m^3/d or 90% of the plant rated capacity; and
- Upgrading of the Water Street SPS when overall system peak sanitary flows exceed approximately 87.5 L/s (current firm rated pumping capacity of Water Street SPS).

4.2 PROPOSED SANITARY SERVICING FOR THE SITE

Based on consultations with the Township, the sewage collection system improvements described in Section 4.1, which are external to the site and which are needed to support growth within the LSDA, will be completed by the Municipality only as development advances in the LSDA. Individual developers are responsible for constructing all sanitary sewers in the LSDA, including trunk sewers as well as any local sewage pumping stations. The preliminary sanitary servicing design for the site is therefore focussed on the proposed sanitary sewers which are located in the LSDA.

A 200 mm diameter sanitary sewer exists at the southern end of Tower Road at SAN MH 201 and flows north to Lakefield Road. The sewer increases to 300 mm in diameter at SAN MH 208, approximately 160 metres upstream (south) of Lakefield Road.

Due to the elevation and limited flow capacity in the 200 mm diameter sewer on Tower Road, a 300 mm diameter gravity sanitary sewer extending upstream from SAN MH208 and generally following the Rays Creek alignment is proposed to service the western portion of the LSDA and the majority of the site.

Sewage design flow and peak flow calculations for the LSDA including the site area have been estimated based on information contained in the Lakefield Sanitary System Upgrades Environmental Assessment (June 2016). Specifically, average daily wastewater flows for the Lakefield wastewater system have historically been 25% higher than average daily demands of the drinking water system (which were determined to be 340 L/c/day). It is assumed that the 25% increase is due to extraneous flows. For design purposes, an average daily domestic sewage flow of 450 L/c/day has been used for the proposed residential development. For comparison, MECP Design Guidelines recommend a range of 225 to 450 L/c/day.

The estimated sewage design flows directed to the existing 200 mm diameter gravity sewer on Tower Road and the proposed 300 mm diameter gravity sewer along Rays Creek, from the total LSDA, are summarized in the following sections. For ease of review, the overall LSDA has been split into the five sewer catchment areas illustrated on the LSDA Sewer Catchment Area Plan (Dwg. S-1) included at the back of this report.

4.3 SEWAGE TO EXISTING 200 MM DIAMETER SEWER ON TOWER ROAD

Referring to drawing S-1, the areas highlighted in orange, yellow and purple illustrate sanitary catchment areas that are proposed to drain to the existing 200 mm diameter sanitary sewer on Tower Road at SAN MH 201.

The area in orange is a portion of the site consisting of 30 townhouse units, 39 single family units and 184 apartment units. Sewage flow from this area is ultimately intended to drain east to a future sewage pumping station (SPS) located in close proximity to the Otonabee River, and pumped west to Tower Road via a future forcemain, in accordance with the preferred alternative of the background EA. However, based on our understanding that the LSDA lands east of the site are not planned for development in the near future, sewage from the majority of the area in orange will drain by gravity to a temporary SPS located at the east limit of the site. A small portion of the area in orange fronting onto and near Tower Road is proposed to drain directly to the Tower Road gravity sewer. The temporary SPS will pump sewage west to the existing 200 mm diameter gravity sewer at the south end of Tower Road via a forcemain. If plans for development of the LSDA lands east of the site are advanced prior to construction of the temporary SPS, the sewage collection systems of both properties can be coordinated to drain by gravity to a permanent SPS located west of the Otonabee River.

The estimated peak flow from only the area in orange is 13.7 L/s. Development of the majority of the area in pink is deferred until Phase 9 due to the significant cost of the temporary SPS and due to the uncertainty related to timing for development of the east portion of the LSDA which would eliminate the need for the temporary SPS.

An alternative gravity outlet exists for the catchment area draining to the temporary SPS, by draining sewage north through the AON Inc. lands within the Murray Street road alignment and west along the north limit of the AON Inc. lands and ultimately discharging into the Tower Road gravity sewer at SAN MH 204. This alternative requires further consultation with AON Inc. and the Township. If it is determined to be feasible, it would eliminate the need for a temporary SPS and will result in the Phase 9 lands being developed in an earlier phase. The alternative option to service the Aon Inc. property and the Phase 9 lands is shown schematically on Drawings S-1 and SAN-1.

The area in yellow consists of the AON Inc. property and represents approximately 6.5 hectares of developable land. This Draft Approved development consists of 26 single family units, 200 apartment units, a retirement facility (including 126 long-term care beds) and a medical centre. Sewage from a portion of the AON Inc. property is proposed to connect into the existing sewer on Murray Street. Two options are provided in the Servicing Options Report prepared by D.M.Wills Associates Limited dated April 2008 including:

Option 1 – Service only half of the length of the proposed Murray Street extension by a gravity sewer draining to the north and the south half of the Murray Street extension by a temporary SPS.

Option 2 – Service only the lots serviceable by gravity and provide individual pumping systems for the apartment buildings and other proposed buildings not able to connect to the sanitary sewer by a gravity system. We assume that the south portion of the Murray Street extension would remain undeveloped until such time that the future lots could be serviced by a SPS station located in the LSDA.

Both Options 1 and 2 rely on pumping stations for the ultimate development of the AON Inc. site.

As indicated above, an alternative gravity outlet to Tower Road exists for all sewage from the AON Inc. property. Otherwise, the south portion of the AON Inc. property will drain south by gravity to a temporary SPS located within the site or a permanent SPS located on the adjacent lands east of the site to be pumped to the existing gravity sewer at the south limit of Tower Road. For the purposes of this study and for conservatism, all flows from the AON Inc. property are assumed to drain to the gravity sewer on Tower Road. The estimated peak flow from only the area in yellow is 16.3 L/s and the total flow has been included in our review of the existing Tower Road gravity sewer.

The area in purple is comprised of approximately 57.1 ha of currently undeveloped lands located in the east portion of the LSDA. Based on available background information contained in the County Official Plan, the future use of these lands will consist of 41.7 ha of low-density residential, 2.8 ha of recreational open space, 7.5 ha of environmental constraint area and 5.1 ha of site-specific policy area. The recreational open space and environmental constraint areas have been excluded from the sanitary design flow calculations. The site-specific policy area has been included as low-density residential area for the purposes of estimating sewage design flows however these design flows will need to be confirmed in the future once the land use has been confirmed. Sewage from the area in purple will drain by gravity from west to east to a permanent SPS located west of the Otonabee River where it will be pumped to the Tower Road gravity sewer. Ideally, the SPS would be designed for the entire east portion of the LSDA including a portion of the site and the AON Inc. property however this will depend on each individual landowner's timing for development. The estimated peak flow from only the area in purple is 48.7L/s.

The combined sewage peak flow that is directed to the 200 mm diameter gravity sewer at the south limit of Tower Road is 74.1 L/s. The existing capacity of the 200 mm diameter sewer between SAN MH 201 and SAN MH 208 is limited by the section of sewer pipe between SAN MH

204 and SAN MH 205 which has a pipe slope of 0.69%. The capacity of a 200 mm diameter sewer sloped at 0.69% (flowing 80% full) is 21.8 L/s.

Based on the above, the existing 200 mm diameter sanitary sewer between SAN MH 201 and SAN MH 208 is undersized to convey the ultimate development peak flow from the LSDA directed to it. However, the existing sewer has capacity to convey some initial development including the estimated peak flows from the site and the majority of the estimated flows from the AON Inc. property. Timing for improvements to the Tower Road sanitary sewer should be reviewed on an ongoing basis as development occurs within the LSDA.

4.4 SEWAGE TO PROPOSED 300 MM DIAMETER SEWER ALONG RAYS CREEK

Referring to drawing S-1, the areas highlighted in blue and green illustrate sanitary catchment areas that are proposed to drain to the proposed 300 mm diameter Rays Creek gravity sewer.

The area in blue is a portion of the site development, consisting of 77 townhouse units, 242 single family units, 396 apartment units and up to 8,500 m^2 of ground floor commercial area. The sewage flow calculations exclude the recreational open space area. The estimated peak flow from the area in blue is 42.0 L/s.

The area in green is approximately 10.5 ha and is comprised of a combination of residential and commercial land uses and a recreational speed skating oval. Based on available background information contained in the County Official Plan, the future use of these lands will consist of 2.6 ha of low-density residential area, 1.1 ha of neighbourhood commercial area, 2.1 ha of site-specific policy area and 0.1 ha of environmental constraint area. The site-specific policy area has been included as neighbourhood commercial area for the purposes of estimating sewage design flows however these design flows will need to be confirmed in the future once the land use has been confirmed. No sewage flows have been assigned for the environmental constraint area and the speed skating oval property. The estimated peak flow from the area in green is 13.3 L/s.

The combined sewage peak flows from the areas in blue and green to the proposed 300 mm diameter Rays Creek gravity sewer is 54.7 L/s. The proposed 300 mm diameter sewer at a minimum slope of 0.4% will convey a maximum flow of 48.9 L/s at 80% capacity and 55.0 L/s at 90% capacity and therefore will have sufficient capacity to convey sewage from the west portion of the LSDA.

The profile and alignment of the 300 mm diameter sewer along Rays Creek was resolved following extensive consultation with the Township and ORCA staff, whereby intrusion into the existing wetland has been minimized as much as possible without compromising the function of the sewer to service a large portion of the LSDA. During pre-consultations directionally drilling was suggested as a means to mitigate potential impacts of the sewer construction on the wetlands.

However from a constructability and long-term maintenance perspective, an open cut sewer installation is recommended due to the varying elevation of bedrock and the difficulty of being able to maintain a constant sewer profile at minimum grade where the drill head enters and exists bedrock. This will be reviewed in detail at the final design stage in consultation with ORCA and the Township. To mitigate impacts of the sewer construction on the wetlands, clay trench plugs are recommended at regular intervals. Rapid sewer construction is also recommended (7 am to 7 pm) and same day reinstatement of the surface material to reduce dewatering activities as much as possible.

The 300 mm diameter sewer will be constructed in phases, only as required to service development in the west portion of the LSDA.

4.5 SEWAGE TO EXISTING SEWERS DOWNSTREAM OF MH 208

The peak sewage design flow from the ultimate buildout of the LSDA to SAN MH 208 is approximately 122.8 L/s and is more than double the estimated peak flow for the LSDA calculated in the background EA of 60.0 L/s. Upon completion of the new gravity sewer extension from Bridge Street to George Street and Fraser Street, which will connect the LSDA to the new George Street SPS, up to 20.0 L/s of peak sewage flows from initial site development within the LSDA can be accommodated in the downstream municipal infrastructure. Once peak sewage flows from the LSDA exceed 20 L/s, additional downstream sanitary system improvements will be required.

It is recommended that sewage flows from the LSDA be monitored on a regular basis as development proceeds to properly plan for the critical downstream infrastructure improvements that are needed to support the ultimate buildout of the LSDA.

4.6 SANITARY DESIGN

The sanitary sewer system will be designed in accordance with MECP design criteria including but not limited to the following:

- An average daily domestic sewage flow of 450 L/c/day is to be used for residential development whereas MECP Design Guidelines recommend a range of 225 to 450 L/c/day. Average daily domestic sewage flow from the commercial uses is to be in accordance with the OBC. Peaking factors are to be calculated in accordance with MECP guidelines;
- Single family and townhouse lots will have individual 100 mm diameter services sloped at a minimum of 2.0%;
- Sanitary services to multi-residential blocks will be sized in the future when additional building details are known;

- Minimum sewer pipe size is 200 mm in diameter;
- Minimum pipe cover from centerline finished grade: 2.75 m;
- Minimum pipe slope of 0.5% for all local sewers and 1.0% for the first upstream leg. The 300 mm diameter Rays Creek sewer will be sloped at a minimum of 0.4% in accordance with MECP guidelines.
- Minimum velocity of 0.6 m/s; and
- Maximum velocity of 3.65 m/s.

The preliminary sewage design calculations are attached in Appendix C and the layout of the proposed sanitary sewer within the site is illustrated on Drawing SAN-1.

5 Internal Roadways and Transportation

A traffic impact assessment was completed for the Lakefield South Development area by Dillon Consulting Limited in 2003. A revised traffic study report was completed by Tranplan Associates in March 2020. The revised study includes a comprehensive review of seven study intersections including five existing intersections and two new intersections. The revised traffic impact study which includes conclusions and recommendations is attached on USB at the back of this report.

The proposed internal roadways will consist of new local roads and collector roads. The new local roads will provide direct access to the low-density residential uses and are proposed to follow a 20.0 m road cross section having an 8.5 m asphalt width which follows the City of Peterborough's Typical Local Road Cross Section. The new collector roads will provide north-south access to the adjacent County and Township road network and east-west access connecting to the Murray Street and Clementi Street corridor to provide access to the core areas of the Village. The new collector roads are proposed to follow a 20.0 m road cross section having a 10.0 m asphalt width which follows the City of Peterborough's Typical Collector Road Cross Section.

Active transportation links consisting of pathways and green trails will be incorporated throughout the subdivision which will be connected to the internal sidewalk system along the collector roads and the existing sidewalks along Lakefield Road and Murray Street.

Based on the findings of the geotechnical investigation, the minimum pavement structure designs for the internal roadways and any other areas where truck traffic is anticipated will consist of the following:

- Surface course asphalt – 40 mm HL3 or HL4
- Binder course asphalt – 50 mm HL8
- Granular Base – 150 mm OPSS 1010 granular 'A'
- Granular Subbase – 400 mm OPSS 1010 granular 'B'

In the future, the internal roads will be assumed by the City which will undertake routine maintenance and snow plowing.

6 Grading

The overall grading design matches existing ground elevations along the perimeter of the site and along the environmental constraint boundary. All site development is proposed outside of the Rays Creek floodplain. We have confirmed there are no existing ground slopes within the development boundary which exceed 3:1 (H:V) and therefore there are no steep slope erosion hazards. Internal road grading has been developed to ensure the majority of stormwater runoff is conveyed to the internal storm sewers which will be sized with capacity for flows generated by a 5-year return period storm event. The internal grading design also minimizes the amount of earth cut and fill and rock excavation while providing sufficient cover over proposed services and while directing stormwater runoff in excess of the storm sewer capacity to the SWM facilities.

The proposed development will be graded in a manner which will satisfy the following goals:

- Minimum road grade: 0.5%
- Maximum road grade: 5.0%
- Minimum lot grade: 2.0%
- Maximum lot grade: 5.0%
- Provide continuous road grades for overland flow conveyance
- Minimize the need for retaining walls
- Minimize the volume of earth to be moved and balance cut with fill on the site
- Minimize the need for rear lot catchbasins
- Achieve the SWM objectives required for the proposed development

Due to the shallow depth to bedrock, rock excavation will be required during servicing construction, primarily for the sanitary sewer installation. This can not be avoided without having to import a large volume of fill which was determined to be cost prohibitive. Due to the shallow depth to bedrock, slab on grade or raised basement type construction, should be considered within the individual building lots to reduce the need for rock excavation.

7 Stormwater Management

The primary objective of the preliminary SWM plan is to demonstrate that the proposed development will not adversely impact the hydrologic cycle and surface water runoff characteristics of the area. This will be accomplished by evaluating the effect of the development on local drainage conditions. Where necessary, solutions will be provided to mitigate any adverse impacts. Issues to be addressed and criteria to be met regarding drainage and SWM are summarized as follows:

- The site will be developed in accordance with all relevant Municipal, Provincial and Agency SWM criteria;
- MECP "Enhanced" treatment level water quality control will be provided, to ensure the development will have no negative impacts on the downstream receivers;
- All post development peak flows directed to each existing outlet will be reduced at or below existing condition peak flow rates during the 2-100-year design storm events based on 4-hour Chicago and 24-hour SCS Type II design storms;
- Existing condition annual infiltration volumes with the catchment area to each outlet are to be matched or increased in the proposed condition;
- Safe conveyance of storm flows from all storms up to and including the Regional (Timmins) Storm event; and
- Implementation of erosion and sediment control measures during and following construction until the ultimate build-out of the site to minimize erosion and sediment transport off-site.

The preliminary SWM plan was prepared recognizing provincial guidelines on water resources and the environment, including the following publications:

- Ministry of Municipal Affairs and Housing Provincial Policy Statement (2020);
- The Otonabee Region Conservation Authority (ORCA) Watershed Planning and Regulations Policy Manual (2012);
- Low Impact Development Stormwater Management Planning and Design Guide (CVC and TRCA, 2010);
- The Ministry of Environment (MOE) Stormwater Management Practices Planning and Design Manual (2003); and
- The Ministry of Natural Resources (MNR) Natural Hazard Technical Guide (2001).

7.1 EXISTING SITE DRAINAGE CONDITIONS

The existing topography, ground cover, and drainage patterns were obtained through a review of relevant background studies, available plans, base mapping, and site investigation. A detailed topographic survey of the site was completed by J.B. Fleguel Surveyors in December 2019 to confirm existing features and elevations.

The site consists primarily of cultivated agricultural field, lightly treed and wetland areas. Existing condition catchment areas within the site have been delineated based on four existing surface water outlets

The SWM plan proposed herein has been developed to match existing condition peak flow rates at each surface water outlet. Portions of the site which have been identified as either floodplain, wetland or wetland buffer have been excluded from the existing (and proposed) condition catchment areas and hydrologic analysis as these areas are not developable and will remain undisturbed following development. Areas of the site which are located west of Rays Creek have also been excluded on the basis that only the lands east of Rays Creek are proposed for development at this time.

Outlet 1

The northern portion of the site (Outlet 1, Catchment 101 – 2.2 ha) drains overland to the north west at an average grade of 3.8 % and discharges into an existing wetland located on the east side of Rays Creek. Rays Creek flows north across Lakefield Road via a 3.6 m wide by 1.2 m high concrete box culvert and discharges into Katchewanooka Lake/Otonabee River approximately 650 m north of Lakefield Road.

Outlet 2

The western portion of the site (Outlet 2, Catchment 102 – 12.0 ha) drains overland to the northwest at an average grade of 3.5 % and discharges into a wetland along the east side of Rays Creek.

Outlet 3

The south west portion of the site (Outlet 3, Catchment 103 – 13.3 ha) drains overland to the south west at an average grade of 1.6 % discharging into a wetland located east of Lakefield Road, north of 7th Line. Discharge from the wetland drains west across Lakefield Road via a concrete box culvert (approximately 0.9 m wide x 0.900 m high with 0.9 m diameter CSP culvert extensions on either side, and west into Rays Creek approximately 200 m west of Lakefield Road.

Outlet 4

The east portion of the site (Outlet 4, Catchment 104 – 15.5 ha) drains overland to the east at an average grade of 1.6 % discharging into an intermittent tributary watercourse to the Otonabee River which is located on the adjacent property to the east.

The ultimate receiver of runoff from all outlets from the site is the Otonabee River.

An Existing Conditions Drainage Plan, Drawing DP-1, which depicts the existing condition drainage patterns, is included at the back of this report.

7.2 EXTERNAL DRAINAGE CONDITIONS

External drainage areas which drain into the developable portions of the site are described below. Safe conveyance of runoff from external drainage areas has been allowed for in the SWM plan included herein.

Catchment EXT-1 (3.2 ha) consisting of the rear portion of several rural residential lots fronting 7th Line, drains overland into Catchment 103 at an average grade of 2.5%. Runoff from this area combines with runoff from Catchment 103 and discharges into the existing wetland at Outlet 3.

Catchment EXT-2 (1.8 ha) also consisting of the rear portion of several rural residential lots fronting 7th Line, drains overland into Catchment 104 at an average grade of 1.3 %. Runoff from this area combines with runoff from Catchment 104 and drains to Outlet 4, discharging into the intermittent tributary to the Otonabee River.

Catchment EXT-3 (5.3 ha) consisting of the majority of the AON Inc. property drains overland to the north east in the direction of the Otonabee River at an average grade of 2.1 %. Although runoff from this area does not drain into Catchment 104, it contributes runoff to Outlet 4. The AON Inc. property has the potential to drain into a centralized SWM facility located with Catchment 104 and on this basis, Catchment EXT-3 has been included in the existing conditions hydrologic analysis included herein.

Tower Road consist of a 26.0 m right-of-way and an 11.0 m wide road platform. It is fully urbanized from Lakefield Road to the elevated water storage tower. A storm sewer exists on the west side of the road ranging in size from 600 mm in diameter adjacent to the water tower to 900 mm in diameter where it outlets to an open ditch at an existing headwall located approximately 80 metres south of Lakefield Road. The ditch is located within the 26.0 m road allowance and flows north and west eventually discharging into Rays Creek immediately upstream of a 3.2 m x 1.2 m concrete box culvert at Lakefield Road. The contributing drainage area to the Tower Road storm system consists of Tower Road itself, Coyle Crescent, portions of Murray Street, and the west portion of both the AON Inc., and the Lakefield District Public School properties. The site area west of Tower Road is lower in elevation than the road and therefore

drains away from Tower Road. On this basis, the drainage conditions within Tower Road and areas upstream are separated from the internal drainage and SWM plan for the site and have therefore been excluded from the existing and future condition hydrologic analyses included herein.

An Existing Conditions Drainage Plan, Drawing DP-1, which depicts the external drainage conditions, is included at the back of this report.

7.3 EXISTING CONDITION HYDROLOGICAL ANALYSIS

A Visual Otthymo hydrologic model (VO6) has been developed to quantify existing condition peak flows from the site and external areas.

The catchment delineations were completed based on the site area proposed for development, the environmental constraint boundaries and the limits of external drainage areas draining into the site. Land uses were established based on field reconnaissance and a review of online aerial photography. The land uses and soil information were used to establish the curve numbers (CN) and other catchment parameters used in the hydrologic model. The CN values were converted to modified CN values (CN*) for use in the Otthymo model. The time to peak values for the catchment areas were calculated using the Bransby Williams and Airport Methods for runoff coefficients “C” greater than and less than 0.4 respectively.

A summary of all catchment parameters established for the existing condition hydrologic model have been included in Appendix D.

Peak flows for storms up to and including the 100-year storm were calculated for the 4-hour Chicago and 24-hour SCS Type II design storms generated using the 2006 City of Peterborough Intensity-Duration-Frequency (IDF) Data (Peterborough Airport) as well as for the Regional (Timmins) Storm. Detailed calculations and Visual Otthymo modeling output are included in Appendix D with the results summarized below in Tables 1-4. The digital hydrologic model files are included on the USB at the back of this report.

Table 1: Existing Conditions Peak Flow Summary – Outlet 1

DESIGN STORM	CATCHMENT 101 2.2 ha (m^3/s)	
	CHI	SCS
25 mm	0.010	-
2-Year	0.020	0.041
5-Year	0.041	0.073
10-Year	0.058	0.097
25-Year	0.082	0.131
50-Year	0.103	0.157
100-Year	0.126	0.185
Regional Storm (Timmins)	0.220	

Table 2: Existing Conditions Peak Flow Summary – Outlet 2

DESIGN STORM	CATCHMENT 102 12.0 ha (m^3/s)	
	CHI	SCS
25 mm	0.050	-
2-Year	0.099	0.202
5-Year	0.203	0.359
10-Year	0.286	0.480
25-Year	0.410	0.648
50-Year	0.515	0.784
100-Year	0.628	0.924
Regional Storm (Timmins)	1.174	

Table 3: Existing Conditions Peak Flow Summary – Outlet 3

DESIGN STORM	CATCHMENT 103 13.3 ha (m^3/s)		CATCHMENT EXT-1 3.2 ha (m^3/s)		TOTAL OUTLET 3 16.5 ha (m^3/s)	
	CHI	SCS	CHI	SCS	CHI	SCS
25 mm	0.047	-	0.013	-	0.058	-
2-Year	0.088	0.156	0.025	0.048	0.109	0.197
5-Year	0.171	0.270	0.050	0.084	0.214	0.342
10-Year	0.236	0.357	0.070	0.113	0.296	0.453
25-Year	0.332	0.477	0.100	0.151	0.417	0.606
50-Year	0.413	0.573	0.125	0.183	0.520	0.729
100-Year	0.500	0.671	0.152	0.215	0.631	0.855
Regional Storm (Timmins)	1.106		0.303		1.394	

Table 4: Existing Conditions Peak Flow Summary – Outlet 4

DESIGN STORM	CATCHMENT 104 15.5 ha (m^3/s)		CATCHMENT EXT-2 1.8 ha (m^3/s)		CATCHMENT EXT-3 5.3 ha (m^3/s)		TOTAL OUTLET 4 22.6 ha (m^3/s)	
	CHI	SCS	CHI	SCS	CHI	SCS		
25 mm	0.063	-	0.008	-	0.025	-	0.095	-
2-Year	0.117	0.212	0.015	0.028	0.046	0.085	0.176	0.322
5-Year	0.229	0.368	0.029	0.048	0.090	0.148	0.344	0.557
10-Year	0.317	0.486	0.041	0.063	0.125	0.195	0.477	0.736
25-Year	0.446	0.649	0.057	0.085	0.176	0.261	0.671	0.983
50-Year	0.555	0.780	0.071	0.102	0.219	0.314	0.837	1.182
100-Year	0.672	0.915	0.086	0.119	0.266	0.368	1.014	1.387
Regional Storm (Timmins)	1.392		0.169		0.507		2.061	

7.4 STORMWATER MANAGEMENT ALTERNATIVES

The preliminary SWM plan is subject to the review and approval of the Township, County and ORCA. For intensive development SWM practices to provide both quantity and quality control of stormwater runoff are required. The MECP SWM design guidelines recommends using the following methods of stormwater management:

Lot Level Source Controls

Lot level controls include measures such as roof leader soak away pits, rear yard ponding areas, reduced grading, rear and side yard swales and other localized lot grading. Other methods of at-source stormwater management controls include Low impact development (LID) practices including rainwater harvesting, green roofs, roof downspout disconnection, infiltration trenches and chambers, vegetated filter strips and permeable pavement. These methods of stormwater control are beneficial since they reduce peak flows from storm events before being conveyed to the watershed. However, the above practices are site specific based on the existing soil conditions and require regular maintenance to be effective. Use of these practices is recommended but only to an extent that is achievable without requiring excessive maintenance.

Conveyance Controls

Infiltration trenches and perforated pipes are two examples of conveyance controls. Typically, these controls attempt to attenuate peak flows on route to the watershed by allowing the stormwater to infiltrate the existing soil. These methods of controlling stormwater are only effective if the soils have good drainage capabilities as are expected onsite. Poor construction practices also reduce the effectiveness of these stormwater management controls. Conveyance controls should be evaluated further at the final design stage.

End-of-Pipe Facilities

End-of-pipe facilities are typically wet ponds, dry ponds or wetlands that control stormwater runoff from an entire development area. These facilities allow all stormwater to be retained and released at a rate equal to that of pre-development and can provide effective quality and quantity control of storm events. The major negative attributes of these facilities are that they require significant land area to provide the treatment controls thus the larger the development the greater the required pond size.

The preliminary SWM plan for the site includes an oil-grit-separator, a dry pond, a wet pond, a hybrid wet/dry pond and a wetland. These facilities will provide water quantity and quality control for the proposed development. LID practices including increased topsoil depth combined with roof downspout disconnection, infiltration trenches , and enhanced grassed swales will be

specified as required to match or increase the existing annual infiltration volume and to reduce the runoff volume directed to each outlet.

7.5 STORMWATER MANAGEMENT PLAN

The preliminary SWM plan for the site has been developed recognizing the SWM requirements for the site. The internal roadways will be constructed to a municipal road cross section standard with all minor system drainage from the roadways and the development areas being captured by a network of storm sewers sized to convey flow from the 5-year storm. Roads and overall lot grading will be constructed to follow the existing topography of the land as much as possible to maintain the pre-development drainage patterns, while still directing major flows overland to the SWM facilities.

The proposed condition drainage patterns are shown on Drawing DP-2.

Separate SWM plans have been developed for each outlet and are described below. LID practices, which will contribute towards maintaining the annual infiltration volume at the site and ensuring a treatment train approach to SWM will be specified upstream of each outlet. The details of the proposed LIDs will be resolved at the final design stage whereas sizing of end-of-pipe SWM facilities is provided herein to demonstrate adequate area has been provided for each to confirm the feasibility of the proposed development.

Outlet 1

A dry SWM facility (SWMF 1) is proposed to provide water quantity control for runoff from Catchment 201 (2.2 ha). SWMF 1 will be designed to control all flows up to and including the 100-year storm such that the controlled peak flows from Catchment 201 are reduced at or below existing condition peak flow rates. 24 hour extended detention will also be provided within SWMF 1 for erosion control. An emergency overflow will be incorporated into the pond design to safely convey all emergency flows directly to Rays Creek.

Since the drainage area of Catchment 201 is less than 5.0 ha, a wet pond cell to provide enhanced level water quality control is not feasible. An oil-grit separator is therefore proposed upstream of the dry pond cell to provide pre-treatment and MECP enhanced level water quality control. Additional LID type practices including infiltration galleries for infiltrating rooftop runoff will be analysed in detail at the final design stage in consideration of the detailed site grading and shallow depth of bedrock.

Outlet 2

The preliminary SWM plan for Outlet 2 includes a hybrid wet/dry SWM facility (SWMF 2) which will provide water quality and quantity control for the western portion of the site including runoff

from all of Catchment 202 (15.5 ha). Stormwater runoff from this catchment will drain into the SWM facility via two wet cells each sized to provide MECP enhanced level water quality control for runoff from the contributing drainage areas. The contributing drainage area to Wet Cell 2 (west wet cell) is less than 5.0 ha and accordingly Wet Cell 1 (east wet cell) will flow through Wet Cell 2 in order to top up and maintain a permanent pool within the west cell. Wet Cell 2 will overflow into the dry cell which will provide water quantity control during all storms up to and including 100-year storm such that the controlled peak flows from Catchment 202 are reduced at or below existing condition peak flow rates. 24 hour extended detention will also be provided within SWMF 2 for erosion control. An emergency overflow will be incorporated into the pond design to safely convey all emergency flows from the dry cell to Rays Creek. The design concept for SWMF 2 which consists of two wet cells and one dry cell at all different elevations was developed to minimize rock excavation to the extent possible.

Outlet 3

The preliminary SWM plan for Outlet 3 includes a wetland (SWMF 3) which will provide water quality and quantity control for the south west portion of the site including runoff from Catchment 203 (9.0 ha) and external area EXT-1 (3.2ha). Stormwater runoff directed to the wetland will drain into the SWM facility via a forebay for pre-treatment. The forebay will overflow into the main wetland call having a permanent pool depth of 0.3 m. the wetland will provide enhanced level water quality control and will control all flows up to and including the 100-year storm such that the controlled peak flows from Catchment 203 and EXT-1 are reduced at or below existing condition peak flow rates. 24 hour extended detention will also be provided within SWMF 3 for erosion control. An emergency overflow will be incorporated into the pond design to safely convey all emergency flows from the dry cell to Rays Creek.

In addition, the wetland area has been sized to provide a 2:1 wetland compensation for a portion of existing wetland that will be removed by the proposed development. A 15.0 metre development buffer has also been applied to the proposed wetland. The proposed wetland will be designed in accordance with MECP design guidelines and will provide additional surface water inputs to the existing wetland immediately beyond the limits of the of the site.

Outlet 4

The preliminary SWM plan for Outlet 4 includes a wet SWM facility (SWMF 4) which will provide water quality and quantity control for the eastern portion of the site as well as the future AON Inc. property. The SWMF 4 will control runoff from Catchments 204 (16.3 ha), EXT-2 (1.8 ha), and PEXT-3 (6.9 ha) and direct it to an intermittent watercourse at Outlet 4. Stormwater runoff will drain into the SWMF 4 via two inlets. A sediment forebay will be provided at each inlet to provide pre-treatment for the main pond cell and each will be sized in accordance with MECP

design criteria. Sufficient water quantity control is provided in the pond to reduce post development peak flows during all storms up to and including the 100-year storm such that the proposed condition peak flows to Outlet 4 are reduced at or below existing condition peak flow rates. 24 hour extended detention will also be provided within SWMF 4 for erosion control. An emergency overflow will be incorporated into the pond design to safely convey all emergency flows from SWMF 4 to Outlet 4.

A proposed conditions drainage plan (Dwg. DP-2) and a preliminary SWM drawing (Dwg. SWM-1) illustrating details of all catchment areas and preliminary cross sections of each SWM facility, are included at the back of this report.

7.5.1 Internal Conveyance of External Drainage

Minor and major system drainage from external Catchments EXT-1 and EXT-2 will be captured by rear lot swales and rear lot catchbasins and will be safely conveyed to SWMF3 and 4 respectively.

Treatment and control of runoff from Catchment PEXT-3, which includes all of the AON inc. property, has been allowed for in SWMF 4 and will be conveyed to the SWMF 4 via the minor and major storm drainage systems.

7.5.2 Emergency Overland Flow Route

Major system drainage, including runoff from storms greater than the 5-year storm, will be conveyed overland within the roadways to the proposed SWM facilities. Minimum 6.0 m wide drainage blocks between the roadways and the SWM facilities have been allowed for safe conveyance of emergency overland flows.

7.5.3 SWM Facility Design Criteria

The final design of the SWM facilities to service the site and external lands will consider the following:

- Sizing of the stormwater quantity control component of the facilities must ensure the post development peak runoff rates from the site are reduced at or below existing conditions and must be exclusive of the storage needed for the quality control component based on current MECP design guidelines;
- Sizing of the stormwater quality control component of the facilities must achieve “Enhanced” protection and erosion control and thus the facilities must have water quality control volumes as determined using Table 3.2 of the MECP SWM design guidelines. 24 hour extended detention of the 25 mm storm runoff volume must also be provided for erosion control;

- Any overtopping of the SWM facilities during the regional storm event must be safely conveyed to the receiving drainage path;
- Optimization of suspended solids and heavy metal removal efficiencies by locating minor system inlets and SWM facility outlets as far apart as possible to prevent short circuiting;
- Optimize nutrient uptake potential and diversity of plantings to enhance local aquatic and wildlife habitats; and
- Consider operation and maintenance requirements and frequency and include as part of the design process.

7.5.4 Water Quantity Control

A hydrologic analysis of the post development condition was completed utilizing the single event Visual OTTHYMO Hydrologic Model. Peak flow rates for the 100-year storm events were calculated for the 4-hour Chicago and 24-hour SCS Type II design storms generated using City of Peterborough IDF data (Peterborough Airport) as well as for the Regional (Timmins) storm.

The catchment delineation for the contributing lands was completed utilizing the available topographic mapping and the Draft Plan of Subdivision prepared by J.B. Fleguel Surveyors. The total impervious (TIMP) and percent directly connected imperviousness for the single-family residential was assumed to be 50% and 35% respectively whereas 75% TIMP and 75% XIMP was assumed for higher density residential areas including townhouses and apartment building blocks. The impervious area calculations were determined in Civil 3D. A summary of all catchment parameters established for the post development hydrologic model have been included in Appendix D.

The time to peak values for the individual catchment areas were calculated using either the Bransby Williams and Airport Methods for runoff coefficient “C” values greater than and less than 0.4 respectively.

Post development peak flow rates at each outlet are shown in Tables 5-8 respectively and the results of the modelling are attached in Appendix D.

Table 5: Proposed Conditions Peak Flow Summary – Outlet 1

DESIGN STORM	CATCHMENT 201 2.2 ha UNCONTROLLED (m^3/s)		CATCHMENT 201 2.2 ha CONTROLLED (m^3/s)	
	CHI	SCS	CHI	SCS
25 mm	0.292	-	0.009 (0.010)	-
2-Year	0.290	0.245	0.014 (0.020)	0.020 (0.041)
5-Year	0.388	0.332	0.026 (0.041)	0.036 (0.073)
10-Year	0.470	0.397	0.036 (0.058)	0.048 (0.097)
25-Year	0.558	0.495	0.049 (0.082)	0.065 (0.131)
50-Year	0.625	0.557	0.061 (0.103)	0.078 (0.157)
100-Year	0.693	0.619	0.073 (0.126)	0.092 (0.185)
Regional Storm (Timmins)	0.251		-	

Notes: (0.010) refers to existing condition peak flow rate.

Table 6: Proposed Conditions Peak Flow Summary – Outlet 2

DESIGN STORM	CATCHMENT 202 15.5 ha UNCONTROLLED (m^3/s)		CATCHMENT 202 15.5 ha CONTROLLED (m^3/s)	
	CHI	SCS	CHI	SCS
25 mm	0.926	-	0.065 (0.050)	
2-Year	1.056	1.061	0.091 (0.099)	0.137 (0.202)
5-Year	1.480	1.519	0.186 (0.203)	0.267 (0.359)
10-Year	1.767	1.959	0.265 (0.286)	0.372 (0.480)
25-Year	2.221	2.425	0.381 (0.410)	0.513 (0.648)
50-Year	2.633	2.790	0.477 (0.515)	0.643 (0.784)
100-Year	2.854	3.157	0.583 (0.628)	0.863 (0.924)
Regional Storm (Timmins)	1.705		-	

Notes: (0.050) refers to existing condition peak flow rate.

Table 7: Proposed Conditions Peak Flow Summary – Outlet 3

DESIGN STORM	CATCHMENT 203 9.0 ha UNCONTROLLED (m^3/s)		CATCHMENT EXT-1 3.2 ha (m^3/s)		TOTAL OUTLET 3 12.2 ha CONTROLLED (m^3/s)	
	CHI	SCS	CHI	SCS	CHI	SCS
25 mm	0.538	-	0.013	-	0.073 (0.058)	-
2-Year	0.595	0.599	0.025	0.048	0.105 (0.109)	0.157 (0.197)
5-Year	0.833	0.915	0.050	0.084	0.202 (0.214)	0.280 (0.342)
10-Year	0.994	1.120	0.070	0.113	0.276 (0.296)	0.376 (0.453)
25-Year	1.254	1.389	0.100	0.151	0.390 (0.417)	0.511 (0.606)
50-Year	1.431	1.601	0.125	0.183	0.484 (0.520)	0.623 (0.729)
100-Year	1.613	1.814	0.152	0.215	0.585 (0.631)	0.822 (0.855)
Regional Storm (Timmins)	0.991		0.303		1.291	

Notes: (0.058) refers to existing condition peak flow rate.

Table 8: Proposed Conditions Peak Flow Summary – Outlet 4

DESIGN STORM	CATCHMENT 204 16.3 ha CONTROLLED (m^3/s)		CATCHMENT EXT-2 1.8 ha (m^3/s)		CATCHMENT PEXT-3 6.9 ha (m^3/s)		TOTAL OUTLET 4 25.0 ha CONTROLLED (m^3/s)	
	CHI	SCS	CHI	SCS	CHI	SCS	CHI	SCS
25 mm	1.224	-	0.008	-	0.915	-	0.125 (0.095)	-
2-Year	1.388	1.323	0.015	0.028	0.931	0.789	0.174 (0.176)	0.255 (0.322)
5-Year	1.923	1.858	0.029	0.048	1.280	1.069	0.337 (0.344)	0.441 (0.557)
10-Year	2.284	2.326	0.041	0.063	1.505	1.321	0.450 (0.477)	0.602 (0.736)
25-Year	2.813	2.844	0.057	0.085	1.791	1.580	0.634 (0.671)	0.826 (0.983)
50-Year	3.816	3.246	0.071	0.102	2.006	1.778	0.793 (0.837)	1.011 (1.182)
100-Year	3.568	3.648	0.086	0.119	2.223	1.974	2.083 (1.014)	1.316 (1.387)
Regional Storm (Timmins)	1.812		0.169		0.790		2.769	

Notes: (0.095) refers to existing condition peak flow rate.

Preliminary stage-storage-discharge data was input into the "route reservoir" commands of the hydrologic model to confirm the quantity control storage requirements and corresponding land allocation for the SWM facility blocks are appropriate. Specific details relating to the pond outlet control structures will be determined at the final design stage.

SWMF 1 has approximately 1,353 m^3 of active storage including an additional 0.3 m of freeboard as illustrated on Drawing SWM-1, whereas 1,072 m^3 of active storage is required during the 100-year 24-hour SCS design storm.

SWMF 2 has approximately 5,982 m^3 of active storage including an additional 0.3 m of freeboard, whereas 5,211 m^3 of active storage is required during the 100-year 24-hour SCS design storm.

SWMF 3 has approximately 2,901 m^3 of active storage including an additional 0.3 m of freeboard, whereas 2,576 m^3 of active storage is required during the 100-year 24-hour SCS design storm.

SWMF 4 has approximately 9,607 m^3 of active storage including an additional 0.3 m of additional freeboard, whereas 9,341 m^3 of active storage is required during the 100-year 24-hour SCS design storm.

A comparison of the post development peak flow summaries with the existing condition peak flow summaries confirms the proposed SWM plan will attenuate the 2-year through 100-year post development peak flows directed to each outlet at or below existing condition peak flow rates

Preliminary stage-volume tables of each facility are included in Appendix D.

7.5.5 Water Quality Control

Water quality control for the development will be provided primarily within the proposed SWM facilities which have been designed to remove a minimum of 80% TSS prior to off-site discharge. An oil-grit-separator is also proposed upstream of SWMF 1 since SWMF 1 on its own does not provide sufficient water quality treatment.

Water quality control plans have been developed for each outlet and are described below. It is noted that the water quality control calculations and storage volumes provided within each SWM facility do not consider the additional water quality benefits of any upstream LID practices and thus are conservative as it relates to water quality treatment of runoff from the proposed development.

Outlet 1

Catchment 201 (2.2 ha) has an estimated imperviousness of 72%. As per MECP guidelines for dry ponds, 203.1 m^3/ha is required for basic treatment level (60% long-term TSS removal) and the larger of 40 m^3/ha or the 25 mm runoff volume released over a minimum of 24 hours is required for extended detention. The corresponding dry pond storage volume is 447 m^3 whereas SWMF 1 includes 1353 m^3 of storage volume. It is noted that the extended detention volume will make up a portion of the water quantity control storage volume.

An oil-grit-separator, sized to provide MECP enhanced treatment of runoff (80% long-term TSS removal), will be proposed upstream of SWMF 1. OGS units are effective at providing water quality treatment for contributing areas less than 5.0 ha provided that they are maintained on a regular basis. Sizing details for the OGS will be provided at the final design stage.

Outlet 2

Catchment 202 (15.5 ha) has a total estimated imperviousness of 53%.

The contributing area to Wet Cell 1, 12.9 ha, has an estimated imperviousness of 54%. As per MECP guidelines for wet ponds, 184.6 m^3/ha of which 144.6 m^3/ha is required for the permanent

pool volume and the larger of 40 m^3/ha or the 25 mm runoff volume released over a minimum of 24 hours is required for extended detention. The corresponding permanent pool volume required for water quality control is 1866 m^3 whereas 3131 m^3 of permanent pool is provided in Wet Cell 1.

The contributing area to Wet Cell 2, 1.8 ha, has an estimated imperviousness of 50.0%. As per MECP guidelines for wet ponds, 176.2 m^3/ha of which 136.2 m^3/ha is required for the permanent pool volume and the larger of 40 m^3/ha or the 25 mm runoff volume released over a minimum of 24 hours is required for extended detention. The corresponding permanent pool volume required for water quality control is 245 m^3 whereas 637 m^3 of permanent pool is provided in Wet Cell 2.

The extended detention volume for the contributing areas to Wet Cells 1 and 2 has been allowed for in the dry cell and makes up a small portion of the overall water quantity storage volume.

Outlet 3

Catchment 203 + EXT1 (12.2 ha) has an estimated imperviousness of 38%. As per MECP guidelines for wetlands, 83.4 m^3/ha of which 43.4 m^3/ha is required for the permanent pool volume and the larger of 40 m^3/ha or the 25 mm runoff volume released over a minimum of 24 hours is required for extended detention. The corresponding permanent pool volume required for water quality control in the wetland is 529 m^3 whereas 1070 m^3 of permanent pool is provided. The extended detention volume for the contributing area makes up a small portion of the water quantity control storage volume.

Outlet 4

Catchment 204 + EXT2 + PEXT3 (25.0 ha) has an estimated imperviousness of 60%. As per MECP guidelines for wet ponds, 197.7 m^3/ha of which 157.7 m^3/ha is required for the permanent pool volume and the larger of 40 m^3/ha or the 25 mm runoff volume released over a minimum of 24 hours is required for extended detention. The corresponding permanent pool volume required for water quality control in the wet pond is 3943 m^3 whereas 4756 m^3 of permanent pool is provided. The extended detention volume for the contributing area makes up a small portion of the water quantity control storage volume.

The above calculations confirm the preliminary SWM plans at each outlet exceed the MECP requirements for water quality treatment.

7.5.6 Water Balance

An existing and proposed condition water balance for the contributing area to each outlet has been prepared in accordance with the Conservation Authority Guidelines for Hydrogeological Assessments, June 2013. The proposed condition was prepared with and without mitigation

measures which at this early juncture includes increased topsoil depth combined with roof downspout disconnections which based on the CVC/TRCA LID manual have the effect of reducing annual runoff volume by 50% in areas having HSG 'A' and 'B' type soils.

Roof downspout disconnections on all single detached and townhouse dwellings have been considered and will have the effect of infiltrating approximately 26,400 m^3 of rooftop runoff from the overall site on an annual basis.

The results of the water balances are summarized in Table 9 below. Detailed water balance calculations are included in Appendix E.

Table 9: Water Balance Summary – Outlet 1,2,3,4

		OUTLET 1			OUTLET 2			OUTLET 3			OUTLET 4		
		Ex.	Pr.		Ex.	Pr.		Ex.	Pr.		Ex.	Pr.	
			W/O LID	With LID		W/O LID	With LID		W/O LID	With LID		W/O LID	With LID
Area	ha	2.20	2.20		12.0	15.5		16.5	12.2		22.6	25.0	
Precipitation	mm							855					
	m^3	18,819	18,819		102,648	132,587		141,141	104,359		193,320	213,850	
Evapo-transpiration	mm	579	285		583	349		572	404		568	317	
	m^3	12,737	6,279		69,957	54,133		94,378	49,237		128,358	79,252	
Infiltration	mm	124	34	34	123	65	140	127.5	86.6	155	129.3	57.5	83
	m^3	2,737	754	754 (-72%)	14,711	10,007	21,674 (+47%)	21,043	10,587	18,867 (-35%)	29,233	14,366	20,798 (-29%)
Runoff	mm	152	536	536	150	442	366	156	365	296	158.1	480.9	455

As indicated in Table 9, additional infiltration measures within the contributing areas to outlets 1, 3 and 4 will be required as the total annual infiltration is shown to decrease by 72%, 35% and 29 % respectively. Rear yard catchbasins connected to perforated pipe systems is one example of

an LID infiltration practice that will be evaluated during the final design stage to increase infiltration. Potential locations for rear yard infiltration features are shown conceptually on Drawing SG-1 and will be confirmed together with other LID opportunities during the final design stage.

The annual infiltration within the contributing area to Outlet 2 is estimated to increase by 47% in the proposed condition and therefore does not require any further mitigation efforts.

8 Erosion and Sediment Control

Erosion and sediment control measures will be implemented for all construction activities within the development site including vegetation clearing, topsoil stripping, grading, and stockpiling of materials. The basic principles considered to minimize erosion and sedimentation and resultant negative environmental impacts include:

- All erosion control devices to be specified in accordance with MNR and OPSD guidelines;
- Silt control fences to be erected before the commencement of any grading operations to control sediment movement;
- A designated construction vehicle entrance(s) to Lakefield Road, with a stone mud mat to reduce off-site tracking of material;
- Temporary swales, temporary silt ponds, and check dams to be constructed to control runoff during construction by lowering velocities and promoting settling of particulates;
- All topsoil piles are to be surrounded with light duty silt fence and are to be seeded immediately upon completion of earthworks;
- Catchbasins will be fitted with filter fabric screens during construction activities, and cleaned out as required and prior to assumption of the works;
- Expose the smallest possible land area to erosion for the shortest possible time;
- Long term siltation and erosion control will be enhanced with a re-vegetation strategy for disturbed areas;
- Confine refuelling and servicing of equipment to areas well away from the drainage systems; and
- Regular inspection of control measures to be instituted through a monitoring and mitigation plan and repairs will be made as necessary. Bi-weekly inspections of the site erosion and sediment control should be completed.

A detailed erosion and sediment control plan will be prepared with the final engineering design of each phase of development.

9 Utilities

Peterborough Distribution Inc., Bell Canada, Nexicom and Enbridge have been contacted to confirm their capability to provide services to the site.

Peterborough Distribution Inc. confirmed the site is located within Hydro One territory. Hydro service is currently available on Lakefield Road however further consultation with Hydro One is required to confirm their existing infrastructure can be expanded to service the site. This will occur during final design of the initial phase of development.

Bell Canada has confirmed fibre-optic infrastructure will be available to service the proposed development.

Nexicom has confirmed cable, internet and telephone infrastructure is available in the area to service the proposed development.

Enbridge has confirmed gas is available along Lakefield Road and 7th Line. However, it is too early in the development process for Enbridge to confirm that gas will be available to service the proposed development. Further coordination is required with Enbridge to confirm that the existing gas infrastructure is sufficient to supply the proposed development.

Correspondence with each utility provider confirming the above information is included in Appendix F.

10 Summary

The servicing strategy presented for the proposed development demonstrates the site can be serviced to accommodate the 968 proposed residential units and up to 8,500 m^2 ground floor commercial uses.

The water supply for the site will be provided from the municipal water distribution system. The 300 mm diameter watermain on Tower Road is proposed to service the Phase 1 site development. However, in accordance with PUC and Township requirements, no more than 50 units are to be constructed before a second redundant feed is provided. The 200 mm diameter Murray Street watermain extension to Tower Road is required for the ultimate development of the AON Inc. property as well as Phase 2 and subsequent phases of development within the site. It is noted that a potential watermain connection exists, through the servicing block between Tower Road and Coyle Crescent to provide a redundant feed to Phase 1 and to enable construction of up to 50 units in Phase 2, in advance of extending the Murray Street watermain to Tower Road however further review of the water distribution model and consultation with the Township is required to confirm the broader effects of this connection.

The existing 200 mm diameter sanitary sewer on Tower Road is undersized to convey the ultimate development peak flow from the LSDA. However, the existing sewer has capacity to convey some initial development including the estimated peak flows from the proposed site (9.4 ha) and the majority of the estimated flows from the AON Inc. property (6.5 ha). Timing for upsizing the Tower Road gravity sanitary sewer should be reviewed on an ongoing basis as development advances within the LSDA. The sewage peak flows from the majority of the site including future development lands south west of the site will drain by gravity to a proposed 300 mm diameter sewer located along Rays Creek on the east side and will discharge into the Tower Road gravity sanitary sewer approximately 160 metres south of Lakefield Road. Upon completion of the new gravity sewer extension from Bridge Street to George Street and Fraser Street by the Township, which will connect the LSDA to the new George Street SPS, up to 20.0 L/s of peak sewage flows from initial site development within the LSDA can be accommodated in the downstream municipal infrastructure. Once peak sewage flows from the LSDA exceed approximately 20 L/s, additional downstream sanitary system improvements, outside of the LSDA will be required.

The preliminary SWM plan includes four SWM facilities including a dry SWM pond (SWMF 1), a hybrid wet/dry SWM pond (SWMF 2), a wetland (SWMF 3), and a wet SWM pond (SWMF 4), each providing a combination of water quality and quantity controls at each existing drainage outlet from the site. An OGS is also proposed upstream of SWMF 1 to achieve the required water quality control criteria. LID practices will be designed at the final design stage as required in

order to meet the water balance criteria for the site which includes matching or exceeding the existing annual infiltration volume within the contributing drainage area of each surface water outlet.

An existing and proposed condition water balance for the contributing area to each outlet has been prepared. LID practices are required within the contributing areas to Outlets 1, 3 and 4 to increase the annual post development infiltration volume to match or exceed the existing condition annual infiltration volume. The annual infiltration volume within the contributing area to Outlet 2 is estimated to increase in the proposed condition compared to the existing condition and therefore does not require any further mitigation efforts.

The availability of existing utilities (hydro, telephone, cable, and gas) has been confirmed with each provider however further coordination is required and will be completed during the final design stage. Final utility designs will be completed as the project proceeds and plans are finalized.

In conclusion, the preliminary servicing and SWM design information included herein confirms the feasibility of the proposed development and thus is adequate to support the proposed Draft Plan of Subdivision.

Appendix A: Record of Pre-Consultation Meeting and Background Correspondence

Record of Pre-Consultation

Prepared by the Peterborough County Planning Department

Name: Triple T Holdings Inc.

Agent: Jeremy Ash, C.C. Tatham
Heather Sadler, EcoVue

Lot: 26 & 27 **Concession:** 7 **Municipality:** Lakefield Ward
Township of Selwyn

Municipal Address: n/a Roll No.(s) 151602000322407
151602000322400
151602000318700

Phone: 705-742-3338 (TTT)

Email: bill@tttholdings.com
jash@cctatham.com
hsadler@ecovueconsulting.com

Office Phone: 705-760-3053 (TTT)
705-876-8340 (EcoVue)

Communication Sent To: **Owner:** ☒ **Agent:** ☒

Meeting Date: 2018-03-08
Meeting Location: County Committee Room

Attendees:	Rob Lamarre, Manager of Building & Planning, Township of Selwyn Jeannette Thompson, Planner, Township of Selwyn Adam Tobin, Project Coordinator Water & Sewer, Township of Selwyn Dylan Adams, Engineering Technician, Peterborough County Doug Saccoccia, Assistant Manager Engineering & Design, Peterborough County of Peterborough Jasmine Gibson, Planning Ecologist, ORCA Neil MacFarlane, Engineering Technologist, ORCA Alex Bradburn, Planning and Development Officer, ORCA Beverly Hurford, Watershed Planner, ORCA Caitlin Robinson, Planner, Peterborough County Iain Mudd, Manager of Planning, Peterborough County Matt Turner, TTT Bill Turner, TTT Jeremy Ash, C.C. Tatham Heather Sadler, EcoVue

A copy of the complete Record of Pre-Consultation will be sent to all attendees ☒

Existing Parcel Description	
County O.P. Description	Settlement Area
Municipal O.P. Designation	Low Density Residential – Specific Policies (Section 6.3.3)
Municipal Zoning	Development (D) Zone
Area/Lot Dimensions	±43 ha (105 ac.)
Existing Use/Buildings	Vacant

Pre-consultation completed for:

☒ Plan of Subdivision (*Application submitted to County*)
☒ Plan of Condominium (*Application submitted to County)*
☒ Official Plan Amendment for
- ☐ County Official Plan *(Application submitted to County*)
- ☒ Local Component of County Official Plan *(Application submitted to County*)
- ☐ Municipal Official Plan (*Application submitted to Township*)

☒ Zoning By-law Amendment (*Application submitted to Township*)

Proposal Summary/Description:

- This is the second pre-consultation to discuss the development of the Lakefield South Lands by Triple T Holdings (TTT).
- Additional lands being considered as part of the overall development area.
- A more detailed conceptual plan and servicing plan was presented in advance of the meeting to facilitate discussion amongst the agencies.
- The proposal includes 849 units in total to be developed in phases as reflected in the Lakefield South Secondary Plan:

Phase 2A
- 156 units
  - 4 blocks for 30 unit, 3-storey apartment buildings = 120 units
  - 3 blocks for 12 unit, 3-storey apartment buildings = 36 units
- 1 block for green space
- 1 block for stormwater management facility

Phase 2B
- 140 units
  - 7 lots for luxury single detached dwellings – 7,641 m² lot size
  - 33 lots for single detached dwellings – 4,740 m² lot size
  - 2 block for 3-storey multi-use buildings = 40 units
  - 1 block for greenspace
  - 1 block two 30 unit, 3-storey apartment buildings = 60 units

Phase 3
- 553 units
  - 27 lots for luxury detached dwellings

- 174 units for single detached dwellings
- 2 blocks for four 30 unit, 3-storey apartment buildings = 120 units
- 7 blocks for nine 12 unit, 3-story apartment buildings = 108 units
- 3 blocks for four multi-use, 3-storey buildings = 80
- 5 blocks for 2 unit townhouses = 10 units
- 7 blocks for 4 unit townhouses = 28 units
- 2 blocks for 3 unit townhouses = 6 units
- 1 block for greenspace
- 1 block for stormwater facility

Discussion:

Topic	Action By
Density Calculations The Growth Plan, 2017 indicates that for upper-and single-tier municipalities in the outer ring of the Growth Plan, the minimum density target for designated greenfield areas contained in the applicable official plan that is approved and in effect as of July 1, 2017 will continue to apply until the next municipal comprehensive review (MCR) is approved and in effect (S.2.2.7.5) Greenfield targets for Peterborough County will be implemented on a phased-in approach with a density of **35 residents/jobs per hectare** being implemented immediately and that this number moves to 40 residents/jobs per hectare by 2015 (S.5.1.3.1, 15th bullet point). Specifically, within the low-density designation of Lakefield, the average density of residential development shall generally be 15 units per gross hectare Within the medium-density designation, the average density of residential development shall generally be 30 units per gross hectare. The maximum height and density of a low rise apartment permitted within the Medium Density Residential designation shall be three storeys and 50 dwelling units per net hectare respectively, provided that, where adjoining lands are designated Medium Density Residential. Please look at gross density and net density Gross density includes all land in the study area Net density is calculated on the portion of the developable area comprising private owned residential and employment lands	County currently in the process of a MCR - late 2019 for completion (estimate)

parcels, exclusive of all other land uses i.e. wetlands, SWM ponds, parks & open spaces and trails

Official Plan Amendment is required to recognize higher densities.

Traffic / Road Network

The Roads Plan for Lakefield in the County/Township Official Plan (Schedule "B1-1") identifies a proposed east-west collector road from County 29 (Lakefield Road) through the Phase 3 lands (see Schedule "B1-1" attached).

Traffic Study to be completed in support of development applications should review this intersection with the collector road to determine if the location of this intersection is appropriate.

Township to provide TTT with traffic study completed for Lakefield South secondary plan

Traffic Study to analyse all four intersections

1. Lakefield Road with Tower Road
2. 7th Line with new internal road at south east corner (traffic study should also look at the condition of 7th Line)
3. 7th Line with Lakefield Road
4. CR-29 and east-west proposed connection

Official Plan Amendment will be required to recognize any changes to the Road Plan (Schedule B1-1) as a result of traffic study findings i.e., 3 proposed collector roads (see Schedule B1-1 attached).

AON draft approved plan of subdivision includes extension of Murray Street. Layout for Phase 3 should include a connection to Murray St. Location of green space in Phase 3 may need to be reconsidered.

Neighbourhood Commercial

The County / Township Official Plan currently recognizes a 1 hectare site located at the south-west corner of Lakefield Road and 7th Line to permit a neighbourhood commercial centre to serve the daily needs of the Lakefield South Development Area.

TTT's proposal includes some mixed-use buildings incorporating ground floor retail.

A market analysis study will be required demonstrating the need for the ground floor retail. Study should build off existing market analysis completed for the Lakefield Secondary Plan. Show need for additional acreage. Demonstrate no impact to existing business area in Lakefield.

Township to provide TTT with market study completed for existing neighbourhood

	commercial location
EcoVue proposed the idea of having more flexible Official Plan policies to allow the area to evolve over time to support commercial/employment opportunities, higher densities, etc.	EcoVue to provide draft policies to County / Township for discussion
Rethink multi-use building located adjacent to existing low density residential along Peacock Road. Alternative location or speak to compatibility through scale, design, setbacks, etc.	
Servicing Concept The Lakefield South Development Area is premised on one stormwater management facility servicing the area.	
3 stormwater facilities are proposed for the development area, including one external facility	
ORCA raised potential slope and wetland issues associated with SWM facility #2. Concern regarding wetland disruption from the sanitary sewer alignment.	
C.C. Tatham advised that following environmental boundary does not work as the depth to bedrock is very shallow – all limestone. Looking for balance through compensation.	
Discussion around sewer line installation – open cut or directional drilling.	
C.C. Tatham advised that direction drilling would be difficult.	
ORCA has concerns around open cut installation within wetland complex. Utility policies of ORCA's policy manual say no site alteration in PSW.	ORCA to attend site with Niblett.
Need to resolve sewer line through PSW with ORCA and position of SWM facility #2.	C.C. Tatham
Location of SWM facility #2 off-site needs to be discussed with land owner. Township to initiate these discussions.	C.C. Tatham to provide Township with rationale / technical background work used to determine the

location for SWM facility #2

Geotechnical and/or Functional Servicing Study to incorporate a section that reviews the impact of the development on neighbouring well users. Speak to nature of wells adjacent to the development along 7th Line and Peacock Road

Archaeology
Stage 1 and 2 Study required
Stage 3 to be determined following recommendations in Stage 1 and 2 reports

Other:

- Updated study list attached
- Planning and Peer Review Reimbursement Agreement attached

Fees: A copy of the current Peterborough County Planning Fees schedule is attached with applicable Peterborough County planning fees emphasized (i.e. highlighted or circled). ☒

Other applicable fees should be confirmed through staff at the local Township, Conservation Authority and/or Peterborough Public Health.

***Record Completed By*: Caitlin Robinson**

⌦ **Please Note**: *Personal information contained on this form is collected under the authority of Section 29(2) of the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c.M.56 as amended and will be used to assist in the correct processing of the application. If you have any questions about the collection, use or disclosure of this information by the County of Peterborough, please contact the CAO or Clerk, County of Peterborough, 470 Water Street, Peterborough, Ontario K9H 3M3 (705-743-0380).*

Study Requirements for
Official Plan Amendments &
Subdivision/Condominium Developments

Updated - March 8, 2018

☒	Functional Servicing Report	
☒	Geotechnical Study	
☒	Storm Water Management Plan	
☒	Hydrogeological Study	Review impact of the development on neighbouring well users - incorporate a section into the Functional Servicing Report
☒	Market Analysis/Justification Study	Independent study, separate from the Planning Study
☒	Environmental Impact Study (EIS)	
☒	Archaeological Study	
☒	Planning Study/Analysis	
☐	Natural Resource Analysis (aggregates, mineral non-aggregates, forests, etc.)	
☐	Noise Impact Study	
☒	Traffic Study	
☐	Agricultural Land Usage Justification	
☒	Review of Impact on Municipal/Other Services – fire, waste disposal, school busing, road conditions, etc.	Incorporate into Planning Study
☒	Source Water Protection (if in Vulnerable Area, require RMO review – Terri Cox, Mark Majchrowski)	
☐	Phase 1 Environmental Site Assessment (generally for lands previously used for commercial and industrial uses)	
☐	Record of Site Condition (converting from a commercial/industrial use to a sensitive (agricultural, residential, parkland or institutional) use)	

☐	Minimum Distance Separation Calculation (where barns exist within 1 km) Include in Planning Study/Analysis)	
☒	Peer Review and Planning Reimbursement Agreement	$10,565.00 to cover costs associated with peer reviews of studies, advertising and

Recommended key agencies to contact:

☒ Township
☐ Trent Severn Waterway
☐ MTO
☒ Conservation Authority
☐ Health Unit
☒ First Nation
☒ Peterborough County Public Works Dept.
☐ Other: _____

Jeremy Ash - Re: FW: Lakefield South Development Area (CCTA Proj#517651)

From: Jeremy Ash
To: rlamarre@nexicom.net
Date: 6/15/2018 4:49 PM
Subject: Re: FW: Lakefield South Development Area (CCTA Proj#517651)
Cc: Jeannette Thompson; bill@tttholdings.com

Good Afternoon Rob.

Thank you for your time earlier this afternoon. I have summarized they key points of our discussion below in red.

Enjoy the weekend.

Jeremy

Jeremy Ash, B.Sc.Eng., P.Eng.
Manager - Ottawa Office
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Tel: (613) 747-3636
Cell: (613) 716-6303
jash@cctatham.com
www.cctatham.com

>>> Rob Lamarre <rlamarre@nexicom.net> 6/13/2018 7:58 AM >>>

Hello Jeremy,

Please accept this further to our meeting earlier this year to discuss the TTT development proposed within the Lakefield South development Area (LSDA).

These comments are in addition to the Record of Pre-Consultation provided following our earlier meeting.

Following the meeting, you asked that the Township provide additional comment with respect to the following:

1) The approval process related to the municipal infrastructure (Municipal Class EA?).
2) Proposed storm water infrastructure on property not owned by the applicant.

3) Other issues

Infrastructure Approval Process

Approval of the infrastructure required to support the proposed development will not have to follow the Municipal Class Environmental Assessment process. It will be sufficient to manage the file through the typical Planning Approval process. The Municipal Class Environmental Assessment Manual does designate private sector developers as subject to the requirements of the EA Act if the private sector developer is proposing an undertaking of a type listed in Schedule C.

Schedule C projects are described as generally including the construction of new facilities and major expansion to existing facilities. Our review of your proposal with our consultant D. M. Wills resulted in their opinion that Schedule C does not include the activities proposed as part of the your development.

Regarding the costs for infrastructure designed and constructed by Triple T, which other land owners within the LSSPA will benefit from (i.e pipe oversizing, SWM control, road/ROW widening, etc.), Triple T would receive development charge credits for this work. The costs/credits will be jointly calculated by the Township and Triple T.

Storm Water Pond on property owned by someone other than the applicant

You have advised that the original storm water management design which was predicated on the construction of one large swm pond for the west watershed is not feasible. You have proposed the construction of a second pond on an adjacent property owned by a third party. If the need for the second pond can be substantiated, the Township would want assurance that the developer had obtained the right (ownership or otherwise) to develop that pond.

The Township will participate in a consultation process with the adjacent landowner to the west upon endorsing a revised SWM plan for the LSSPA and a preliminary SWM pond design on the adjacent lands. Triple T would participate in this consultation process also. A preliminary SWM report (by Triple T) would seem appropriate for review and approval by the Township and ORCA, following which consultation with the adjacent landowner would occur. It is not beneficial for Triple T to obtain ownership of any external land for construction of a pond to be transferred to the Township in the future.

Infrastructure through wetland

ORCA provided a very rigid response to the notion you advanced of bisecting a small portion of the existing wetland to accommodate a sanitary sewer. They were essentially unequivocal in stating that they would not permit any excavation even in light of your proposal to compensate. They advised that may permit directional boring. Jeannette and I spoke with our peers about their recent experience with the CA in relation to similar issues. They have run up against the very same responses. The CA has consistently prohibited any excavation within a wetland and our peers have not had any success getting them to deviate from that stand.

Work by Niblett Environmental related to the wetland boundary mapping is nearing completion. It will help inform our proposed sanitary sewer alignment. We will consult directly with ORCA to find middle ground on a sewer alignment that respects the wetland feature and function and meets the servicing requirements for the LSSPA.

I'm sorry it took as long as it did for us to get back to you, we wanted to speak with our consultant and other municipalities to get a clear understanding of the new realities as they relate to the protection of environmental features etc.

I'll leave it with you to propose the way forward. As always, we are open to coordinating meetings with commenting agencies, or our consultant. The ball is back in our court to start advancing the preliminary engineering design work.

An important note to consider would be the timing of the construction of the downstream sanitary main required to accommodate flows from you're the LSDA. We want to ensure that our efforts are appropriately coordinated. Noted. We can discuss this further upon completion of the preliminary engineering work which will include proposed sanitary design flows.

I look forward to hearing from you.

Robert Lamarre, MAATO, CBCO, CRBO
Manager of Building and Planning
The Corporation of The Township of Selwyn
(p) 705-292-9507 ext. 219
(f) 705-292-6491
Visit our website at www.selwyntownship.ca

Jeremy Ash - Lakefield South Secondary Plan Area - Sanitary Servicing Review Meeting Discussion Summary (CCTA Proj#517651)

From: Jeremy Ash
To: atobin@nexicom.net; bill@tttholdings.com; W H Turner; cellingwood@nib...
Date: 8/28/2018 12:58 PM
Subject: Lakefield South Secondary Plan Area - Sanitary Servicing Review Meeting Discussion Summary (CCTA Proj#517651)

Good Afternoon.

As a follow up to our meeting on August 21, 2018, we provide the following summary of the key discussion points and our next steps:

1. CCTA provided a summary of the work completed since the last meeting on March 8, 2018 including: 1) Additional field work by Niblett to better understand the existing wetlands and boundaries, 2) Consultation with the Township which resolved that a typical planning approval process will be followed (as opposed to a municipal class EA) and that the Township will participate in a consultation process related to the external SWM facility (i.e located on lands not owned by Triple T) , 3) The cost for infrastructure oversizing (i.e pipe oversizing, road widening, SWM controls etc.) which would benefit other SPA land owners would be credited to Triple T by the Township in the form of development charge credits, 4) Review of three sanitary sewer collection alternatives including selecting the preferred alternative, 5) Revised servicing concept drawing showing road connectivity to the approved AON draft plan and adjustments to the development concept for the north parcel.

2. General discussion related to the preferred sanitary sewer profile and alignment including design and construction measures intended to mitigate impacts to the wetland including: open cut sewer installation in the outer 15 m of the wetland buffer (where required) however outside of the wetland buffer as much as possible, directional drilling below core wetland areas, clay trench plugs every 50 m within sensitive areas, rapid construction (7 am to 7 pm) to reduce dewatering as much as possible and same day reinstatement of surface material. ORCA mentioned TRCA's horizontal directional drill guidelines (which I now have) and these will be referenced in the development of a directional drilling plan at the construction stage.

3. Directional drilling is planned only in areas where the drill head will advance through rock. Open cut is preferred in all areas where the directional drill head would be expected to enter and exit rock since the design sewer profile would otherwise be difficult to maintain in these areas. The length of directional drilling has also been minimized to reduce construction costs. In areas where directional drilling is planned to occur, the Township will need to approve the construction method and be willing to accept some pipe deflection in the constructed sewer.

4. Minor adjustments to the sanitary sewer profile west of the north parcel were discussed and will be reflected on the preliminary design drawings and discussed in the EIS. Otherwise the group reached a consensus that the current alignment and planned mitigation efforts are generally appropriate to protect the adjacent wetland.

5. ORCA raised the potential for a steep slope erosion hazard along Rays Creek that needs to be reviewed. This will be evaluated as part of the preliminary engineering design.

6. The evaluation of the wetland and the discussed mitigation measures covered in the EIS will assume the wetland as PSW. This classification allows ORCA to review and interpret MNRFs PSW policies in-house and not require a subsequent circulation to the MNRF.

7. The location of SWM facility #3 is being reviewed by Niblett to determine if it is appropriate. The proposal to locate a SWM pond at this location is premised on it providing regular base flows to the defined watercourse downstream. Niblett will provide additional clarification on this topic in the coming weeks, prior to the development of the EIS and preliminary engineering documents.

If you have any questions or inclusions/exclusions to the above, please 'reply all' to the group.

Thank you.

Jeremy

Jeremy Ash, B.Sc.Eng., P.Eng.
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Tel: (613) 747-3636
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jash@cctatham.com
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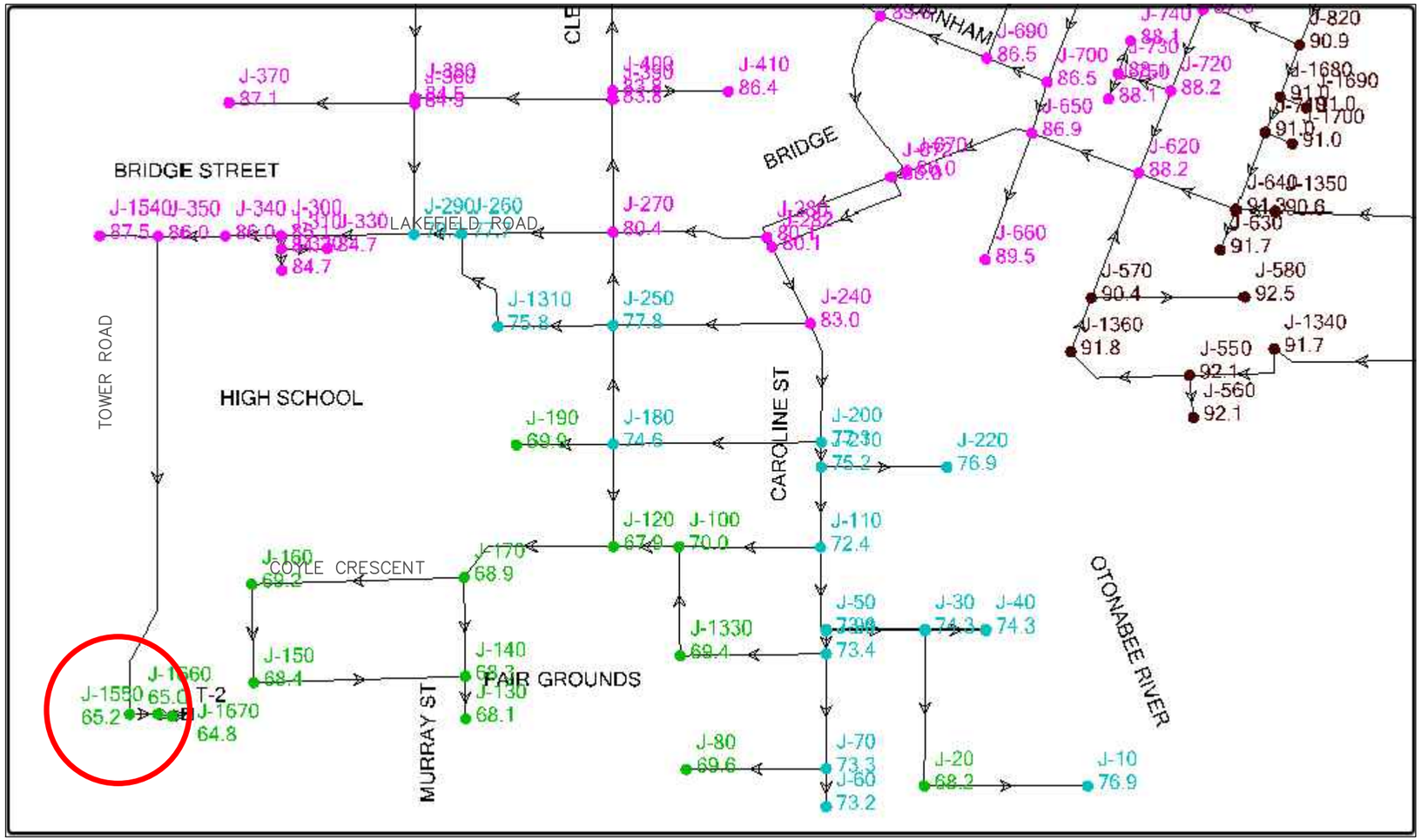
Appendix B:
Water System Model Output



USING 2013 MODEL DATA

Sketch No.

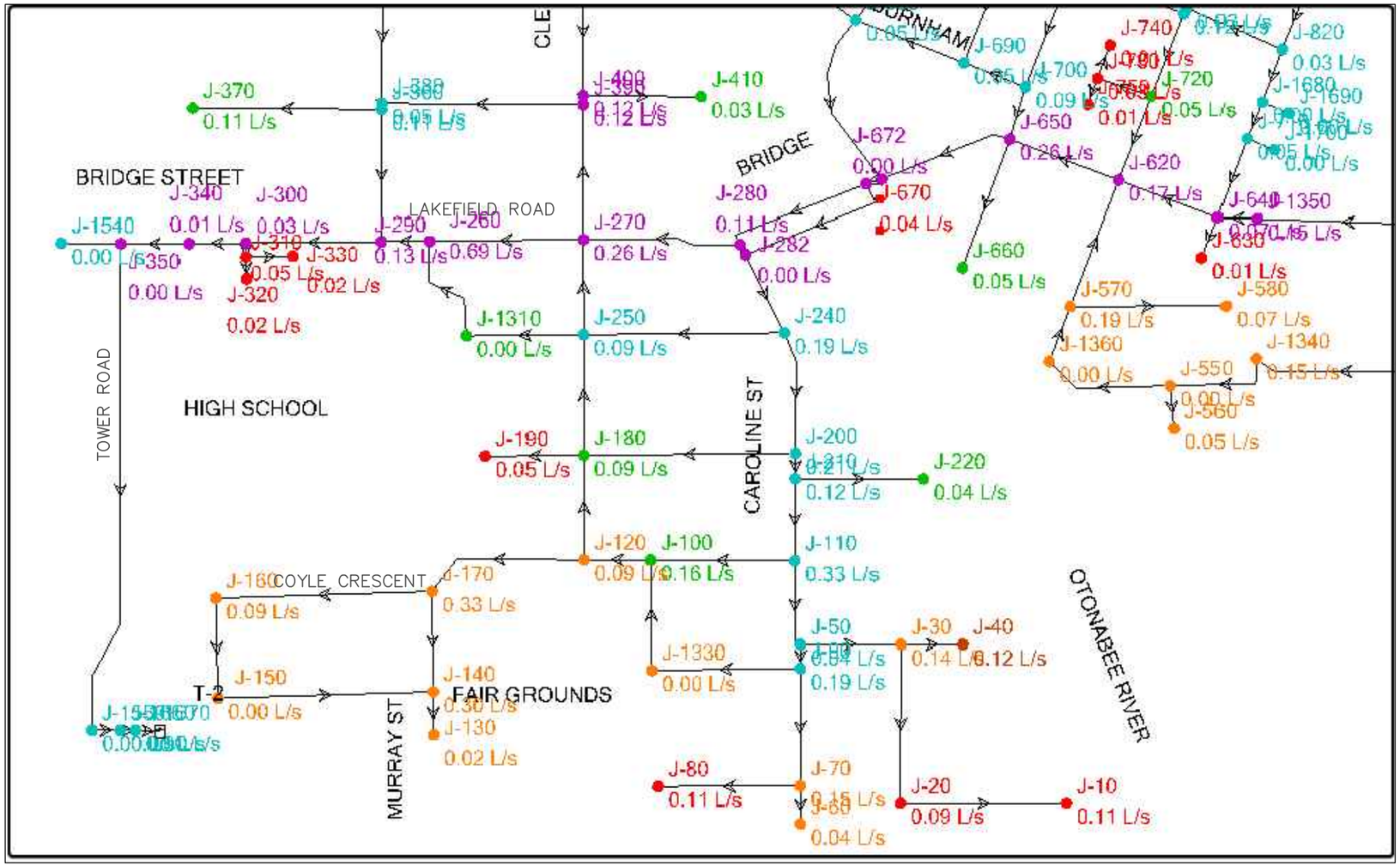
EXISTING
AVERAGE DAY PRESSURE
(lbs/ln^2)

WILLS

D.M. Wills Associates Limited
150 Jameson Drive
Peterborough, Ontario
Canada K9J 0B9

P. 705.742.2297
F. 705.741.3568
E. wills@dmwills.com

Drawn By: CS	Scale: NTS
	Plot Date: FEBRUARY 2020
	Project No.: 2918
Engineer: RJ	Drawing File No.: 2918_FIGURES



USING 2013 MODEL DATA

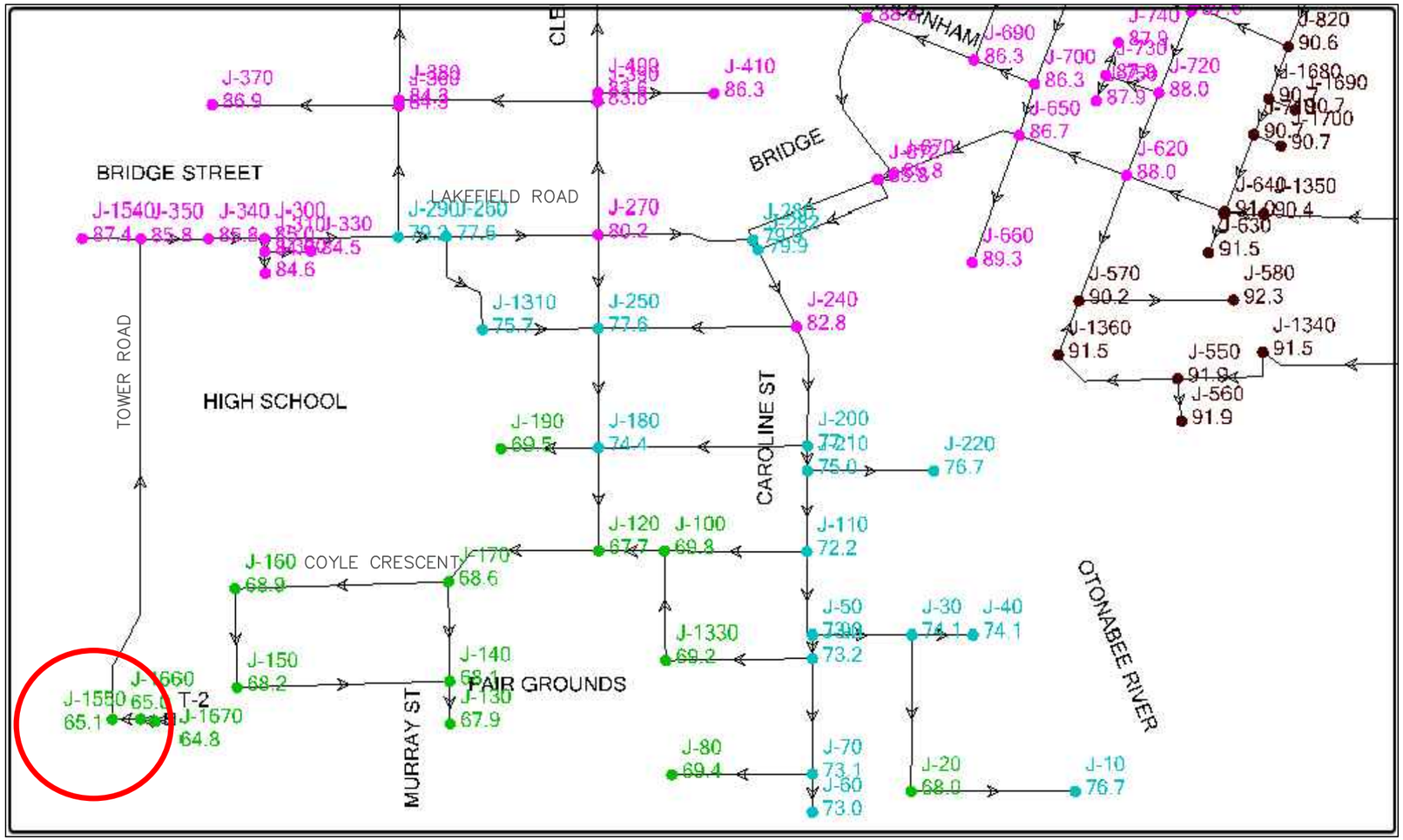
Sketch No.

EXISTING
AVERAGE DAY DEMAND

D.M. Wills Associates Limited
150 Jameson Drive
Peterborough, Ontario
Canada K9J 0B9

P. 705.742.2297
F. 705.741.3568
E. wills@dmwills.com

Drawn By: CS	Scale: NTS
	Plot Date: FEBRUARY 2020
	Project No.: 2918
Engineer: RJ	Drawing File No.: 2918_FIGURES



USING 2013 MODEL DATA

Sketch No.

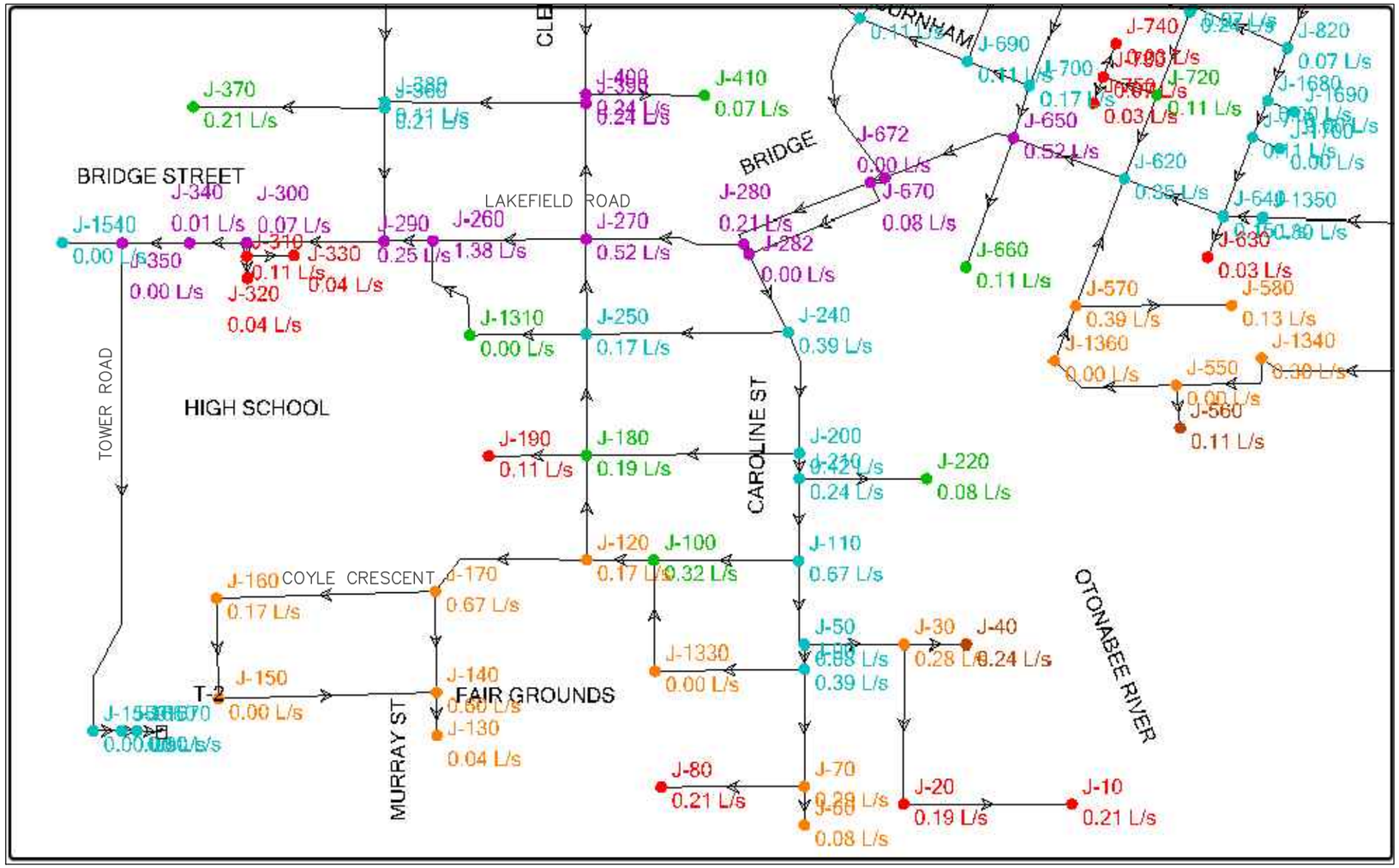
EXISTING
MAXIMUM DAY PRESSURE
(lbs/ln^2)

WILLS

D.M. Wills Associates Limited
150 Jameson Drive
Peterborough, Ontario
Canada K9J 0B9

P. 705.742.2297
F. 705.741.3568
E. wills@dmwills.com

Drawn By	Scale
CS	NTS
	Plot Date: FEBRUARY 2020
	Project No.: 2918
Engineer: RJ	Drawing File No.: 2918_FIGURES



USING 2013 MODEL DATA

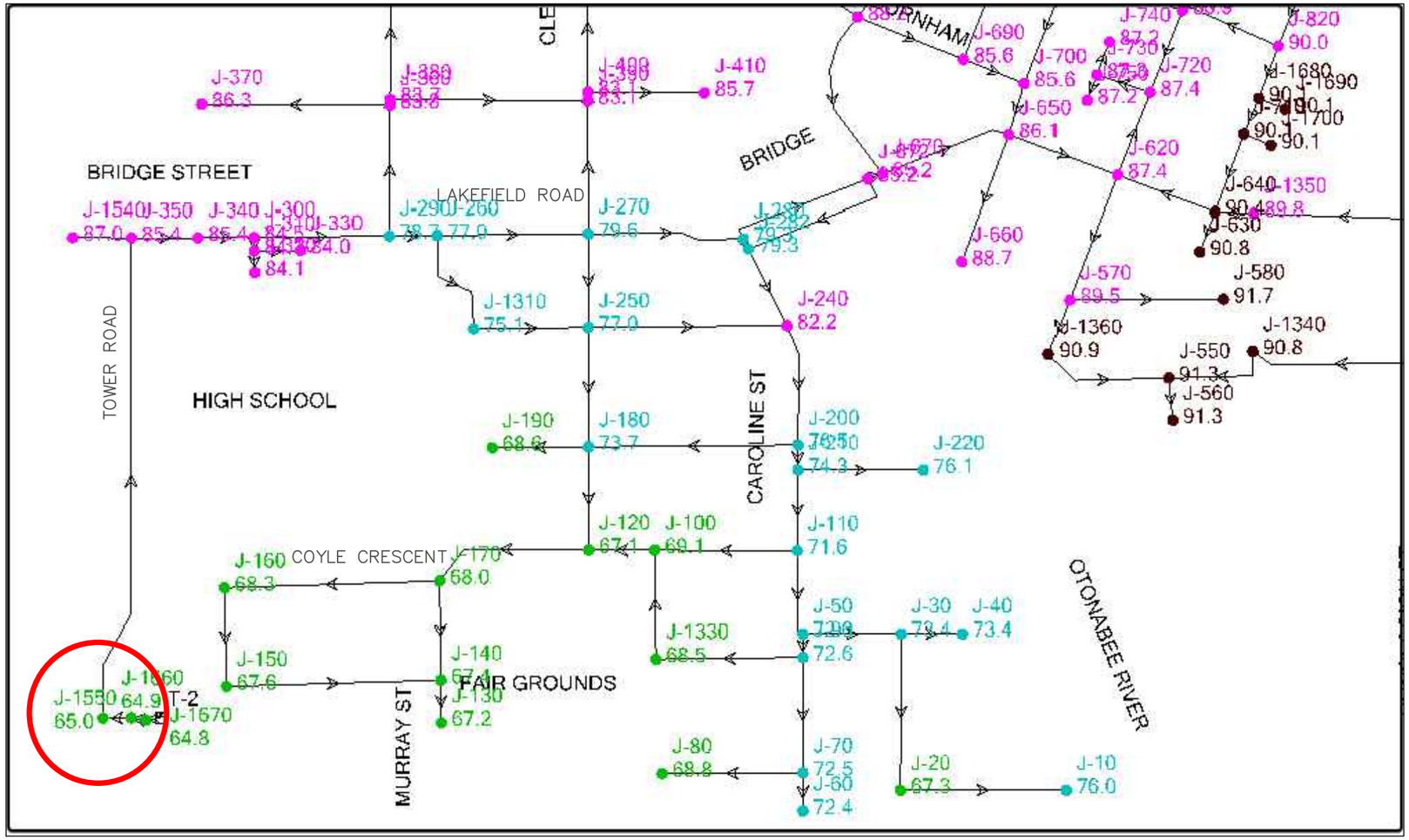
Sketch No.

EXISTING
MAXIMUM DAY DEMAND

D.M. Wills Associates Limited
150 Jameson Drive
Peterborough, Ontario
Canada K9J 0B9

P. 705.742.2297
F. 705.741.3568
E. wills@dmwills.com

Drawn By: CS	Scale: NTS
	Plot Date: FEBRUARY 2020
	Project No.: 2918
Engineer: RJ	Drawing File No.: 2918_FIGURES



USING 2013 MODEL DATA

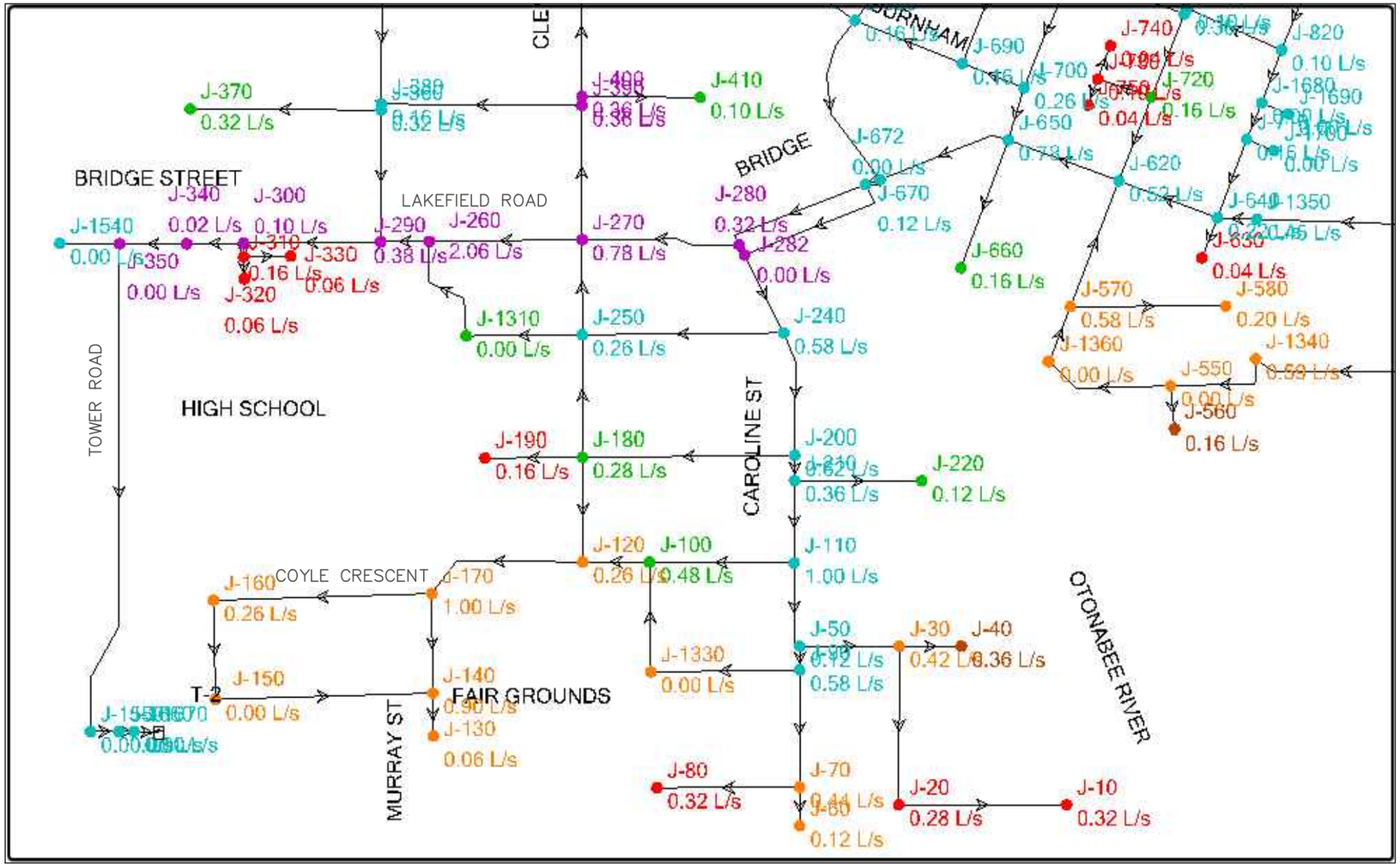
Sketch No.

EXISTING
PEAK HOUR PRESSURE
(lbs/ln^2)

D.M. Wills Associates Limited
150 Jameson Drive
Peterborough, Ontario
Canada K9J 0B9

P. 705.742.2297
F. 705.741.3568
E. wills@dmwills.com

Drawn By: CS	Scale: NTS
	Plot Date: FEBRUARY 2020
	Project No.: 2918
Engineer: RJ	Drawing File No.: 2918_FIGURES



USING 2013 MODEL DATA

Sketch No.

EXISTING
PEAK HOUR DEMAND

D.M. Wills Associates Limited
150 Jameson Drive
Peterborough, Ontario
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Drawn By: CS	Scale: NTS
	Plot Date: FEBRUARY 2020
	Project No.: 2918
Engineer: RJ	Drawing File No.: 2918_FIGURES

Appendix C:
Sanitary Design Calculations

TATHAM ENGINEERING

Sewage Flow Calculations

Tatham File No. : 517651
Project : 3358 Lakefield Road
Date : July 24, 2020
Designed by : Guillaume Courtois

PROPOSED SEWAGE FLOW TO EX SAN MH 201

From Site

30 Townhouse Units (assumed 2 bedrooms, 2.4 people/unit)
= 450 L/c/day
= 450L * 30 units * 2.4 ppu
= 32,400 L/d (design flow)
= 0.38 L/s (design flow)

Estimated population: 72 (Assuming a population of 2.4 people/unit)

39 Single Family Units (assumed 3 bedrooms, 2.7 people/unit)
= 450 L/c/day (based on Lakefield Sanitary System Upgrades Class EA
= 450L * 39 units * 2.7 ppu
= 44,753 L/d (design flow)
= 0.52 L/s (design flow)

Estimated population: 106 (Assuming a population of 2.7 people/unit)

184 Apartment Units (assumed 2 people per unit)
= 450 L/c/day (based on Lakefield Sanitary System Upgrades Class EA
= 450L * 184 units * 2.0 ppu
= 165,600 L/d (design flow)
= 1.92 L/s (design flow)

Estimated population: 368 (Assuming a population of 2.0 people/unit)

Extraneous Flow
= 0.28 L/s/ha (as per Section A.1.9.e of the City of Peterborough Engineering Design Standards)
= 0.28 L/s * 9.4 ha (tributary area)
= 2.63 L/s

Sewage Flow From Site Only at SAN MH 201

Residential Design Flow:	2.81	L/s
Total Population:	546	
Residential Peaking Factor (Harmon):	4.0	
Residential Peak Flow:	11.1	L/s
Extraneous Flow:	2.6	L/s
Total Peak Flow:	**13.7**	L/s

From AON Inc. Property

26 Single Family Units (assumed 3 bedrooms, 2.7 people per unit)
= 450 L/c/day (based on Lakefield Sanitary System Upgrades Class EA
= 450L * 26 units * 2.7 ppu
= 31,590 L/d (design flow)
= 0.37 L/s (design flow)

Estimated population: 70.2 (Assuming a population of 2.7 people/unit)

200 Apartment Units (assumed 2 people per unit)
= 450 L/c/day (based on Lakefield Sanitary System Upgrades Class EA
= 450L * 200 units * 2.0 ppu
= 180,000 L/d (design flow)
= 2.08 L/s (design flow)

Estimated population: 400 (Assuming a population of 2.0 people/unit)

126 Long-Term Care (LTC) Beds
= 450 L per bed (as per OBC Table 8.2.1.3.B. Item 14.)
= 450 L * 126 beds
= 56,700 L/d (design flow)
= 0.66 L/s (design flow)

Estimated population: 126 (Assuming a population of 1 person/bed)

0.8 ha Medical Centre/Lab Lot Area
= 1.15 L/s/ha (as no information is available for the future building, Section A.1.9.b of the City of Peterborough Engineering Design Standards was used)
= 1.15 L/s * 0.8 ha
= 0.92 L/s (design flow)

Extraneous Flow
= 0.28 L/s/ha (as per Section A.1.9.e of the City of Peterborough Engineering Design Standards)
= 0.28 L/s * 6.5 ha (tributary area)
= 1.82 L/s

Sewage Flow From AON Inc. site to SAN MH 201

Residential Design Flow:	3.11	L/s
Total Population:	596.2	
Residential Peaking Factor (Harmon):	3.9	
Residential Peak Flow:	12.2	L/s
Commercial Design Flow:	0.9	L/s
Commercial Peaking Factor:	2.5	(As per Section A.1.9.b of the City of Peterborough Engineering Design Standards)
Commercial Peak Flow:	2.3	L/s
Extraneous Flow:	1.8	L/s

Total Peak Flow: **16.3** L/s

From LSDA lands Northeast of Site

46.8 ha Low Density Residential Area (includes 5.1 ha of site-specific policy area)
= 15 units/ha @ 2.7 people/unit (As no information is available for the future development, 15 units/ha was assumed for low density residential)

= 15 units * 46.8 ha
= 702 units
= 450 L/c/day (based on Lakefield Sanitary System Upgrades Class EA
= 450L * 702 units * 2.7 ppu
= 852,930 L/d (design flow)
= 9.87 L/s (design flow)

Estimated population: 1896 (Assuming a population of 2.7 people/unit)

Extraneous Flow
= 0.28 L/s/ha (as per Section A.1.9.e of the City of Peterborough Engineering Design Standards)
= 0.28 L/s * 46.8 ha (tributary area)
= 13.1 L/s
Note: The calculations in this section exclude 2.8 ha recreation/open space area and a 7.5 ha environmental constraint area.

Sewage Flow From LSDA Lands Northeast of Site to SAN MH 201

Residential Design Flow:	9.9	L/s
Total Population:	1896	
Residential Peaking Factor (Harmon):	3.6	
Residential Peak Flow:	35.6	L/s
Extraneous Flow:	13.1	L/s
Total Peak Flow:	**48.7**	L/s

Total Combined Sewage Flow to SAN MH 201

Residential Design Flow:	15.8	L/s
Total Population:	3038.2	
Residential Peaking Factor (Harmon):	3.4	
Residential Peak Flow:	54.3	L/s
Commercial Design Flow:	0.9	L/s
Commercial Peaking Factor:	2.5	(As per Section A.1.9.b of the City of Peterborough Engineering Design Standards)
Commercial Peak Flow:	2.3	L/s
Extraneous Flow:	17.6	L/s
Total Combined Peak Flow:	**74.1**	L/s

The available sewer capacity between EX SAN MH 201 and EX SAN MH 208 is limited between SAN MH 204 and SAN MH 205 based on the existing pipe slope

from	to	length (m)	dia. (mm)	slope (%)	full capacity (L/s)	80% capacity (L/s)	velocity (full) (m/s)
EX SAN MH 204	EX SAN MH 205	90.0	200	0.69%	27.24	**21.80**	0.9

Manning's Coefficient (n) = 0.013

TATHAM ENGINEERING

Sewage Flow Calculations

Tatham File No. : 517651
Project : 3358 Lakefield Road
Date : July 24, 2020
Designed by : Guillaume Courtois

PROPOSED SEWAGE FLOW TO PROPOSED RAYS CREEK SANITARY SEWER

From Site

77 Townhouse Units (assumed 2 bedrooms, 2.4 people per unit)
= 450 L/c/day (based on Lakefield Sanitary System Upgrades Class EA
= 450L * 77 units * 2.4 ppu
= 83,160 L/d (design flow)
= 0.96 L/s (design flow)

Estimated population: 185 (Assuming a population of 2.4 people/unit)

242 Single Family Units (assumed 3 bedrooms, 2.7 people per unit)
= 450 L/c/day (based on Lakefield Sanitary System Upgrades Class EA
= 450L * 242 units * 2.7 ppu
= 294,030 L/d (design flow)
= 3.40 L/s (design flow)

Estimated population: 654 (Assuming a population of 2.7 people/unit)

396 Apartment Units (assumed 2 people per unit)
= 450 L/c/day (based on Lakefield Sanitary System Upgrades Class EA
= 450L * 396 units * 2.0 ppu
= 356,400 L/d (design flow)
= 4.13 L/s (design flow)

Estimated population: 792 (Assuming a population of 2.0 people/unit)

8500 m^2 of Commercial Ground Floor Area
= 75 L per 9.3 m^2 of floor space (as per OBC Table 8.2.1.3.B. Item 15.b)
= (8500 m^2 / 9.3 m^2) * 75 L
= 68,548 L/d (design flow)
= 0.79 L/s (design flow)

Extraneous Flow
= 0.28 L/s/ha (as per Section A.1.9.e of the City of Peterborough Engineering Design Standards)
= 0.28 L/s * 32 ha (tributary area)
= 8.96 L/s

Note: The calculations in this section exclude a 4.5 ha recreation/open space area, currently used for a speed skating oval.

Sewage Flow From the Site to Rays Creek Gravity Sewer

Residential Design Flow:	8.5	L/s
Total Population:	1631	
Residential Peaking Factor (Harmon):	3.7	
Residential Peak Flow:	31.0	L/s
Commercial Design Flow:	0.8	L/s
Commercial Peaking Factor:	2.5	(As per Section A.1.9.b of the City of Peterborough Engineering Design Standards)
Commercial Peak Flow:	2.0	L/s
Extraneous Flow:	9.0	L/s
Total Peak Flow:	**42.0**	L/s

From LSDA lands Southwest of Site

2.6 ha Low Density Residential Area
= 15 units/ha @ 2.7 people/unit (As no information is available for the future development, 15 units/ha was assumed for low density residential)

= 15 units * 2.6 ha
= 39 units
= 450 L/c/day (based on Lakefield Sanitary System Upgrades Class EA
= 450L * 39 units * 2.7 ppu
= 47,385 L/d (design flow)
= 0.55 L/s (design flow)

Estimated population: 106 (Assuming a population of 2.7 people/unit)

3.2 ha Neighbourhood Commercial Area
= 1.15 L/s/ha (as no information is available for the future development, Section A.1.9.b of the City of Peterborough Engineering Design Standards was used)
= 1.15 L/s * 3.2 ha
= 3.73 L/s (design flow)

Extraneous Flow
= 0.28 L/s/ha (as per Section A.1.9.e of the City of Peterborough Engineering Design Standards)
= 0.28 L/s * 5.9 ha (tributary area)
= 1.65 L/s

Note: The calculations in this section exclude a 0.2 ha environmental constraint area and the speed skating oval site.

Sewage Flow From LSDA lands Southwest of Site

Residential Design Flow:	0.5	L/s
Total Population:	106	
Residential Peaking Factor (Harmon):	4.2	
Residential Peak Flow:	2.3	L/s
Commercial Design Flow:	3.7	L/s
Commercial Peaking Factor:	2.5	(As per Section A.1.9.b of the City of Peterborough Engineering Design Standards)
Commercial Peak Flow:	9.3	L/s
Extraneous Flow:	1.7	L/s
Total Peak Flow:	**13.3**	L/s

Total Combined Sewage Flow to Rays Creek Sanitary Sewer

Residential Design Flow:	9.04	L/s
Total Population:	1737	
Residential Peaking Factor (Harmon):	3.6	
Residential Peak Flow:	32.8	L/s
Commercial Design Flow:	4.5	L/s
Commercial Peaking Factor:	2.5	(As per Section A.1.9.b of the City of Peterborough Engineering Design Standards)
Commercial Peak Flow:	11.3	L/s
Extraneous Flow:	10.6	L/s
Total Combined Peak Flow:	**54.7**	L/s

Proposed Rays Creek sanitary sewer capacity:

dia. (mm)	slope (%)	full capacity (L/s)	80% capacity (L/s)	velocity (full) (m/s)
300	0.40%	61.16	**48.9**	0.9

Manning's Coefficient (n) = 0.013
Minimum Velocity = 0.6 m/s
Maximum Velocity = 3.0 m/s

TATHAM ENGINEERING

Sewage Flow Calculations

Tatham File No. : 517651
Project : 3358 Lakefield Road
Date : July 24, 2020
Designed by : Guillaume Courtois

PROPOSED SEWAGE FLOW TO EX SAN MH 208

Residential Design Flow:	24.83	L/s
Total Population:	4776	
Residential Peaking Factor (Harmon):	3.3	
Residential Peak Flow:	81.0	L/s
Commercial Design Flow:	5.4	L/s
Commercial Peaking Factor:	2.5	
Commercial Peak Flow:	13.6	L/s
Extraneous Flow:	28.2	L/s
Total Combined Peak Flow:	**122.8**	L/s

Available sewage capacity @ EX SAN MH 208:

from	to	length (m)	dia. (mm)	slope (%)	full capacity (L/s)	80% capacity (L/s)	velocity (full) (m/s)
EX SAN MH 208	EX SAN MH 212	74.0	300	1.00%	96.7	**77.4**	1.4

Manning's Coefficient (n) = 0.013

Appendix D:
Stormwater Management

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Nov-19
Designed By:	HY/ALB
Checked By:	JA
Subject:	Hydrologic Parameters

3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment EXT-1 **Area** 3.2 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	3.2	1	0.6	0.19	60	2.6	0.81	69	0	0	65	0	0	74	0	0	100	0	0	50	67.3
																									0
																									0
																									0
																									0
				Totals	3.2	1	0.6	0.19		2.6	0.81		0	0		0	0		0	0		0	0		67.3
																								CN*(AMC II)	65.5
																								CN*(AMC III)	81.4

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	256.08	m
Minimum Catchment Elevation	247.49	m
Catchment length	340	m
Catchment Slope	2.5%	
Catchment Area	3.2	ha
Time of Concentration (Minutes)	**14.33**	
Time of Concentration (Hours)	**0.24**	
Time to Peak (2/3 x Time of Concentration)	**0.16**	

Time to Peak	**0.41 hrs**

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	256.08	m
Minimum Catchment Elevation	247.49	m
Catchment length	340	m
Catchment Slope	3%	
Catchment Area	3.2	ha
Time of Concentration (Minutes)	**36.55**	
Time of Concentration (Hours)	**0.61**	
Time to Peak (2/3 x Time of Concentration)	**0.41**	

Initial Abstraction	**5.9 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.27**

Landuse Type	Soil Series				
	OL	0	0	0	0
	2	#N/A	#N/A	#N/A	#N/A
Forest/Woodland	0.25	#N/A	#N/A	#N/A	#N/A
Cultivated	0.35	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.27	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.27	#N/A	#N/A	#N/A	#N/A

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Nov-19
Designed By:	HY/ALB
Checked By:	JA
Subject:	Hydrologic Parameters

3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment EXT-2 **Area** 1.8 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	1.8	1	0	0	60	1.8	1	69	0	0	65	0	0	74	0.00	0	100	0	0	50	69.0
																									0
																									0
																									0
																									0
				Totals	1.8	1	0	0		1.8	1		0	0		0	0		0	0		0	0		69.0
																								CN*(AMC II)	66.9
																								CN*(AMC III)	82.3

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	256.08	m
Minimum Catchment Elevation	252.57	m
Catchment length	275	m
Catchment Slope	1.3%	
Catchment Area	1.8	ha
Time of Concentration (Minutes)	**14.08**	
Time of Concentration (Hours)	**0.23**	
Time to Peak (2/3 x Time of Concentration)	**0.16**	

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	256.08	m
Minimum Catchment Elevation	252.57	m
Catchment length	275	m
Catchment Slope	1%	
Catchment Area	1.8	ha
Time of Concentration (Minutes)	**40.90**	
Time of Concentration (Hours)	**0.68**	
Time to Peak (2/3 x Time of Concentration)	**0.45**	

Time to Peak	**0.45 hrs**

Initial Abstraction	**5.0 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.28**

Landuse Type	Soil Series				
	OL	0	0	0	0
	2	#N/A	#N/A	#N/A	#N/A
Forest/Woodland	0.25	#N/A	#N/A	#N/A	#N/A
Cultivated	0.35	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.27	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.28	#N/A	#N/A	#N/A	#N/A

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Nov-19
Designed By:	HY/ALB
Checked By:	JA
Subject:	Hydrologic Parameters

3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment EXT-3 **Area** 5.3 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	2.9	0.55	0	0	60	2.90	1	69	0	0	65	0	0	74	0.00	0	100	0	0	50	69.0
EI	EMILY	B	Loam	2	2.4	0.45	0	0	60	2.40	1	69	0	0	65	0	0	74	0.00	0	100	0	0	50	69.0
																									0
																									0
																									0
				Totals	5.3	1	0	0		5.3	1		0	0		0	0		0	0		0	0		69.0
																								CN*(AMC II)	66.9
																								CN*(AMC III)	82.3

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	245.8	m
Catchment length	337	m
Catchment Slope	2.1%	
Catchment Area	5.3	ha
Time of Concentration (Minutes)	**13.97**	
Time of Concentration (Hours)	**0.23**	
Time to Peak (2/3 x Time of Concentration)	**0.16**	

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	245.8	m
Catchment length	337	m
Catchment Slope	2%	
Catchment Area	5.3	ha
Time of Concentration (Minutes)	**38.20**	
Time of Concentration (Hours)	**0.64**	
Time to Peak (2/3 x Time of Concentration)	**0.42**	

Time to Peak	**0.42 hrs**

Initial Abstraction	**5 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.28**

Landuse Type	Soil Series				
	OL	EI	0	0	0
	2	2	#N/A	#N/A	#N/A
Forest/Woodland	0.25	0.25	#N/A	#N/A	#N/A
Cultivated	0.35	0.35	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	0.28	#N/A	#N/A	#N/A
Impervious	0.95	0.95	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	0.05	#N/A	#N/A	#N/A
Meadows	0.27	0.27	#N/A	#N/A	#N/A
Soil Series Total	0.28	0.28	#N/A	#N/A	#N/A

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Nov-19
Designed By:	HY/ALB
Checked By:	JA
Subject:	Hydrologic Parameters

3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment EXT-3 **Area** 6.9 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	4.5	0.65	0	0	60	1.13	0.25	69	0	0	65	0	0	74	3.38	0.75	100	0	0	50	92.3
EI	EMILY	B	Loam	2	2.4	0.35	0	0	60	0.60	0.25	69	0	0	65	0	0	74	1.80	0.75	100	0	0	50	92.3
																									0
																									0
																									0
				Totals	6.9	1	0	0		1.73	0.25		0	0		0	0		5.18	0.75		0	0		92.3
																								CN*(AMC II)	93.1
																								CN*(AMC III)	96.9

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	245.8	m
Catchment length	337	m
Catchment Slope	2%	
Catchment Area	6.9	ha
Time of Concentration (Minutes)	**13.60**	
Time of Concentration (Hours)	**0.23**	
Time to Peak (2/3 x Time of Concentration)	**0.15**	

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	245.8	m
Catchment length	337	m
Catchment Slope	2%	
Catchment Area	6.9	ha
Time of Concentration (Minutes)	**14.79**	
Time of Concentration (Hours)	**0.25**	
Time to Peak (2/3 x Time of Concentration)	**0.16**	

Time to Peak	**0.15 hrs**

Initial Abstraction	**2.75 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.78**

Landuse Type	Soil Series				
	OL	EI	0	0	0
	2	2	#N/A	#N/A	#N/A
Forest/Woodland	0.25	0.25	#N/A	#N/A	#N/A
Cultivated	0.35	0.35	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	0.28	#N/A	#N/A	#N/A
Impervious	0.95	0.95	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	0.05	#N/A	#N/A	#N/A
Meadows	0.27	0.27	#N/A	#N/A	#N/A
Soil Series Total	0.78	0.78	#N/A	#N/A	#N/A

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Checked By:	JA
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3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment 101 **Area** 2.2 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	2.2	1	0.4	0.18	60	1.8	0.82	69	0	0	65	0	0	74	0	0	100	0	0	50	67.4
																									0
																									0
																									0
																									0
				Totals	2.2	1	0.4	0.18		1.8	0.82		0	0		0	0		0	0		0	0		67.4
																								CN*(AMC II)	65.6
																								CN*(AMC III)	81.4

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	244.53	m
Minimum Catchment Elevation	235.27	m
Catchment length	244	m
Catchment Slope	3.8%	
Catchment Area	2.2	ha
Time of Concentration (Minutes)	**9.84**	
Time of Concentration (Hours)	**0.16**	
Time to Peak (2/3 x Time of Concentration)	**0.11**	

Time to Peak	**0.30 hrs**

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	244.53	m
Minimum Catchment Elevation	235.27	m
Catchment length	244	m
Catchment Slope	4%	
Catchment Area	2.2	ha
Time of Concentration (Minutes)	**27.07**	
Time of Concentration (Hours)	**0.45**	
Time to Peak (2/3 x Time of Concentration)	**0.30**	

Initial Abstraction	**5.9 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.27**

Landuse Type	Soil Series				
	OL	0	0	0	0
	2	#N/A	#N/A	#N/A	#N/A
Forest/Woodland	0.25	#N/A	#N/A	#N/A	#N/A
Cultivated	0.35	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.27	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.27	#N/A	#N/A	#N/A	#N/A

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3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment 102 **Area** 12.0 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	12.0	1	3.1	0.26	60	8.9	0.74	69	0	0	65	0	0	74	0	0	100	0	0	50	66.7
																									0
																									0
																									0
																									0
				Totals	12.0	1	3.1	0.26		8.9	0.74		0	0		0	0		0	0		0	0		66.7
																								CN*(AMC II)	65.0
																								CN*(AMC III)	81.0

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	243	m
Catchment length	282	m
Catchment Slope	3.5%	
Catchment Area	12.0	ha
Time of Concentration (Minutes)	**9.73**	
Time of Concentration (Hours)	**0.16**	
Time to Peak (2/3 x Time of Concentration)	**0.11**	

Time to Peak	**0.33 hrs**

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	243	m
Catchment length	282	m
Catchment Slope	4%	
Catchment Area	12	ha
Time of Concentration (Minutes)	**29.84**	
Time of Concentration (Hours)	**0.50**	
Time to Peak (2/3 x Time of Concentration)	**0.33**	

Initial Abstraction	**6.3 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.27**

Landuse Type	Soil Series				
	OL	0	0	0	0
	2	#N/A	#N/A	#N/A	#N/A
Forest/Woodland	0.25	#N/A	#N/A	#N/A	#N/A
Cultivated	0.35	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.27	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.27	#N/A	#N/A	#N/A	#N/A

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3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment 103 **Area** 13.3 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	9.4	0.71	0	0	60	9.4	1	69	0	0	65	0	0	74	0	0	100	0	0	50	69
EI	EMILY	B	Loam	2	3.9	0.29	0	0	60	3.9	1	69	0	0	65	0	0	74	0	0	100	0	0	50	69
																									0
																									0
																									0
				Totals	13.3	1	0	0		13.3	1		0	0		0	0		0	0		0	0		69.0
																								CN*(AMC II)	66.9
																								CN*(AMC III)	82.3

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	242.5	m
Catchment length	666	m
Catchment Slope	1.6%	
Catchment Area	13.3	ha
Time of Concentration (Minutes)	**26.76**	
Time of Concentration (Hours)	**0.45**	
Time to Peak (2/3 x Time of Concentration)	**0.30**	

Time to Peak	**0.66 hrs**

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	242.5	m
Catchment length	666	m
Catchment Slope	2%	
Catchment Area	13.3	ha
Time of Concentration (Minutes)	**59.36**	
Time of Concentration (Hours)	**0.99**	
Time to Peak (2/3 x Time of Concentration)	**0.66**	

Initial Abstraction	**5 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.28**

Landuse Type	Soil Series				
	OL	EI	0	0	0
	2	2	#N/A	#N/A	#N/A
Forest/Woodland	0.25	0.25	#N/A	#N/A	#N/A
Cultivated	0.35	0.35	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	0.28	#N/A	#N/A	#N/A
Impervious	0.95	0.95	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	0.05	#N/A	#N/A	#N/A
Meadows	0.27	0.27	#N/A	#N/A	#N/A
Soil Series Total	0.28	0.28	#N/A	#N/A	#N/A

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3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment 104 **Area** 15.5 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	11.6	0.75	0	0	60	11.6	1	69	0	0	65	0	0	74	0	0	100	0	0	50	69
EI	EMILY	B	Loam	2	3.9	0.25	0	0	60	3.9	1	69	0	0	65	0	0	74	0	0	100	0	0	50	69
																									0
																									0
																									0
				Totals	15.5	1	0	0		15.5	1		0	0		0	0		0	0		0	0		69.0
																								CN*(AMC II)	66.9
																								CN*(AMC III)	82.3

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	246.2	m
Catchment length	426	m
Catchment Slope	1.6%	
Catchment Area	15.5	ha
Time of Concentration (Minutes)	**16.81**	
Time of Concentration (Hours)	**0.28**	
Time to Peak (2/3 x Time of Concentration)	**0.19**	

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	246.2	m
Catchment length	426	m
Catchment Slope	2%	
Catchment Area	15.5	ha
Time of Concentration (Minutes)	**47.28**	
Time of Concentration (Hours)	**0.79**	
Time to Peak (2/3 x Time of Concentration)	**0.53**	

Time to Peak	**0.53 hrs**

Initial Abstraction	**5.0 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.28**

Landuse Type	Soil Series				
	OL	EI	0	0	0
	2	2	#N/A	#N/A	#N/A
Forest/Woodland	0.25	0.25	#N/A	#N/A	#N/A
Cultivated	0.35	0.35	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	0.28	#N/A	#N/A	#N/A
Impervious	0.95	0.95	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	0.05	#N/A	#N/A	#N/A
Meadows	0.27	0.27	#N/A	#N/A	#N/A
Soil Series Total	0.28	0.28	#N/A	#N/A	#N/A

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3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment 201 **Area** 2.2 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	2.2	1	0	0	60	0.31	0.14	69	0	0	65	0	0	74	1.59	0.72	100	0.3	0.14	50	88.8
																									0
																									0
																									0
																									0
				Totals	2.2	1	0	0		0.31	0.14		0	0		0	0		1.59	0.72		0.3	0.14		88.8
																								CN*(AMC II)	88.2
																								CN*(AMC III)	94.5

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	241.5	m
Minimum Catchment Elevation	236	m
Catchment length	248	m
Catchment Slope	2%	
Catchment Area	2.2	ha
Time of Concentration (Minutes)	**11.14**	
Time of Concentration (Hours)	**0.19**	
Time to Peak (2/3 x Time of Concentration)	**0.12**	

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	241.5	m
Minimum Catchment Elevation	236	m
Catchment length	248	m
Catchment Slope	2%	
Catchment Area	2.2	ha
Time of Concentration (Minutes)	**14.52**	
Time of Concentration (Hours)	**0.24**	
Time to Peak (2/3 x Time of Concentration)	**0.16**	

Time to Peak	**0.12 hrs**

Initial Abstraction	**2.2 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.73**

Landuse Type	Soil Series				
	OL	0	0	0	0
	2	#N/A	#N/A	#N/A	#N/A
Forest/Woodland	0.25	#N/A	#N/A	#N/A	#N/A
Cultivated	0.35	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.27	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.73	#N/A	#N/A	#N/A	#N/A

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3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment 202 **Area** 15.5 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	12.6	0.81	0	0	60	4.622	0.37	69	0	0	65	0	0	74	6.68	0.53	100	1.3	0.10	50	83.5
EI	EMILY	B	Loam	2	2.9	0.19	0	0	60	1.36	0.47	69	0	0	65	0	0	74	1.54	0.53	100	0	0	50	85.4
																									0
																									0
																									0
				Totals	15.5	1	0	0		5.99	0.39		0	0		0	0		8.22	0.53		1.3	0.08		83.8
																								CN*(AMC II)	82.7
																								CN*(AMC III)	91.7

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	253.4	m
Minimum Catchment Elevation	247	m
Catchment length	476	m
Catchment Slope	1%	
Catchment Area	15.5	ha
Time of Concentration (Minutes)	**19.44**	
Time of Concentration (Hours)	**0.32**	
Time to Peak (2/3 x Time of Concentration)	**0.22**	

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	253.4	m
Minimum Catchment Elevation	247	m
Catchment length	476	m
Catchment Slope	1%	
Catchment Area	15.5	ha
Time of Concentration (Minutes)	**31.23**	
Time of Concentration (Hours)	**0.52**	
Time to Peak (2/3 x Time of Concentration)	**0.35**	

Time to Peak	**0.22 hrs**

Initial Abstraction	**3.0 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.62**

Landuse Type	Soil Series				
	OL	EI	0	0	0
	2	2	#N/A	#N/A	#N/A
Forest/Woodland	0.25	0.25	#N/A	#N/A	#N/A
Cultivated	0.35	0.35	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	0.28	#N/A	#N/A	#N/A
Impervious	0.95	0.95	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	0.05	#N/A	#N/A	#N/A
Meadows	0.27	0.27	#N/A	#N/A	#N/A
Soil Series Total	0.61	0.64	#N/A	#N/A	#N/A

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3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment 202-1 **Area** 12.9 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	10	0.78	0	0	60	4.18	0.42	69	0	0	65	0	0	74	5.40	0.54	100	0.42	0.04	50	84.9
EI	EMILY	B	Loam	2	2.9	0.22	0	0	60	1.33	0.46	69	0	0	65	0	0	74	1.57	0.54	100	0	0	50	85.7
																									0
																									0
																									0
				Totals	12.9	1	0	0		5.51	0.43		0	0		0	0		6.97	0.54		0.42	0.03		85.1
																								CN*(AMC II)	84.5
																								CN*(AMC III)	92.6

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	253.4	m
Minimum Catchment Elevation	247	m
Catchment length	476	m
Catchment Slope	1%	
Catchment Area	12.9	ha
Time of Concentration (Minutes)	**19.80**	
Time of Concentration (Hours)	**0.33**	
Time to Peak (2/3 x Time of Concentration)	**0.22**	

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	253.4	m
Minimum Catchment Elevation	247	m
Catchment length	476	m
Catchment Slope	1%	
Catchment Area	12.9	ha
Time of Concentration (Minutes)	**30.04**	
Time of Concentration (Hours)	**0.50**	
Time to Peak (2/3 x Time of Concentration)	**0.33**	

Time to Peak	**0.22 hrs**

Initial Abstraction	**3.2 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.63**

Landuse Type	Soil Series				
	OL	EI	0	0	0
	2	2	#N/A	#N/A	#N/A
Forest/Woodland	0.25	0.25	#N/A	#N/A	#N/A
Cultivated	0.35	0.35	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	0.28	#N/A	#N/A	#N/A
Impervious	0.95	0.95	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	0.05	#N/A	#N/A	#N/A
Meadows	0.27	0.27	#N/A	#N/A	#N/A
Soil Series Total	0.63	0.64	#N/A	#N/A	#N/A

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Nov-19
Designed By:	HY/ALB
Checked By:	JA
Subject:	Hydrologic Parameters

3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment 202-2 **Area** 1.8 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	1.8	1.00	0	0	60	0.82	0.46	69	0	0	65	0	0	74	0.90	0.50	100	0.08	0.04	50	83.7
	#N/A	#N/A	#N/A	#N/A	0	0.00	0	0	#N/A	0.00	#DIV/0!	#N/A	0	0	#N/A	0	0	#N/A	0.00	0.5	#N/A	0	0	#N/A	0.0
																									0
																									0
																									0
				Totals	1.8	1	0	0		0.82	0.46		0	0		0	0		0.90	0.50		0.08	0.04		83.7
																								CN*(AMC II)	82.7
																								CN*(AMC III)	91.7

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	253.4	m
Minimum Catchment Elevation	247	m
Catchment length	476	m
Catchment Slope	1%	
Catchment Area	1.8	ha
Time of Concentration (Minutes)	**24.11**	
Time of Concentration (Hours)	**0.40**	
Time to Peak (2/3 x Time of Concentration)	**0.27**	

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	253.4	m
Minimum Catchment Elevation	247	m
Catchment length	476	m
Catchment Slope	1%	
Catchment Area	1.8	ha
Time of Concentration (Minutes)	**31.94**	
Time of Concentration (Hours)	**0.53**	
Time to Peak (2/3 x Time of Concentration)	**0.35**	

Time to Peak	**0.27 hrs**

Initial Abstraction	**3.3 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.60**

Landuse Type	Soil Series				
	OL	0	0	0	0
	2	#N/A	#N/A	#N/A	#N/A
Forest/Woodland	0.25	#N/A	#N/A	#N/A	#N/A
Cultivated	0.35	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.27	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.60	#N/A	#N/A	#N/A	#N/A

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Nov-19
Designed By:	HY/ALB
Checked By:	JA
Subject:	Hydrologic Parameters

3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment 203 **Area** 9.0 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	7.8	0.87	0	0	60	3.2786	0.42	69	0	0	65	0	0	74	4.00	0.51	100	0.52	0.07	50	83.6
EI	EMILY	B	Loam	2	1.2	0.13	0	0	60	0.58	0.49	69	0	0	65	0	0	74	0.62	0.51	100	0	0.00	50	84.9
																									0
																									0
																									0
				Totals	9	1	0	0		3.86	0.43		0	0		0	0		4.62	0.51		0.52	0.06		83.8
																								CN*(AMC II)	82.8
																								CN*(AMC III)	91.7

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	246	m
Catchment length	417	m
Catchment Slope	2%	
Catchment Area	9	ha
Time of Concentration (Minutes)	**17.20**	
Time of Concentration (Hours)	**0.29**	
Time to Peak (2/3 x Time of Concentration)	**0.19**	

Time to Peak	**0.19 hrs**

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	253	m
Minimum Catchment Elevation	246	m
Catchment length	417	m
Catchment Slope	2%	
Catchment Area	9	ha
Time of Concentration (Minutes)	**27.47**	
Time of Concentration (Hours)	**0.46**	
Time to Peak (2/3 x Time of Concentration)	**0.31**	

Initial Abstraction	**3.17211 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.61**

Landuse Type	Soil Series				
	OL	EI	0	0	0
	2	2	#N/A	#N/A	#N/A
Forest/Woodland	0.25	0.25	#N/A	#N/A	#N/A
Cultivated	0.35	0.35	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	0.28	#N/A	#N/A	#N/A
Impervious	0.95	0.95	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	0.05	#N/A	#N/A	#N/A
Meadows	0.27	0.27	#N/A	#N/A	#N/A
Soil Series Total	0.61	0.62	#N/A	#N/A	#N/A

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Nov-19
Designed By:	HY/ALB
Checked By:	JA
Subject:	Hydrologic Parameters

3358 LAKEFIELD ROAD - CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

EXISITING CONDITION

Catchment 204 **Area** 16.3 ha

Rain Gauge: Peterborough Airport
100-yr 24hr SCS Rainfall Depth: 108.7 mm

WEIGHTED CN VALUE

Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics		Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
OL	OTONABEE	B	Loam or Silt Loam	2	12.6	0.77	0	0	60	3.70	0.29	69	0	0	65	0	0	74	7.60	0.60	100	1.3	0.10	50	85.7
EI	EMILY	B	Loam	2	3.7	0.23	0	0	60	1.47	0.40	69	0	0	65	0	0	74	2.23	0.60	100	0	0	50	87.7
																									0
																									0
																									0
				Totals	16.3	1	0	0		5.17	0.32		0	0		0	0		9.83	0.60		1.3	0.08		86.2
																								CN*(AMC II)	85.5
																								CN*(AMC III)	93.1

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	253.1	m
Minimum Catchment Elevation	250.4	m
Catchment length	504	m
Catchment Slope	1%	
Catchment Area	16.3	ha
Time of Concentration (Minutes)	**24.62**	
Time of Concentration (Hours)	**0.41**	
Time to Peak (2/3 x Time of Concentration)	**0.27**	

For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	253.1	m
Minimum Catchment Elevation	250.4	m
Catchment length	504	m
Catchment Slope	1%	
Catchment Area	16.3	ha
Time of Concentration (Minutes)	**39.06**	
Time of Concentration (Hours)	**0.65**	
Time to Peak (2/3 x Time of Concentration)	**0.43**	

Time to Peak	**0.27 hrs**

Initial Abstraction	**2.79223 mm**

Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	**0.67**

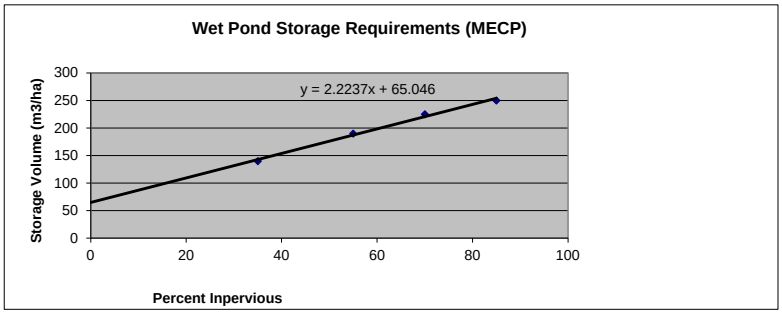
Landuse Type	Soil Series				
	OL	EI	0	0	0
	2	2	#N/A	#N/A	#N/A
Forest/Woodland	0.25	0.25	#N/A	#N/A	#N/A
Cultivated	0.35	0.35	#N/A	#N/A	#N/A
Pasture/Lawn	0.28	0.28	#N/A	#N/A	#N/A
Impervious	0.95	0.95	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	0.05	#N/A	#N/A	#N/A
Meadows	0.27	0.27	#N/A	#N/A	#N/A
Soil Series Total	0.66	0.68	#N/A	#N/A	#N/A

Project :	3358 Lakefield Road Development
File No.	517651
Date:	Nov-19
Designed By:	HY
Checked By:	JA
Subject:	Impervious Area Calculations

Impervious Area Calculations

PEXT-3		
Total Area (ha)	6.90	
Future Development Area (ha)	6.90	
Impervious Area (ha)	5.18	(Assume 75% TIMP and 75% XIMP for future development)
Total % Impervious (TIMP)	75.0%	
Directly Connected Impervious (XIMP)	75.0%	
Pervious Area CN	69	
201		
Total Area (ha)	2.20	
High Density Residential (ha)	1.95	(Assume 75% TIMP and 75% XIMP over high density residential area)
SWM Pond (ha)	0.25	(Assume 50% TIMP and 50% XIMP over SWM pond area)
Impervious Area (ha)	1.6	
Total % Impervious (TIMP)	72.2%	
Directly Connected Impervious (XIMP)	72.2%	
Pervious Area CN	69	
202		
Total Area (ha)	15.50	
Low Density Residential (ha)	12.25	(Assume 50% TIMP and 35% XIMP over low density residential area)
High Density Residential (ha)	1.95	(Assume 75% TIMP and 75% XIMP over high density residential area)
SWM Pond (ha)	1.30	(Assume 50% TIMP and 50% XIMP over SWM pond area)
Impervious Area (ha)	8.2	
Total % Impervious (TIMP)	53.1%	
Directly Connected Impervious (XIMP)	41.3%	
Pervious Area CN	69	
202(1)		
Total Area (ha)	12.90	
Low Density Residential (ha)	10.53	(Assume 50% TIMP and 35% XIMP over low density residential area)
High Density Residential (ha)	1.95	(Assume 75% TIMP and 75% XIMP over high density residential area)
SWM Pond (ha)	0.42	(Assume 50% TIMP and 50% XIMP over SWM pond area)
Impervious Area (ha)	6.9	
Total % Impervious (TIMP)	53.8%	
Directly Connected Impervious (XIMP)	41.5%	

TATHAM ENGINEERING	Project:	3358 Lakefield Road Development	Date:	Nov-19
	File No.:	517651	Designed By:	HY
	Subject:	Wet SWM Pond Water Quality Calculations	Checked By:	JA



MECP Water Quality Storage Volumes

Table 3.2 Values

% imp	Storage (m^3/ha)
35	140
55	190
70	225
85	250

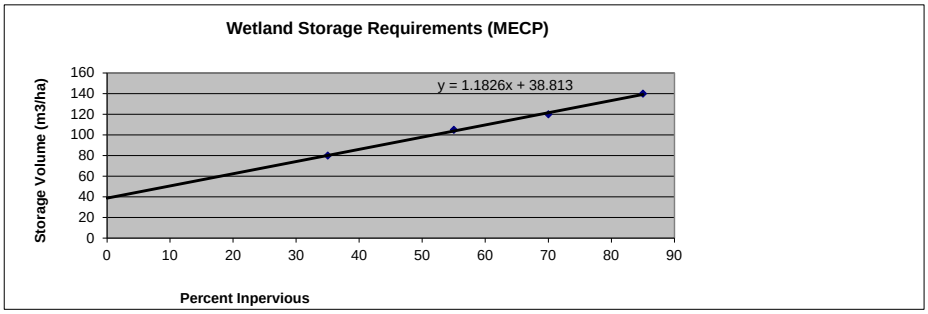
(Enahnced 80% long-term TSS Removal)

SWM POND2 (Catchment 202)		WET CELL 1 (Catchment 202-1)	WET CELL 2 (Catchment 202-2)
Drainage Area (ha):	15.5	12.9	1.80
% imp:	53%	54%	50%
MECP Storage Volume Required (m^3/ha):	183.2	184.6	176.2
Permanent Pool Storage Volume Required (m^3):	2220.0	1865.8	245.2
Extended Detention Storage Volume (m^3):	620.0	516.0	72.0
25 mm Runoff Volume (m^3):	1886.2	1569.8	219.0
Permanent Pool Storage Volume Available (m^3):	3750	3131.2	637.2

SWM POND4 (Catchment 204+EXT2+PEXT3)

Drainage Area (ha):	25.00	(204+EXT2+PEXT3)
% imp:	60%	(Weighted AVG., 203 - 60%, EXT2 - 0%, PEXT-3 - 75%)
MECP Storage Volume Required (m^3/ha):	197.7	
Permanent Pool Storage Volume Required (m^3):	3942.8	
Extended Detention Storage Volume (m^3):	1000.0	
25 mm Runoff Volume (m^3):	3698.8	
Permanent Pool Storage Volume Available (m^3):	4756	

TATHAM ENGINEERING	Project:	3358 Lakefield Road Development	Date:	Nov-19
	File No.:	517651	Designed By:	HY
	Subject:	Wetland Water Quality Calculations	Checked By:	JA



MECP Water Quality Storage Volumes

Table 3.2 Values

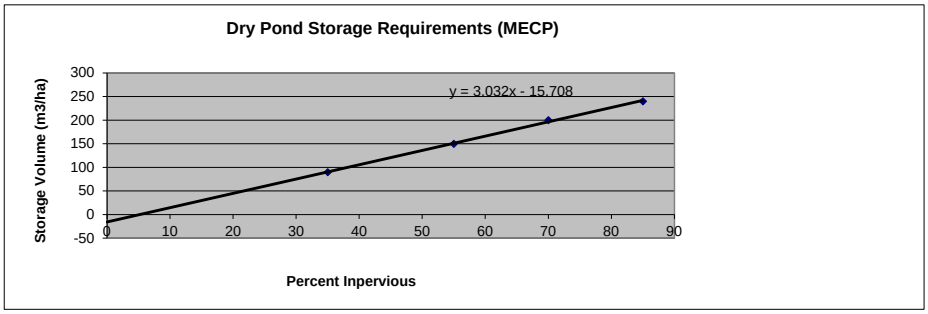
% imp	Storage (m^3/ha)
35	80
55	105
70	120
85	140

(Enahnced 80% long-term TSS Removal)

SWM POND3 (Catchment 203 + EXT1)

Drainage Area (ha):	12.20	(203+EXT1)
% imp:	38%	(Weighted AVG., 204 - 51%, EXT1 - 0%)
MECP Storage Volume Required (m^3/ha):	83.4	
Permanent Pool Storage Volume Required (m^3):	528.9	
Extended Detention Storage Volume (m^3):	488.0	
25 mm Runoff Volume (m^3):	1074.8	
Permanent Pool Storage Volume Available (m^3):	1069.6	

TATHAM ENGINEERING	Project:	3358 Lakefield Road Development	Date:	Nov-19
	File No.:	517651	Designed By:	HY
	Subject:	Dry Pond Water Quality Calculations	Checked By:	JA



MECP Water Quality Storage Volumes

Table 3.2 Values

% imp	Storage (m^3/ha)
35	90
55	150
70	200
85	240

(Basic 60% long-term TSS Removal)

SWM POND1 (Catchment 201)

Drainage Area (ha):	2.20	(Catchment 201)
% imp:	72%	
MECP Storage Volume Required (m^3/ha):	203.1	
MECP Storage Volume Required (m^3):	446.8	
25 mm Runoff Volume (m^3):	398.4	
Pond Storage Volume Available (m^3):	1353.1	

TATHAM ENGINEERING

Project :	3358 Lakefield Road Development
File No.	517651
Date:	Nov-19
Designed By:	HY
Checked By:	JA
Subject:	Pond Volume Table

SWM FACILITY 1 DRY CELL VOLUME TABLE

Elevation (m)	Depth (m)	Increasing (m^2)	Accum (m^2)	Volume (m^3)	Accum. (m^3)
236.00	0.00	0.00	1722.00	0.00	0.00
236.05	0.05	29.13	1751.13	86.8	86.8
236.10	0.10	29.37	1780.50	88.3	175.1
236.15	0.15	29.62	1810.12	89.8	264.9
236.20	0.20	29.86	1839.98	91.3	356.1
236.25	0.25	30.11	1870.09	92.8	448.9
236.30	0.30	30.35	1900.44	94.3	543.1
236.35	0.35	30.59	1931.03	95.8	638.9
236.40	0.40	30.84	1961.87	97.3	736.3
236.45	0.45	31.08	1992.96	98.9	835.1
236.50	0.50	31.33	2024.28	100.4	935.6
236.55	0.55	31.57	2055.86	102.0	1037.6
236.60	0.60	31.82	2087.67	103.6	1141.1
236.65	0.65	32.06	2119.73	105.2	1246.3
236.70	0.70	32.31	2152.04	106.8	1353.1
236.75	0.75	32.55	2184.59	108.4	1461.5
236.80	0.80	32.79	2217.38	110.0	1571.6
236.85	0.85	33.04	2250.42	111.7	1683.3
236.90	0.90	33.28	2283.70	113.4	1796.6
236.95	0.95	33.53	2317.23	115.0	1911.7
237.00	1.00	33.77	2351.00	116.7	2028.4

** Need 1072m^3 during 100-yr SCS

TATHAM ENGINEERING

Project :	3358 Lakefield Road Development
File No.	517651
Date:	Nov-19
Designed By:	HY
Checked By:	JA
Subject:	Pond Volume Table

SWM FACILITY 2 WET CELL 1 (QUALITY STORAGE)

Elevation (m)	Depth (m)	Increasing (m^2)	Accum (m^2)	Volume (m^3)	Accum. (m^3)
245.20	0.00	0.00	2503.00	0.00	0.00
245.25	0.05	58.63	2561.63	126.6	126.6
245.30	0.10	59.31	2620.94	129.6	256.2
245.35	0.15	59.99	2680.93	132.5	388.7
245.40	0.20	60.67	2741.60	135.6	524.3
245.45	0.25	61.35	2802.94	138.6	662.9
245.50	0.30	62.02	2864.97	141.7	804.6
245.55	0.35	62.70	2927.67	144.8	949.4
245.60	0.40	63.38	2991.05	148.0	1097.4
245.65	0.45	64.06	3055.11	151.2	1248.5
245.70	0.50	64.74	3119.85	154.4	1402.9
245.75	0.55	65.42	3185.27	157.6	1560.5
245.80	0.60	66.10	3251.37	160.9	1721.4
245.85	0.65	66.78	3318.14	164.2	1885.7
245.90	0.70	67.45	3385.60	167.6	2053.2
245.95	0.75	68.13	3453.73	171.0	2224.2
246.00	0.80	68.81	3522.55	174.4	2398.6
246.05	0.85	69.49	3592.04	177.9	2576.5
246.10	0.90	70.17	3662.21	181.4	2757.8
246.15	0.95	70.85	3733.05	184.9	2942.7
246.20	1.00	71.53	3804.58	188.4	3131.2
246.25	1.05	72.21	3876.79	192.0	3323.2
246.30	1.10	72.88	3949.67	195.7	3518.9
246.35	1.15	73.56	4023.24	199.3	3718.2
246.40	1.20	74.24	4097.48	203.0	3921.2
246.45	1.25	74.92	4172.40	206.7	4127.9
246.50	1.30	75.60	4248.00	210.5	4338.4

SWM FACILITY 2 WET CELL 2 (QUALITY STORAGE)

Elevation (m)	Depth (m)	Increasing (m^2)	Accum (m^2)	Volume (m^3)
243.40	0.00	0.00	498.00	0.00
243.45	0.05	12.90	510.90	25.2
243.50	0.10	13.06	523.96	25.9
243.55	0.15	13.23	537.19	26.5
243.60	0.20	13.39	550.59	27.2
243.65	0.25	13.56	564.15	27.9
243.70	0.30	13.72	577.87	28.5
243.75	0.35	13.89	591.76	29.2
243.80	0.40	14.05	605.82	29.9
243.85	0.45	14.22	620.04	30.6
243.90	0.50	14.38	634.42	31.4
243.95	0.55	14.55	648.97	32.1
244.00	0.60	14.71	663.68	32.8
244.05	0.65	14.88	678.56	33.6
244.10	0.70	15.04	693.61	34.3
244.15	0.75	15.21	708.82	35.1
244.20	0.80	15.37	724.19	35.8
244.25	0.85	15.54	739.73	36.6
244.30	0.90	15.70	755.43	37.4
244.35	0.95	15.87	771.30	38.2
244.40	1.00	16.03	787.33	39.0
244.45	1.05	16.20	803.53	39.8
244.50	1.10	16.36	819.90	40.6
244.55	1.15	16.53	836.42	41.4
244.60	1.20	16.69	853.12	42.2
244.65	1.25	16.86	869.98	43.1
244.70	1.30	17.02	887.00	43.9

SWM FACILITY 2 DRY CELL (QUANTITY STORAGE)

Elevation (m)	Depth (m)	Increasing Area (m^2)	Accum Area (m^2)	Volume (m^3)	Accum. Volume (m^3)
242.70	0.00	0.00	5365.00	0.00	0.00
242.75	0.05	59.68	5424.68	269.7	269.7
242.80	0.10	60.01	5484.69	272.7	542.5
242.85	0.15	60.34	5545.03	275.7	818.2
242.90	0.20	60.67	5605.71	278.8	1097.0
242.95	0.25	61.00	5666.71	281.8	1378.8
243.00	0.30	61.33	5728.04	284.9	1663.7
243.05	0.35	61.66	5789.70	287.9	1951.6
243.10	0.40	61.99	5851.69	291.0	2242.6
243.15	0.45	62.32	5914.02	294.1	2536.8
243.20	0.50	62.65	5976.67	297.3	2834.0
243.25	0.55	62.98	6039.65	300.4	3134.4
243.30	0.60	63.31	6102.96	303.6	3438.0
243.35	0.65	63.64	6166.60	306.7	3744.7
243.40	0.70	63.97	6230.58	309.9	4054.7
243.45	0.75	64.30	6294.88	313.1	4367.8
243.50	0.80	64.63	6359.51	316.4	4684.2
243.55	0.85	64.96	6424.48	319.6	5003.8
243.60	0.90	65.29	6489.77	322.9	5326.6
243.65	0.95	65.62	6555.39	326.1	5652.8
243.70	1.00	65.95	6621.35	329.4	5982.2
243.75	1.05	66.28	6687.63	332.7	6314.9
243.80	1.10	66.61	6754.24	336.0	6650.9
243.85	1.15	66.94	6821.19	339.4	6990.3
243.90	1.20	67.27	6888.46	342.7	7333.1
243.95	1.25	67.60	6956.07	346.1	7679.2
244.00	1.30	67.93	7024.00	349.5	8028.7

** Need 5211 during 24 hr SCS
** need 2220 permanent pool **

TATHAM ENGINEERING

Project :	3358 Lakefield Road Developmen
File No.	517651
Date:	Feb-20
Designed By:	HY
Checked By:	JA
Subject:	Pond Volume Table

SWM FACILITY 3 FOREBAY

Elevation (m)	Depth (m)	Increasing (m^2)	Accum (m^2)	Volume (m^3)	Quality (m^3)	Quantity
243.40	0.00	0.00	40.00	0.00	0	0
243.45	0.05	7.66	47.66	2.2	2	0
243.50	0.10	8.33	56.00	2.6	5	0
243.55	0.15	9.01	65.00	3.0	8	0
243.60	0.20	9.68	74.68	3.5	11	0
243.65	0.25	10.35	85.03	4.0	15	0
243.70	0.30	11.02	96.04	4.5	20	0
243.75	0.35	11.69	107.73	5.1	25	0
243.80	0.40	12.36	120.10	5.7	31	0
243.85	0.45	13.03	133.13	6.3	37	0
243.90	0.50	13.70	146.83	7.0	44	0
243.95	0.55	14.37	161.20	7.7	52	0
244.00	0.60	15.05	176.25	8.4	60	0
244.05	0.65	15.72	191.97	9.2	69	0
244.10	0.70	16.39	208.35	10.0	79	0
244.15	0.75	17.06	225.41	10.8	90	0
244.20	0.80	17.73	243.14	11.7	102	0
244.25	0.85	18.40	261.54	12.6	114	0
244.30	0.90	19.07	280.62	13.6	128	0
244.35	0.95	19.74	300.36	14.5	142	0
244.40	1.00	20.41	320.77	15.5	158	0
244.45	1.05	21.09	341.86	16.6	158	17
244.50	1.10	21.76	363.62	17.6	158	34
244.55	1.15	22.43	386.04	18.7	158	53
244.60	1.20	23.10	409.14	19.9	158	73
244.65	1.25	23.77	432.91	21.0	158	94
244.70	1.30	24.44	457.35	22.3	158	116
244.75	1.35	25.11	482.47	23.5	158	140
244.80	1.40	25.78	508.25	24.8	158	164
244.85	1.45	26.45	534.70	26.1	158	190
244.90	1.50	27.13	561.83	27.4	158	218
244.95	1.55	27.80	589.63	28.8	158	247
245.00	1.60	28.47	618.10	30.2	158	277
245.05	1.65	29.14	647.23	31.6	158	308
245.10	1.70	29.81	677.04	33.1	158	342
245.15	1.75	30.48	707.53	34.6	158	376
245.20	1.80	31.15	738.68	36.2	158	412
245.25	1.85	31.82	770.50	37.7	158	450
245.30	1.90	32.49	803.00	39.3	158	489
245.35	1.95	33.17	836.16	41.0	158	530
245.40	2.00	33.84	870.00	42.7	158	573

SWM FACILITY 3 MAIN CELL

Elevation (m)	Depth (m)	Increasing (m^2)	Accum Area (m^2)
243.40	0.00	0.00	0.00
243.45	0.00	0.00	0.00
243.50	0.00	0.00	0.00
243.55	0.00	0.00	0.00
243.60	0.00	0.00	0.00
243.65	0.00	0.00	0.00
243.70	0.00	0.00	0.00
243.75	0.00	0.00	0.00
243.80	0.00	0.00	0.00
243.85	0.00	0.00	0.00
243.90	0.00	0.00	0.00
243.95	0.00	0.00	0.00
244.00	0.00	0.00	0.00
244.05	0.00	0.00	0.00
244.10	0.00	0.00	2864.70
244.15	0.05	57.12	2921.82
244.20	0.10	57.68	2979.50
244.25	0.15	58.25	3037.74
244.30	0.20	58.81	3096.55
244.35	0.25	59.37	3155.93
244.40	0.30	59.94	3215.86
244.45	0.35	60.50	3276.36
244.50	0.40	61.06	3337.43
244.55	0.45	61.63	3399.06
244.60	0.50	62.19	3461.25
244.65	0.55	62.76	3524.00
244.70	0.60	63.32	3587.32
244.75	0.65	63.88	3651.21
244.80	0.70	64.45	3715.66
244.85	0.75	65.01	3780.67
244.90	0.80	65.57	3846.24
244.95	0.85	66.14	3912.38
245.00	0.90	66.70	3979.08
245.05	0.95	67.27	4046.35
245.10	1.00	67.83	4114.18
245.15	1.05	68.39	4182.57
245.20	1.10	68.96	4251.53
245.25	1.15	69.52	4321.05
245.30	1.20	70.09	4391.14
245.35	1.25	70.65	4461.79
245.40	1.30	71.21	4533.00

** Need 2576 of active storage during 100 yr SCS
** need 528 m3 of permanent pool

TATHAM ENGINEERING

Project :	3358 Lakefield Road Developmen
File No.	517651
Date:	Nov-19
Designed By:	HY
Checked By:	JA
Subject:	Pond Volume Table

SWM FACILITY 4 MAIN CELL

Elevation (m)	Depth (m)	Increasing Area (m^2)	Accum Area (m^2)	Volume (m^3)	Quality Volume (m^3)	Quantity Volume (m^3)
245.30	0.00	0.00	4185.00	0	0	0
245.35	0.05	54.86	4239.86	211	211	0
245.40	0.10	55.21	4295.07	213	424	0
245.45	0.15	55.57	4350.64	216	640	0
245.50	0.20	55.93	4406.57	219	859	0
245.55	0.25	56.29	4462.86	222	1081	0
245.60	0.30	56.64	4519.50	225	1305	0
245.65	0.35	57.00	4576.50	227	1533	0
245.70	0.40	57.36	4633.85	230	1763	0
245.75	0.45	57.71	4691.57	233	1996	0
245.80	0.50	58.07	4749.64	236	2232	0
245.85	0.55	58.43	4808.07	239	2471	0
245.90	0.60	58.79	4866.85	242	2713	0
245.95	0.65	59.14	4926.00	245	2958	0
246.00	0.70	59.50	4985.50	248	3206	0
246.05	0.75	59.86	5045.36	251	3456	0
246.10	0.80	60.21	5105.57	254	3710	0
246.15	0.85	60.57	5166.14	257	3967	0
246.20	0.90	60.93	5227.07	260	4227	0
246.25	0.95	61.29	5288.36	263	4490	0
246.30	1.00	61.64	5350.00	266	4756	0
246.30	1.00	7659.83	13009.83	0	4756	0
246.35	1.05	100.44	13110.27	653	4756	653
246.40	1.10	100.83	13211.10	658	4756	1311
246.45	1.15	101.21	13312.31	663	4756	1974
246.50	1.20	101.60	13413.91	668	4756	2642
246.55	1.25	101.99	13515.90	673	4756	3316
246.60	1.30	102.37	13618.27	678	4756	3994
246.65	1.35	102.76	13721.03	683	4756	4677
246.70	1.40	103.15	13824.18	689	4756	5366
246.75	1.45	103.53	13927.71	694	4756	6060
246.80	1.50	103.92	14031.63	699	4756	6759
246.85	1.55	104.30	14135.93	704	4756	7463
246.90	1.60	104.69	14240.62	709	4756	8172
246.95	1.65	105.08	14345.70	715	4756	8887
247.00	1.70	105.46	14451.16	720	4756	9607
247.05	1.75	105.85	14557.01	725	4756	10332
247.10	1.80	106.24	14663.25	731	4756	11063
247.15	1.85	106.62	14769.87	736	4756	11798
247.20	1.90	107.01	14876.88	741	4756	12540
247.25	1.95	107.39	14984.27	747	4756	13286
247.30	2.00	107.78	15092.05	752	4756	14038

** Need 9341 during 100 yr SCS**
** Need 3942permanent pool **

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       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\4d91e7c6
-20f1-4f66-87bd-b9b3940cf231\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\4d91e7c6
-20f1-4f66-87bd-b9b3940cf231\scenario


DATE: 11/02/2020                          TIME: 09:08:56

USER:


COMMENTS: _____________________________________________________


  ***********************************************
  ** SIMULATION : Run 01                       **
  ***********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM               15.0
    [ Ptot= 49.00 mm ]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.03 12.33  11.41 0.23   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.21 12.42  11.41 0.23   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.53]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.09 12.33  11.41 0.23   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
```



```
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    0.29 12.42  11.41  n/a   0.000
*
    ADD [  0043+  0044]  0034  3  5.0   22.60    0.32 12.42  11.41  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.04 12.17  10.53 0.21   0.000
    [CN=65.6         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0026  1  5.0    3.20    0.05 12.33  10.50 0.21   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0027  1  5.0   13.30    0.16 12.58  11.41 0.23   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0026+  0027]  0035  3  5.0   16.50    0.20 12.50  11.23  n/a   0.000
*
 ** CALIB NASHYD         0025  1  5.0   12.00    0.20 12.17  10.16 0.21   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\7f16e5ea
-9160-45a4-afd4-2583ba503821\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\7f16e5ea
-9160-45a4-afd4-2583ba503821\scenario


DATE: 11/02/2020                          TIME: 09:08:56

USER:


COMMENTS: _____________________________________________________
```

```
  ********************************************
  ** SIMULATION : Run 02                     **
  ********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM                15.0
    [ Ptot= 65.00 mm ]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.05 12.33  19.39 0.30   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.37 12.42  19.39 0.30   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.53]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.15 12.33  19.39 0.30   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    0.51 12.42  19.39  n/a   0.000
*
    ADD [  0043+  0044]  0034  3  5.0   22.60    0.56 12.42  19.39  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.07 12.17  18.16 0.28   0.000
    [CN=65.6         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0026  1  5.0    3.20    0.08 12.25  18.11 0.28   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0027  1  5.0   13.30    0.27 12.58  19.39 0.30   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0026+  0027]  0035  3  5.0   16.50    0.34 12.50  19.14  n/a   0.000
*
 ** CALIB NASHYD         0025  1  5.0   12.00    0.36 12.17  17.62 0.27   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```



```
                    *****  S U M M A R Y   O U T P U T  *****

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\abe3b33c
-5bf8-432d-9314-5cb926d9b482\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\abe3b33c
-5bf8-432d-9314-5cb926d9b482\scenario


DATE: 11/02/2020                          TIME: 09:08:56

USER:


COMMENTS: _____________________________________________________________


  ********************************************
  ** SIMULATION : Run 03                     **
  ********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM                15.0
    [ Ptot= 75.60 mm ]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.06 12.33  25.39 0.34   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.49 12.42  25.39 0.34   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.53]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.20 12.25  25.39 0.34   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    0.67 12.42  25.39  n/a   0.000
*
    ADD [  0043+  0044]  0034  3  5.0   22.60    0.74 12.33  25.39  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.10 12.17  23.93 0.32   0.000
    [CN=65.6         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0026  1  5.0    3.20    0.11 12.25  23.87 0.32   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0027  1  5.0   13.30    0.36 12.58  25.39 0.34   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
```

```
   ADD [  0026+  0027]  0035  3  5.0   16.50    0.45 12.50  25.10  n/a   0.000
*
 ** CALIB NASHYD         0025  1  5.0   12.00    0.48 12.17  23.30 0.31   0.000
    [CN=65.0        ]
    [ N = 3.0:Tp 0.33]
*
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\aa863043
-35d9-40c9-b9fc-a3e69d486c89\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\aa863043
-35d9-40c9-b9fc-a3e69d486c89\scenario


DATE: 11/02/2020                          TIME: 09:08:56

USER:


COMMENTS: _____________________________________________________________


  ***********************************************
  ** SIMULATION : Run 04                       **
  ***********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

     START @  0.00 hrs
     --------------------
   MASS STORM               15.0
   [ Ptot= 88.90 mm ]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.08 12.33  33.59 0.38   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.65 12.42  33.59 0.38   0.000
```



```
    [CN=66.9        ]
    [ N = 3.0:Tp 0.53]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.26 12.25  33.59 0.38   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.42]
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    0.90 12.33  33.59  n/a   0.000
*
    ADD [  0043+  0044]  0034  3  5.0   22.60    0.98 12.33  33.59  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.13 12.17  31.85 0.36   0.000
    [CN=65.6        ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0026  1  5.0    3.20    0.15 12.25  31.77 0.36   0.000
    [CN=65.5        ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0027  1  5.0   13.30    0.48 12.58  33.59 0.38   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0026+  0027]  0035  3  5.0   16.50    0.61 12.50  33.24  n/a   0.000
*
 ** CALIB NASHYD         0025  1  5.0   12.00    0.65 12.17  31.09 0.35   0.000
    [CN=65.0        ]
    [ N = 3.0:Tp 0.33]
*
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\f42646d9
-cbf0-4b37-b920-faecce6a6b79\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\f42646d9
-cbf0-4b37-b920-faecce6a6b79\scenario


DATE: 11/02/2020                          TIME: 09:08:56
```

USER:

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : Run 05                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM                15.0
    [ Ptot= 98.90 mm ]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.10 12.33  40.15 0.41   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.78 12.42  40.15 0.41   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.53]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.31 12.25  40.15 0.41   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    1.08 12.33  40.15  n/a   0.000
*
    ADD [  0043+  0044]  0034  3  5.0   22.60    1.18 12.33  40.15  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.16 12.17  38.22 0.39   0.000
    [CN=65.6         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0026  1  5.0    3.20    0.18 12.25  38.13 0.39   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0027  1  5.0   13.30    0.57 12.58  40.16 0.41   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0026+  0027]  0035  3  5.0   16.50    0.73 12.50  39.76  n/a   0.000
*
 ** CALIB NASHYD         0025  1  5.0   12.00    0.78 12.17  37.37 0.38   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
 FINISH

================================================================================
========================

================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
```



```
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

Output filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\ca029342
-19d0-4090-825d-c4a930d015a9\scenario
Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\ca029342
-19d0-4090-825d-c4a930d015a9\scenario

DATE: 11/02/2020 TIME: 09:08:56

USER:

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : Run 06                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM                15.0
    [ Ptot=108.70 mm ]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.12 12.33  46.88 0.43   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.91 12.42  46.88 0.43   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.53]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.37 12.25  46.88 0.43   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    1.27 12.33  46.88  n/a   0.000
*
    ADD [  0043+  0044]  0034  3  5.0   22.60    1.39 12.33  46.88  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.19 12.17  44.76 0.41   0.000
```

```
    [CN=65.6         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0026  1  5.0    3.20    0.22 12.25  44.66 0.41   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0027  1  5.0   13.30    0.67 12.58  46.88 0.43   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0026+  0027]  0035  3  5.0   16.50    0.85 12.50  46.45  n/a   0.000
*
 ** CALIB NASHYD         0025  1  5.0   12.00    0.92 12.17  43.83 0.40   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
```

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================================================================================
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       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\bd85e30f
-94ad-48d2-82fc-97ca82f049b9\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\bd85e30f
-94ad-48d2-82fc-97ca82f049b9\scenario


DATE: 11/02/2020                          TIME: 09:10:05

USER:


COMMENTS: _____________________________________________________


  ************************************************
  ** SIMULATION : Run 01                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

     START @  0.00 hrs
     --------------------
    READ STORM                5.0
    [ Ptot= 25.00 mm ]
    fname :
C:\Users\HYu\AppData\Local\Temp\3361675f-0a0a-426a-bcf6-fb06de11352c\97e22a62-587a-
4fb0-b63b-a92c279
    remark: 25 mm Rainfall Event

*
 ** CALIB NASHYD         0039  1  5.0   12.00    0.05  1.83   2.25 0.09   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
 ** CALIB NASHYD         0038  1  5.0    3.20    0.01  1.92   2.39 0.10   0.000
    [CN=65.5         ]
```



```
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0041  1  5.0   13.30    0.05  2.33   2.75 0.11   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0038+  0041]  0040  3  5.0   16.50    0.06  2.25   2.68  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.01  1.75   2.39 0.10   0.000
    [CN=65.6         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.01  2.00   2.75 0.11   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.02  1.92   2.75 0.11   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.06  2.08   2.75 0.11   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.53]
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    0.09  2.08   2.75  n/a   0.000
*
    ADD [  0043+  0044]  0042  3  5.0   22.60    0.09  2.08   2.75  n/a   0.000
*
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\adff81b2
-e5ba-41c5-b2ad-6e91273d3861\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\adff81b2
-e5ba-41c5-b2ad-6e91273d3861\scenario


DATE: 11/02/2020                          TIME: 09:10:05

USER:
```

COMMENTS: _____

```
  ***********************************************
  ** SIMULATION : Run 02                       **
  ***********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 33.08 mm ]
*
 ** CALIB NASHYD         0039  1  5.0   12.00    0.10  1.75   4.39 0.13   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
 ** CALIB NASHYD         0038  1  5.0    3.20    0.02  1.92   4.59 0.14   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0041  1  5.0   13.30    0.09  2.25   5.13 0.16   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0038+  0041]  0040  3  5.0   16.50    0.11  2.17   5.03  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.02  1.75   4.61 0.14   0.000
    [CN=65.6         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.01  1.92   5.13 0.16   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.05  1.92   5.13 0.16   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.12  2.00   5.13 0.16   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.53]
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    0.16  2.00   5.13  n/a   0.000
*
    ADD [  0043+  0044]  0042  3  5.0   22.60    0.18  2.00   5.13  n/a   0.000
*
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
```



```
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

Output filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\6242d562-b9ca-4d6d-bd67-990ef20c76f0\scenario
Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\6242d562-b9ca-4d6d-bd67-990ef20c76f0\scenario

DATE: 11/02/2020 TIME: 09:10:05

USER:

COMMENTS: _____

```
  ***********************************************
  ** SIMULATION : Run 03                       **
  ***********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 45.08 mm ]
*
 ** CALIB NASHYD         0039  1  5.0   12.00    0.20  1.75   8.56 0.19   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
 ** CALIB NASHYD         0038  1  5.0    3.20    0.05  1.83   8.87 0.20   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0041  1  5.0   13.30    0.17  2.17   9.69 0.21   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0038+  0041]  0040  3  5.0   16.50    0.21  2.08   9.53  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.04  1.67   8.90 0.20   0.000
    [CN=65.6         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.03  1.92   9.69 0.21   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.09  1.83   9.69 0.21   0.000
```

```
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.23  2.00   9.69 0.21   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.53]
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    0.32  2.00   9.69  n/a   0.000
*
    ADD [  0043+  0044]  0042  3  5.0   22.60    0.34  2.00   9.69  n/a   0.000
*
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\34023484
-5b0d-411d-ba0c-c89535593ab3\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\34023484
-5b0d-411d-ba0c-c89535593ab3\scenario


DATE: 11/02/2020                          TIME: 09:10:05

USER:


COMMENTS: _____________________________________________________________


  ***********************************************
  ** SIMULATION : Run 04                       **
  ***********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

     START @  0.00 hrs
     --------------------
    CHIC STORM               10.0
    [ Ptot= 52.74 mm ]
*
```



```
 ** CALIB NASHYD         0039  1  5.0   12.00    0.29  1.75  11.77 0.22   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
 ** CALIB NASHYD         0038  1  5.0    3.20    0.07  1.83  12.15 0.23   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0041  1  5.0   13.30    0.24  2.17  13.14 0.25   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0038+  0041]  0040  3  5.0   16.50    0.30  2.08  12.95  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.06  1.67  12.18 0.23   0.000
    [CN=65.6         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.04  1.92  13.14 0.25   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.12  1.83  13.14 0.25   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.32  2.00  13.14 0.25   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.53]
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    0.44  2.00  13.14  n/a   0.000
*
    ADD [  0043+  0044]  0042  3  5.0   22.60    0.48  1.92  13.14  n/a   0.000
*
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L              (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\f0fcf338
-9ae4-4437-ad2c-f79a4cf6bd2b\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\f0fcf338
```

-9ae4-4437-ad2c-f79a4cf6bd2b\scenario

DATE: 11/02/2020 TIME: 09:10:05

USER:

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : Run 05                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 62.87 mm ]
*
 ** CALIB NASHYD         0039  1  5.0   12.00    0.41  1.75  16.55 0.26   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
 ** CALIB NASHYD         0038  1  5.0    3.20    0.10  1.83  17.01 0.27   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0041  1  5.0   13.30    0.33  2.17  18.25 0.29   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0038+  0041]  0040  3  5.0   16.50    0.42  2.08  18.01  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.08  1.67  17.06 0.27   0.000
    [CN=65.6         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.06  1.92  18.24 0.29   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.18  1.83  18.25 0.29   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.45  2.00  18.25 0.29   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.53]
*
    ADD [  0045+  0047]  0043  3  5.0   20.80    0.61  1.92  18.25  n/a   0.000
*
    ADD [  0043+  0044]  0042  3  5.0   22.60    0.67  1.92  18.25  n/a   0.000
*
 FINISH
```



```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

Output filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\bdb2d9f6
-079f-432c-9eaa-1ccb04f64120\scenario
Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\bdb2d9f6
-079f-432c-9eaa-1ccb04f64120\scenario

DATE: 11/02/2020 TIME: 09:10:05

USER:

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : Run 06                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 70.55 mm ]
*
 ** CALIB NASHYD         0039  1  5.0   12.00    0.51  1.75  20.53 0.29   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
 ** CALIB NASHYD         0038  1  5.0    3.20    0.12  1.83  21.06 0.30   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0041  1  5.0   13.30    0.41  2.17  22.47 0.32   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
```

```
   ADD [  0038+  0041]  0040  3  5.0   16.50    0.52  2.08  22.20  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.10  1.67  21.12 0.30   0.000
    [CN=65.6        ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.07  1.92  22.47 0.32   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.22  1.83  22.47 0.32   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.42]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.55  2.00  22.47 0.32   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.53]
*
   ADD [  0045+  0047]  0043  3  5.0   20.80    0.77  1.92  22.47  n/a   0.000
*
   ADD [  0043+  0044]  0042  3  5.0   22.60    0.84  1.92  22.47  n/a   0.000
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\3b371a02
-fcf2-4b78-bb7a-016ae11932c3\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\3b371a02
-fcf2-4b78-bb7a-016ae11932c3\scenario


DATE: 11/02/2020                          TIME: 09:10:05

USER:


COMMENTS: _____________________________________________________________


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



```
 ** SIMULATION : Run 07                         **
 ***********************************************

 W/E COMMAND             HYD ID   DT    AREA   ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha    '  cms   hrs     mm           cms

     START @  0.00 hrs
     --------------------
   CHIC STORM                10.0
   [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0039  1  5.0   12.00    0.63  1.75  24.75 0.32   0.000
    [CN=65.0        ]
    [ N = 3.0:Tp 0.33]
*
 ** CALIB NASHYD         0038  1  5.0    3.20    0.15  1.83  25.35 0.32   0.000
    [CN=65.5        ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0041  1  5.0   13.30    0.50  2.17  26.93 0.34   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.66]
*
   ADD [  0038+  0041]  0040  3  5.0   16.50    0.63  2.08  26.62  n/a   0.000
*
 ** CALIB NASHYD         0024  1  5.0    2.20    0.13  1.67  25.41 0.33   0.000
    [CN=65.6        ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0044  1  5.0    1.80    0.09  1.92  26.93 0.34   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0047  1  5.0    5.30    0.27  1.83  26.93 0.34   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.42]
*
 ** CALIB NASHYD         0045  1  5.0   15.50    0.67  2.00  26.93 0.34   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.53]
*
   ADD [  0045+  0047]  0043  3  5.0   20.80    0.93  1.92  26.93  n/a   0.000
*
   ADD [  0043+  0044]  0042  3  5.0   22.60    1.01  1.92  26.93  n/a   0.000
*
```

```
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\8e2bcbc7
-a933-457f-812d-34fa3ba5909d\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\8e2bcbc7
-a933-457f-812d-34fa3ba5909d\scenario


DATE: 11/02/2020                          TIME: 09:16:55

USER:


COMMENTS: _____________________________________________________


  ***********************************************
  ** SIMULATION : Run 01                       **
  ***********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\HYu\AppData\Local\Temp\042e345d-b52a-4a80-aa66-2a2b620e5093\5e4769b9-6f1e-
4c72-91b8-db63fa5
    remark: TIMMINS STORM

*
 ** CALIB NASHYD         0005  1  5.0    1.80    0.13  8.17 112.67 0.58   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0006  1  5.0   14.80    1.02  8.17 112.67 0.58   0.000
    [CN=66.9         ]
```



```
    [ N = 3.0:Tp 0.53]
*
 ** CALIB NASHYD         0012  1  5.0    5.30    0.39  8.08 112.67 0.58   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
    ADD [  0012+  0006]  0002  3  5.0   20.10    1.41  8.17 112.67  n/a   0.000
*
    ADD [  0002+  0005]  0003  3  5.0   21.90    1.54  8.17 112.67  n/a   0.000
*
 ** CALIB NASHYD         0004  1  5.0    2.60    0.20  8.00 109.74 0.57   0.000
    [CN=65.8         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0036  1  5.0    1.90    0.17  8.00 128.22 0.66   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.27]
*
    ADD [  0036+  0004]  0007  3  5.0    4.50    0.37  8.00 117.54  n/a   0.000
*
 ** CALIB NASHYD         0008  1  5.0    3.20    0.23  8.08 109.08 0.57   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0011  1  5.0   14.70    0.94  8.33 112.68 0.58   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0011+  0008]  0009  3  5.0   17.90    1.15  8.25 112.03  n/a   0.000
*
 ** CALIB NASHYD         0010  1  5.0   12.00    0.89  8.08 107.73 0.56   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
 ** CALIB NASHYD         0046  1  5.0    2.20    0.22  8.00 142.75 0.74   0.000
    [CN=81.4         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0052  1  5.0    5.30    0.51  8.08 145.66 0.75   0.000
    [CN=82.3         ]
    [ N = 3.0:Tp 0.42]
*
 ** CALIB NASHYD         0053  1  5.0   15.50    1.39  8.17 145.67 0.75   0.000
    [CN=82.3         ]
    [ N = 3.0:Tp 0.53]
*
    ADD [  0052+  0053]  0050  3  5.0   20.80    1.89  8.17 145.66  n/a   0.000
*
 ** CALIB NASHYD         0054  1  5.0    1.80    0.17  8.08 145.66 0.75   0.000
    [CN=82.3         ]
    [ N = 3.0:Tp 0.45]
*
    ADD [  0050+  0054]  0048  3  5.0   22.60    2.06  8.17 145.66  n/a   0.000
*
 ** CALIB NASHYD         0049  1  5.0   12.00    1.17  8.00 141.50 0.73   0.000
    [CN=81.0         ]
    [ N = 3.0:Tp 0.33]
*
 ** CALIB NASHYD         0051  1  5.0    3.20    0.30  8.08 142.79 0.74   0.000
    [CN=81.4         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0055  1  5.0   13.30    1.11  8.33 145.67 0.75   0.000
```

```
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\27e40808
-3037-4043-83a0-78ff571b97da\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\27e40808
-3037-4043-83a0-78ff571b97da\scenario


DATE: 11/02/2020                          TIME: 09:15:12

USER:


COMMENTS: _____________________________________________________


  ***********************************************
  ** SIMULATION : Run 01                       **
  ***********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM                15.0
    [ Ptot= 49.00 mm ]
*
 ** CALIB STANDHYD       0251  1  5.0   15.50    1.06 12.00  28.48 0.58   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.14 13.00  28.44  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.05 12.33  10.50 0.21   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    0.60 12.00  27.54 0.56   0.000
```



```
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    0.63 12.00  23.07  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.16 12.67  23.06  n/a   0.000
*
 *  CALIB NASHYD         0255  1  5.0    1.80    0.03 12.33  11.41 0.23   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    0.79 12.00  39.06 0.80   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    1.32 12.00  31.85 0.65   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    2.11 12.00  34.00  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    2.13 12.00  32.37  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    0.25 12.83  32.35  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.24 12.00  37.98 0.78   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.02 13.00  37.57  n/a   0.000
*
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\870fe1da
-38e6-4c1c-a32f-c8d35ed79b74\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\870fe1da
-38e6-4c1c-a32f-c8d35ed79b74\scenario


DATE: 11/02/2020                          TIME: 09:15:12
```

USER:

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : Run 02                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      ---------------------
    MASS STORM                 15.0
    [ Ptot= 65.00 mm ]
*
 ** CALIB STANDHYD       0251  1  5.0   15.50    1.52 12.00  40.70 0.63   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.27 12.67  40.67  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.08 12.25  18.11 0.28   0.000
    [CN=65.5       ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    0.92 12.00  39.60 0.61   0.000
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    0.97 12.00  33.96  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.28 12.50  33.94  n/a   0.000
*
 *  CALIB NASHYD         0255  1  5.0    1.80    0.05 12.33  19.39 0.30   0.000
    [CN=66.9       ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    1.07 12.00  53.17 0.82   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    1.86 12.00  44.67 0.69   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    2.93 12.00  47.20  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    2.95 12.00  45.20  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    0.44 12.67  45.17  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.33 12.00  51.87 0.80   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.04 12.58  51.45  n/a   0.000
*
================================================================================
========================
```



```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M M M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

Output filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\0c7d376d-224b-4f70-95e0-2e39ad68d63d\scenario
Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\0c7d376d-224b-4f70-95e0-2e39ad68d63d\scenario

DATE: 11/02/2020 TIME: 09:15:12

USER:

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : Run 03                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      ---------------------
    MASS STORM                 15.0
    [ Ptot= 75.60 mm ]
*
 ** CALIB STANDHYD       0251  1  5.0   15.50    1.96 12.00  49.21 0.65   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.37 12.58  49.17  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.11 12.25  23.87 0.32   0.000
    [CN=65.5       ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    1.12 12.00  48.01 0.64   0.000
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    1.19 12.00  41.68  n/a   0.000
```

```
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.38 12.50  41.67  n/a   0.000
*
 *  CALIB NASHYD         0255  1  5.0    1.80    0.06 12.33  25.39 0.34   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    1.32 12.00  62.70 0.83   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    2.33 12.00  53.50 0.71   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    3.65 12.00  56.23  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    3.68 12.00  54.01  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    0.60 12.58  53.99  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.40 12.00  61.26 0.81   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.05 12.58  60.85  n/a   0.000
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
         V V    I      SS   U   U  A   A  L
          VV    I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\f857bf89
-8bcb-4bcc-b945-ffcb035fa2e2\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\f857bf89
-8bcb-4bcc-b945-ffcb035fa2e2\scenario

DATE: 11/02/2020                          TIME: 09:15:12

USER:
```



```
COMMENTS: ____________________________________________________________

  ********************************************
  ** SIMULATION : Run 04                     **
  ********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM                  15.0
    [ Ptot= 88.90 mm ]
*
 ** CALIB STANDHYD       0251  1  5.0   15.50    2.43 12.00  60.24 0.68   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.51 12.50  60.20  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.15 12.25  31.77 0.36   0.000
    [CN=65.5        ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    1.39 12.00  58.95 0.66   0.000
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    1.48 12.00  51.82  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.51 12.42  51.80  n/a   0.000
*
 *  CALIB NASHYD         0255  1  5.0    1.80    0.08 12.33  33.59 0.38   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    1.58 12.00  74.81 0.84   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    2.84 12.00  64.87 0.73   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    4.42 12.00  67.83  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    4.47 12.00  65.36  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    0.83 12.50  65.34  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.49 12.00  73.24 0.82   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.07 12.50  72.82  n/a   0.000
*
 FINISH

================================================================================
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================================================================================
```

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       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\7d3a9699
-2af9-4ca2-b94b-8a59b1a2fdc9\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\7d3a9699
-2af9-4ca2-b94b-8a59b1a2fdc9\scenario


DATE: 11/02/2020                          TIME: 09:15:12

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 05                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

     START @  0.00 hrs
     --------------------
    MASS STORM                15.0
    [ Ptot= 98.90 mm ]
*
 *  CALIB STANDHYD       0251  1  5.0   15.50    2.79 12.00  68.74 0.70   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.64 12.50  68.71  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.18 12.25  38.13 0.39   0.000
    [CN=65.5       ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    1.60 12.00  67.39 0.68   0.000
    [I%=38.0:S%= 2.00]
```



```
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    1.72 12.00  59.72  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.62 12.42  59.70  n/a   0.000
*
 *  CALIB NASHYD         0255  1  5.0    1.80    0.10 12.33  40.15 0.41   0.000
    [CN=66.9       ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    1.78 12.00  84.02 0.85   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    3.25 12.00  73.60 0.74   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    5.02 12.00  76.70  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    5.08 12.00  74.07  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    1.01 12.50  74.05  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.56 12.00  82.35 0.83   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.08 12.50  81.94  n/a   0.000
*
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\902e5df6
-343c-4033-a10e-d8c76af894b2\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\902e5df6
-343c-4033-a10e-d8c76af894b2\scenario


DATE: 11/02/2020                          TIME: 09:15:12
```

USER:

COMMENTS: _____

```
  ***********************************************
  ** SIMULATION : Run 06                       **
  ***********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    MASS STORM                15.0
    [ Ptot=108.70 mm ]
*
 *  CALIB STANDHYD       0251  1  5.0   15.50    3.16 12.00  77.23 0.71   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.86 12.42  77.20  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.22 12.25  44.66 0.41   0.000
    [CN=65.5        ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    1.81 12.00  75.82 0.70   0.000
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    1.95 12.00  67.65  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.82 12.33  67.63  n/a   0.000
*
 *  CALIB NASHYD         0255  1  5.0    1.80    0.12 12.33  46.88 0.43   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    1.97 12.00  93.12 0.86   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    3.65 12.00  82.28 0.76   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    5.62 12.00  85.50  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    5.69 12.00  82.72  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    1.32 12.33  82.70  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.62 12.00  91.37 0.84   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.09 12.42  90.95  n/a   0.000
*
```

```
    [CN=82.3         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0051+  0055]  0056  3  5.0   16.50    1.39  8.25 145.11  n/a   0.000
*
 FINISH

================================================================================
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```

```
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       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\d3c76390
-15f5-4e0d-b213-1feeaecf2b1e\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\d3c76390
-15f5-4e0d-b213-1feeaecf2b1e\scenario


DATE: 11/02/2020                          TIME: 09:15:51

USER:


COMMENTS: _____________________________________________________


  ************************************************
  ** SIMULATION : Run 01                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                5.0
    [ Ptot= 25.00 mm ]
    fname :
C:\Users\HYu\AppData\Local\Temp\40450e6d-5072-4a14-be7a-b9ee409c477f\97e22a62-587a-
4fb0-b63b-a92c279
    remark: 25 mm Rainfall Event

*
 ** CALIB NASHYD        0255  1  5.0    1.80    0.01  2.00   2.75 0.11   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD      0245  1  5.0    6.90    0.92  1.33  18.75 0.75   0.000
    [I%=75.0:S%= 2.00]
```



```
*
 *  CALIB STANDHYD      0250  1  5.0   16.30    1.22  1.33  14.28 0.57   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250] 0246  3  5.0   23.20    2.14  1.33  15.61  n/a   0.000
*
    ADD [  0246+  0255] 0254  3  5.0   25.00    2.14  1.33  14.68  n/a   0.000
*
 ** Reservoir
    OUTFLOW:            0252  1  5.0   25.00    0.13  2.83  14.66  n/a   0.000
*
 *  CALIB STANDHYD      0247  1  5.0    2.20    0.29  1.33  18.11 0.72   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:            0253  1  5.0    2.20    0.01  3.50  17.69  n/a   0.000
*
 *  CALIB STANDHYD      0251  1  5.0   15.50    0.93  1.33  12.17 0.49   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:            0242  1  5.0   15.50    0.06  3.08  12.14  n/a   0.000
*
 *  CALIB NASHYD        0243  1  5.0    3.20    0.01  1.92   2.39 0.10   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD      0244  1  5.0    9.00    0.54  1.33  11.59 0.46   0.000
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244] 0248  3  5.0   12.20    0.54  1.33   9.17  n/a   0.000
*
 ** Reservoir
    OUTFLOW:            0249  1  5.0   12.20    0.07  2.33   9.16  n/a   0.000
*
 FINISH

================================================================================
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================================================================================
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       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
```

```
  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\0401e032
-ef38-4b18-99a4-d57d90638bd1\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\0401e032
-ef38-4b18-99a4-d57d90638bd1\scenario

DATE: 11/02/2020                          TIME: 09:15:50

USER:

COMMENTS: _____________________________________________________

  ************************************************
  ** SIMULATION : Run 02                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 33.08 mm ]
*
 ** CALIB NASHYD         0255  1  5.0    1.80    0.01  1.92   5.13 0.16   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    0.93  1.33  25.45 0.77   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    1.39  1.33  19.92 0.60   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    2.32  1.33  21.56  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    2.32  1.33  20.38  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    0.17  2.92  20.36  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.29  1.33  24.65 0.74   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.01  3.17  24.23  n/a   0.000
*
 *  CALIB STANDHYD       0251  1  5.0   15.50    1.06  1.33  17.32 0.52   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.09  3.08  17.28  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.02  1.92   4.59 0.14   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    0.60  1.33  16.60 0.50   0.000
```



```
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    0.60  1.33  13.45  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.11  2.42  13.43  n/a   0.000
*
================================================================================
======================


       V    V   I    SSSSS  U   U    A    L              (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\9e20f463
-7723-4c9c-8383-f0feabff1135\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\9e20f463
-7723-4c9c-8383-f0feabff1135\scenario

DATE: 11/02/2020                          TIME: 09:15:50

USER:

COMMENTS: _____________________________________________________

  ************************************************
  ** SIMULATION : Run 03                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 45.08 mm ]
*
 ** CALIB NASHYD         0255  1  5.0    1.80    0.03  1.92   9.69 0.21   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
```

```
 *  CALIB STANDHYD       0245  1  5.0    6.90    1.28  1.33  35.66 0.79   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    1.92  1.33  28.83 0.64   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    3.20  1.33  30.86  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    3.21  1.33  29.34  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    0.34  2.50  29.32  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.39  1.33  34.65 0.77   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.03  2.67  34.23  n/a   0.000
*
 *  CALIB STANDHYD       0251  1  5.0   15.50    1.48  1.33  25.62 0.57   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.19  2.58  25.59  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.05  1.83   8.87 0.20   0.000
    [CN=65.5       ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    0.83  1.33  24.73 0.55   0.000
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    0.84  1.33  20.57  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.20  2.17  20.56  n/a   0.000
*
================================================================================
=======================
```

```
      V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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```

***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

Output filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\c524dc5b


```
-2c49-489d-b8e5-6ad65c74c8f7\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\c524dc5b
-2c49-489d-b8e5-6ad65c74c8f7\scenario

DATE: 11/02/2020                          TIME: 09:15:51

USER:

COMMENTS: _____________________________________________________________

  ************************************************
  ** SIMULATION : Run 04                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm           cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                 10.0
    [ Ptot= 52.74 mm ]
*
 ** CALIB NASHYD         0255  1  5.0    1.80    0.04  1.92  13.14 0.25   0.000
    [CN=66.9       ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    1.51  1.33  42.33 0.80   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    2.28  1.33  34.79 0.66   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    3.79  1.33  37.03  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    3.80  1.33  35.31  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    0.45  2.33  35.29  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.47  1.33  41.19 0.78   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.04  2.42  40.78  n/a   0.000
*
 *  CALIB STANDHYD       0251  1  5.0   15.50    1.77  1.33  31.26 0.59   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.26  2.42  31.22  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.07  1.83  12.15 0.23   0.000
    [CN=65.5       ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    0.99  1.33  30.28 0.57   0.000
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    1.01  1.33  25.52  n/a   0.000
```

```
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.28  2.08  25.51  n/a   0.000
*
================================================================================
=======================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\a08b98d1
-5991-4dc4-b047-748421769c27\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\a08b98d1
-5991-4dc4-b047-748421769c27\scenario


DATE: 11/02/2020                          TIME: 09:15:50

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 05                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

     START @  0.00 hrs
     --------------------
    CHIC STORM                10.0
    [ Ptot= 62.87 mm ]
*
 ** CALIB NASHYD         0255  1  5.0    1.80    0.06  1.92  18.24 0.29   0.000
    [CN=66.9        ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    1.79  1.33  51.27 0.82   0.000
    [I%=75.0:S%= 2.00]
*
```



```
 *  CALIB STANDHYD       0250  1  5.0   16.30    2.81  1.33  42.93 0.68   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    4.60  1.33  45.41  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    4.61  1.33  43.45  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    0.63  2.25  43.43  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.56  1.33  50.00 0.80   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.05  2.25  49.58  n/a   0.000
*
 *  CALIB STANDHYD       0251  1  5.0   15.50    2.22  1.33  39.03 0.62   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.38  2.25  38.99  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.10  1.83  17.01 0.27   0.000
    [CN=65.5        ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    1.25  1.33  37.95 0.60   0.000
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    1.28  1.33  32.45  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.39  2.00  32.44  n/a   0.000
*
================================================================================
=======================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\99de1783
-e1ea-4481-8d11-b7c3fa805b21\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\99de1783
```

-e1ea-4481-8d11-b7c3fa805b21\scenario

DATE: 11/02/2020 TIME: 09:15:50

USER:

COMMENTS: _____

```
  ***********************************************
  ** SIMULATION : Run 06                       **
  ***********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 70.55 mm ]
*
 ** CALIB NASHYD         0255  1  5.0    1.80    0.07  1.92  22.47 0.32   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    2.01  1.33  58.14 0.82   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    3.19  1.33  49.26 0.70   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    5.19  1.33  51.90  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    5.21  1.33  49.78  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0252  1  5.0   25.00    0.79  2.17  49.76  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.63  1.33  56.77 0.80   0.000
    [I%=72.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0253  1  5.0    2.20    0.06  2.17  56.35  n/a   0.000
*
 *  CALIB STANDHYD       0251  1  5.0   15.50    2.53  1.33  45.12 0.64   0.000
    [I%=41.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0242  1  5.0   15.50    0.48  2.17  45.08  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.12  1.83  21.06 0.30   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    1.43  1.33  43.97 0.62   0.000
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    1.46  1.33  37.96  n/a   0.000
*
 ** Reservoir
    OUTFLOW:             0249  1  5.0   12.20    0.48  2.00  37.94  n/a   0.000
```



```
*
==============================================================================
=======================


       V    V   I    SSSSS  U   U    A    L              (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\cde98e27
-b337-495d-a08b-a74d858223a6\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\cde98e27
-b337-495d-a08b-a74d858223a6\scenario


DATE: 11/02/2020                          TIME: 09:15:51

USER:


COMMENTS: _____

  ***********************************************
  ** SIMULATION : Run 07                       **
  ***********************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                   min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 78.18 mm ]
*
 ** CALIB NASHYD         0255  1  5.0    1.80    0.09  1.92  26.93 0.34   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    2.22  1.33  65.03 0.83   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    3.57  1.33  55.68 0.71   0.000
    [I%=52.0:S%= 2.00]
*
```

```
================================================================================
========================


       V    V   I    SSSSS  U   U    A    L             (v 6.0.2000)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat

  Output  filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\5592e8cd
-de27-44cb-98eb-790127cf9574\scenario
  Summary filename:
C:\Users\HYu\AppData\Local\Civica\VH5\e2c2d2be-418b-4c4d-a4c4-d228733f752c\5592e8cd
-de27-44cb-98eb-790127cf9574\scenario


DATE: 11/02/2020                          TIME: 09:17:58

USER:


COMMENTS: _____________________________________________________


  ************************************************
  ** SIMULATION : Run 01                        **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                60.0
    [ Ptot=193.00 mm ]
    fname :
C:\Users\HYu\AppData\Local\Temp\eea27d29-535e-4f3d-b862-c065f1b86d10\5e4769b9-6f1e-
4c72-91b8-db63fa5
    remark: TIMMINS STORM

*
 ** CALIB NASHYD         0005  1  5.0    1.80    0.13  8.17 112.67 0.58   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.45]
*
 ** CALIB NASHYD         0006  1  5.0   14.80    1.02  8.17 112.67 0.58   0.000
    [CN=66.9         ]
```



```
    [ N = 3.0:Tp 0.53]
*
 ** CALIB NASHYD         0012  1  5.0    5.30    0.39  8.08 112.67 0.58   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.42]
*
    ADD [  0012+  0006]  0002  3  5.0   20.10    1.41  8.17 112.67  n/a   0.000
*
    ADD [  0002+  0005]  0003  3  5.0   21.90    1.54  8.17 112.67  n/a   0.000
*
 ** CALIB NASHYD         0004  1  5.0    2.60    0.20  8.00 109.74 0.57   0.000
    [CN=65.8         ]
    [ N = 3.0:Tp 0.30]
*
 ** CALIB NASHYD         0036  1  5.0    1.90    0.17  8.00 128.22 0.66   0.000
    [CN=74.0         ]
    [ N = 3.0:Tp 0.27]
*
    ADD [  0036+  0004]  0007  3  5.0    4.50    0.37  8.00 117.54  n/a   0.000
*
 ** CALIB NASHYD         0008  1  5.0    3.20    0.23  8.08 109.08 0.57   0.000
    [CN=65.5         ]
    [ N = 3.0:Tp 0.41]
*
 ** CALIB NASHYD         0011  1  5.0   14.70    0.94  8.33 112.68 0.58   0.000
    [CN=66.9         ]
    [ N = 3.0:Tp 0.66]
*
    ADD [  0011+  0008]  0009  3  5.0   17.90    1.15  8.25 112.03  n/a   0.000
*
 ** CALIB NASHYD         0010  1  5.0   12.00    0.89  8.08 107.73 0.56   0.000
    [CN=65.0         ]
    [ N = 3.0:Tp 0.33]
*
 ** CALIB NASHYD         0255  1  5.0    1.80    0.17  8.08 145.66 0.75   0.000
    [CN=82.3         ]
    [ N = 3.0:Tp 0.45]
*
 *  CALIB STANDHYD       0245  1  5.0    6.90    0.79  8.00 179.74 0.93   0.000
    [I%=75.0:S%= 2.00]
*
 *  CALIB STANDHYD       0250  1  5.0   16.30    1.81  8.00 171.71 0.89   0.000
    [I%=52.0:S%= 2.00]
*
    ADD [  0245+  0250]  0246  3  5.0   23.20    2.60  8.00 174.10  n/a   0.000
*
    ADD [  0246+  0255]  0254  3  5.0   25.00    2.77  8.00 172.05  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.30  8.08 142.79 0.74   0.000
    [CN=81.4         ]
    [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    0.99  8.00 167.16 0.87   0.000
    [I%=38.0:S%= 2.00]
*
    ADD [  0243+  0244]  0248  3  5.0   12.20    1.29  8.00 160.77  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.25  8.00 178.08 0.92   0.000
    [I%=72.0:S%= 2.00]
*
 *  CALIB STANDHYD       0251  1  5.0   15.50    1.70  8.00 168.09 0.87   0.000
    [I%=41.0:S%= 2.00]
*
```

FINISH

==========
==========

```
   ADD [  0245+  0250]  0246  3  5.0   23.20    5.79  1.33  58.46  n/a   0.000
*
   ADD [  0246+  0255]  0254  3  5.0   25.00    5.81  1.33  56.19  n/a   0.000
*
 ** Reservoir
   OUTFLOW:             0252  1  5.0   25.00    0.96  2.08  56.17  n/a   0.000
*
 *  CALIB STANDHYD       0247  1  5.0    2.20    0.69  1.33  63.57 0.81   0.000
   [I%=72.0:S%= 2.00]
*
 ** Reservoir
   OUTFLOW:             0253  1  5.0    2.20    0.07  2.17  63.15  n/a   0.000
*
 *  CALIB STANDHYD       0251  1  5.0   15.50    2.85  1.33  51.31 0.66   0.000
   [I%=41.0:S%= 2.00]
*
 ** Reservoir
   OUTFLOW:             0242  1  5.0   15.50    0.58  2.17  51.28  n/a   0.000
*
 *  CALIB NASHYD         0243  1  5.0    3.20    0.15  1.83  25.35 0.32   0.000
   [CN=65.5        ]
   [ N = 3.0:Tp 0.41]
*
 *  CALIB STANDHYD       0244  1  5.0    9.00    1.61  1.33  50.10 0.64   0.000
   [I%=38.0:S%= 2.00]
*
   ADD [  0243+  0244]  0248  3  5.0   12.20    1.65  1.33  43.61  n/a   0.000
*
 ** Reservoir
   OUTFLOW:             0249  1  5.0   12.20    0.59  2.00  43.59  n/a   0.000
*
```

Appendix E:
Water Budget

TATHAM ENGINEERING

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Jul-20
Designed By:	OP
Checked By:	JA
Subject:	Water Balance Calculations - OUTLET 1

Catchments: 101

Average Soil Moisture Capacity (mm) 177 (MECP Table 3.1, HSG 'B')

Thornthwaite Coefficient 1.03

Catchment Area Outlet 1 (ha) 2.20

Inflitration Factors:

Topography Infiltration Factor	0.10
Soil Infiltration Factor	0.30
Land Cover Infiltration Factor	0.15
MECP Infiltration Factor	0.55
Average Infiltration Factor	0.45
Runoff from Impervious Surfaces	0.80

Month	Average Temperature (°C)	Precipitation (mm)	Heat Index	Average Daylight Hours	Number of Days in Month	Unadjusted PET (mm)	Daylight Factor	Adjusted PET (mm)	Accumulated Potential Water Loss (APWL) (mm)	Storage (S) (mm)	Change in Storage (ΔS) (mm)	AET (mm)	Water Surplus (mm)	Potential Infiltration (mm)	Potential Direct Surface Runoff (mm)
January	-8.5	57.4	0.0	9.3	31.0	0.0	0.8	0.0	0	177	0	0	57	26	32
February	-7.0	51.5	0.0	10.4	28.0	0.0	0.9	0.0	0	177	0	0	52	23	28
March	-1.8	56.1	0.0	11.9	31.0	0.0	1.0	0.0	0	177	0	0	56	25	31
April	5.9	68.6	1.3	13.4	30.0	28.8	1.1	32.2	0	177	0	32	36	16	20
May	12.1	81.5	3.8	14.7	31.0	60.3	1.2	76.6	0	177	0	77	5	2	3
June	17.0	79.9	6.4	15.4	30.0	85.6	1.3	110.0	-25	154	-24	103	0	0	0
July	19.6	70.6	7.9	15.1	31.0	99.1	1.3	128.9	-83	96	-58	128	0	0	0
August	18.3	77.0	7.1	14.0	31.0	92.3	1.2	111.1	-118	49	-47	124	0	0	0
September	13.9	85.3	4.7	12.5	30.0	69.6	1.0	72.6	-105	62	13	73	0	0	0
October	7.5	76.9	1.8	11.0	31.0	36.9	0.9	35.0	-63	104	42	35	0	0	0
November	1.9	86.4	0.2	9.7	30.0	9.0	0.8	7.2	0	177	73	7	6	3	3
December	-4.4	64.2	0.0	8.9	31.0	0.0	0.7	0.0	0	177	0	0	64	29	35
Total		**855.4**	**33.3**			**481.5**		**573.6**				**579.0**	**276.4**	**124.4**	**152.0**

TOTAL WATER SURPLUS **276.4**

Note:

1) Source - Peterborough A Climate Normal Data for 1969 - 2006 (Environment Canada).
2) Thornthwaite method used to determine the potential Evapotranspiration.
3) PET - potential evapotranspiration; AET - actual evapotranspiration.

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Jul-20
Designed By:	OP
Checked By:	JA
Subject:	Water Balance Calculations - OUTLET 1

Catchments: 201

Average Soil Moisture Capacity (mm) 185 (MECP Table 3.1, HSG 'B')

Thornthwaite Coefficient 1.03

Catchment Area Outlet 1 (ha) 2.20

Inflitration Factors:

Topography Infiltration Factor	0.10
Soil Infiltration Factor	0.30
Land Cover Infiltration Factor	0.15
MECP Infiltration Factor	0.55
Average Infiltration Factor	0.45
Runoff from Impervious Surfaces	0.80

Month	Average Temperature (°C)	Precipitation (mm)	Heat Index	Average Daylight Hours	Number of Days in Month	Unadjusted PET (mm)	Daylight Factor	Adjusted PET (mm)	Accumulated Potential Water Loss (APWL) (mm)	Storage (S) (mm)	Change in Storage (ΔS)	AET (mm)	Water Surplus (mm)	Potential Infiltration (mm)	Potential Direct Surface Runoff (mm)
January	-8.5	57.4	0.0	9.3	31.0	0.0	0.8	0.0	0	185	0	0	57	26	32
February	-7.0	51.5	0.0	10.4	28.0	0.0	0.9	0.0	0	185	0	0	52	23	28
March	-1.8	56.1	0.0	11.9	31.0	0.0	1.0	0.0	0	185	0	0	56	25	31
April	5.9	68.6	1.3	13.4	30.0	28.8	1.1	32.2	0	185	0	32	36	16	20
May	12.1	81.5	3.8	14.7	31.0	60.3	1.2	76.6	0	185	0	77	5	2	3
June	17.0	79.9	6.4	15.4	30.0	85.6	1.3	110.0	-25	162	-24	103	0	0	0
July	19.6	70.6	7.9	15.1	31.0	99.1	1.3	128.9	-83	103	-59	129	0	0	0
August	18.3	77.0	7.1	14.0	31.0	92.3	1.2	111.1	-118	55	-48	125	0	0	0
September	13.9	85.3	4.7	12.5	30.0	69.6	1.0	72.6	-105	67	13	73	0	0	0
October	7.5	76.9	1.8	11.0	31.0	36.9	0.9	35.0	-63	109	42	35	0	0	0
November	1.9	86.4	0.2	9.7	30.0	9.0	0.8	7.2	0	185	76	7	3	1	2
December	-4.4	64.2	0.0	8.9	31.0	0.0	0.7	0.0	0	185	0	0	64	29	35
Total		**855.4**	**33.3**			**481.5**		**573.6**				**581.8**	**273.6**	**123.1**	**150.5**

TOTAL WATER SURPLUS **273.6**

Note:

1) Source - Peterborough A Climate Normal Data for 1969 - 2006 (Environment Canada).
2) Thornthwaite method used to determine the potential Evapotranspiration.
3) PET - potential evapotranspiration; AET - actual evapotranspiration.

TATHAM ENGINEERING	**Project:**	3358 Lakefield Road Development
	File No.:	517661
	Date:	Jul-20
	Designed By:	OP
	Checked By:	JA
	Subject:	Water Balance Calculations - OUTLET 1

Catchment Designation	Pre-Development			Post-Development		
	Pervious	Impervious	Total	Pervious	Impervious	Total
Catchment Area Outlet 1 (ha)	2.2	0.0	2.2	0.6	1.6	2.2
Inflitration Factors						
Topography Infiltration Factor	0.10	-	-	0.10	-	-
Soil Infiltration Factor	0.30	-	-	0.30	-	-
Land Cover Infiltration Factor	0.15	-	-	0.15	-	-
MOE Infiltration Factor	0.55	-	-	0.55	-	-
Run-Off Coefficient	0.45	-	-	0.45	-	-
Runoff from Impervious Surfaces	0.00	0.80	-	0.00	0.80	-
Inputs						
Precipitation (mm/yr)	855.4	855.4	855.4	855.4	855.4	855.4
Run-on (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Other Inputs (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Total Inputs (mm/yr)	855.4	855.4	855.4	855.4	855.4	855.4
Outputs						
Precipitation surplus (mm/yr)	276.4	684.3	276.4	273.6	684.3	570.0
Net surplus (mm/yr)	276.4	684.3	276.4	273.6	684.3	570.0
Evapotranspiration (mm/yr)	579.0	171.1	579.0	581.8	171.1	285.4
Inflitration (mm/yr)	124.4	0.0	124.4	123.1	0.0	34.3
Infiltration of Pervious Runoff (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Infiltration of Impervious Runoff (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Total Infiltration (mm/yr)	124.4	0.0	124.4	123.1	0.0	34.3
Run-off Pervious Areas (mm/yr)	152.0	0.0	152.0	150.5	0.0	41.9
Run-off Impervious Areas (mm/yr)	0.0	684.3	0.0	0.0	684.3	493.8
Total Run-off (mm/yr)	152.0	684.3	152.0	150.5	684.3	535.7
Total Outputs (mm/yr)	855.4	855.4	855.4	855.4	855.4	855.4
Inputs						
Precipitation (m3/yr)	18,819	0	18,819	5,239	13,579	18,819
Run-on (m3/yr)	0	0	0	0	0	0
Other Inputs (m3/yr)	0	0	0	0	0	0
Total Inputs (m3/yr)	18,819	0	18,819	5,239	13,579	18,819
Outputs						
Precipitation surplus (m3/yr)	6,082	0	6,082	1,676	10,864	12,540
Net surplus (m3/yr)	6,082	0	6,082	1,676	10,864	12,540
Evapotranspiration (m3/yr)	12,737	0	12,737	3,563	2,716	6,279
Inflitration (m3/yr)	2,737	0	2,737	754	0	754
Infiltration of Pervious Runoff (m3/yr)	0	0	0	0	0	0
Infiltration of Impervious Runoff (m3/yr)	0	0	0	0	0	0
Total Infiltration (m3/yr)	2,737	0	2,737	754	0	754
Run-off Pervious Areas (m3/yr)	3,345	0	3,345	922	0	922
Run-off Impervious Areas (m3/yr)	0	0	0	0	10,864	10,864
Total Run-off (m3/yr)	3,345	0	3,345	922	10,864	11,785
Total Outputs (m3/yr)	18,819	0	18,819	5,239	13,579	18,819

Notes: 1. Evaporation from impervious areas was assumed to be 20% of precipitation and is within the acceptable range as per the Conservation Authority Guidelines for Hydrogeological Assessment Submissions (June, 2013)

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Jul-20
Designed By:	OP
Checked By:	JA
Subject:	Water Balance Calculations - OUTLET 2

Catchments: 102

Average Soil Moisture Capacity (mm) 189 (MECP Table 3.1, HSG 'B')

Thornthwaite Coefficient 1.03

Catchment Area Outlet 2 (ha) 12.00

Infiltration Factors:

Topography Infiltration Factor	0.10
Soil Infiltration Factor	0.30
Land Cover Infiltration Factor	0.15
MECP Infiltration Factor	0.55
Average Infiltration Factor	0.45
Runoff from Impervious Surfaces	0.80

Month	Average Temperature (°C)	Precipitation (mm)	Heat Index	Average Daylight Hours	Number of Days in Month	Unadjusted PET (mm)	Daylight Factor	Adjusted PET (mm)	Accumulated Potential Water Loss (APWL) (mm)	Storage (S) (mm)	Change in Storage (ΔS) (mm)	AET (mm)	Water Surplus (mm)	Potential Infiltration (mm)	Potential Direct Surface Runoff (mm)
January	-8.5	57.4	0.0	9.3	31.0	0.0	0.8	0.0	0	189	0	0	57	26	32
February	-7.0	51.5	0.0	10.4	28.0	0.0	0.9	0.0	0	189	0	0	52	23	28
March	-1.8	56.1	0.0	11.9	31.0	0.0	1.0	0.0	0	189	0	0	56	25	31
April	5.9	68.6	1.3	13.4	30.0	28.8	1.1	32.2	0	189	0	32	36	16	20
May	12.1	81.5	3.8	14.7	31.0	60.3	1.2	76.6	0	189	0	77	5	2	3
June	17.0	79.9	6.4	15.4	30.0	85.6	1.3	110.0	-25	165	-24	104	0	0	0
July	19.6	70.6	7.9	15.1	31.0	99.1	1.3	128.9	-83	106	-59	130	0	0	0
August	18.3	77.0	7.1	14.0	31.0	92.3	1.2	111.1	-118	57	-49	126	0	0	0
September	13.9	85.3	4.7	12.5	30.0	69.6	1.0	72.6	-105	70	13	73	0	0	0
October	7.5	76.9	1.8	11.0	31.0	36.9	0.9	35.0	-63	112	42	35	0	0	0
November	1.9	86.4	0.2	9.7	30.0	9.0	0.8	7.2	0	189	77	7	2	1	1
December	-4.4	64.2	0.0	8.9	31.0	0.0	0.7	0.0	0	189	0	0	64	29	35
Total		**855.4**	**33.3**			**481.5**		**573.6**				**583.0**	**272.4**	**122.6**	**149.8**

TOTAL WATER SURPLUS **272.4**

Note:

1) Source - Peterborough A Climate Normal Data for 1969 - 2006 (Environment Canada).
2) Thornthwaite method used to determine the potential Evapotranspiration.
3) PET - potential evapotranspiration; AET - actual evapotranspiration.

TATHAM ENGINEERING

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Jul-20
Designed By:	OP
Checked By:	JA
Subject:	Water Balance Calculations - OUTLET 2

Catchments: 202

Average Soil Moisture Capacity (mm) 115 (MECP Table 3.1, HSG 'B')

Thornthwaite Coefficient 1.03

Catchment Area Outlet 2 (ha) 15.50

Inflitration Factors:

Topography Infiltration Factor	0.10
Soil Infiltration Factor	0.30
Land Cover Infiltration Factor	0.15
MECP Infiltration Factor	0.55
Average Infiltration Factor	0.45
Runoff from Impervious Surfaces	0.80

Month	Average Temperature (°C)	Precipitation (mm)	Heat Index	Average Daylight Hours	Number of Days in Month	Unadjusted PET (mm)	Daylight Factor	Adjusted PET (mm)	Accumulated Potential Water Loss (APWL) (mm)	Storage (S) (mm)	Change in Storage (ΔS)	AET (mm)	Water Surplus (mm)	Potential Infiltration (mm)	Potential Direct Surface Runoff (mm)
January	-8.5	57.4	0.0	9.3	31.0	0.0	0.8	0.0	0	115	0	0	57	26	32
February	-7.0	51.5	0.0	10.4	28.0	0.0	0.9	0.0	0	115	0	0	52	23	28
March	-1.8	56.1	0.0	11.9	31.0	0.0	1.0	0.0	0	115	0	0	56	25	31
April	5.9	68.6	1.3	13.4	30.0	28.8	1.1	32.2	0	115	0	32	36	16	20
May	12.1	81.5	3.8	14.7	31.0	60.3	1.2	76.6	0	115	0	77	5	2	3
June	17.0	79.9	6.4	15.4	30.0	85.6	1.3	110.0	-25	93	-23	103	0	0	0
July	19.6	70.6	7.9	15.1	31.0	99.1	1.3	128.9	-83	45	-48	118	0	0	0
August	18.3	77.0	7.1	14.0	31.0	92.3	1.2	111.1	-118	16	-29	106	0	0	0
September	13.9	85.3	4.7	12.5	30.0	69.6	1.0	72.6	-105	29	13	73	0	0	0
October	7.5	76.9	1.8	11.0	31.0	36.9	0.9	35.0	-63	71	42	35	0	0	0
November	1.9	86.4	0.2	9.7	30.0	9.0	0.8	7.2	0	115	44	7	35	16	19
December	-4.4	64.2	0.0	8.9	31.0	0.0	0.7	0.0	0	115	0	0	64	29	35
Total		**855.4**	**33.3**			**481.5**		**573.6**				**550.2**	**305.2**	**137.4**	**167.9**

TOTAL WATER SURPLUS **305.2**

Note:

1) Source - Peterborough A Climate Normal Data for 1969 - 2006 (Environment Canada).
2) Thornthwaite method used to determine the potential Evapotranspiration.
3) PET - potential evapotranspiration; AET - actual evapotranspiration.

TATHAM ENGINEERING	**Project:**	3358 Lakefield Road Development
	File No.:	517661
	Date:	Jul-20
	Designed By:	OP
	Checked By:	JA
	Subject:	Water Balance Calculations - OUTLET 2

Catchment Designation	Pre-Development			Post-Development		
	Pervious	Impervious	Total	Pervious	Impervious	Total
Catchment Area Outlet 2 (ha)	12.0	0.0	12.0	7.3	8.2	15.5
Inflitration Factors						
Topography Infiltration Factor	0.10	-	-	0.10	-	-
Soil Infiltration Factor	0.30	-	-	0.30	-	-
Land Cover Infiltration Factor	0.15	-	-	0.15	-	-
MOE Infiltration Factor	0.55	-	-	0.55	-	-
Run-Off Coefficient	0.45	-	-	0.45	-	-
Runoff from Impervious Surfaces	0.00	0.80	-	0.00	0.80	-
Inputs						
Precipitation (mm/yr)	855.4	855.4	855.4	855.4	855.4	855.4
Run-on (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Other Inputs (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Total Inputs (mm/yr)	855.4	855.4	855.4	855.4	855.4	855.4
Outputs						
Precipitation surplus (mm/yr)	272.4	684.3	272.4	305.2	684.3	506.2
Net surplus (mm/yr)	272.4	684.3	272.4	305.2	684.3	506.2
Evapotranspiration (mm/yr)	583.0	171.1	583.0	550.2	171.1	349.2
Inflitration (mm/yr)	122.6	0.0	122.6	137.4	0.0	64.6
Infiltration of Pervious Runoff (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Infiltration of Impervious Runoff (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Total Infiltration (mm/yr)	122.6	0.0	122.6	137.4	0.0	64.6
Run-off Pervious Areas (mm/yr)	149.8	0.0	149.8	167.9	0.0	78.9
Run-off Impervious Areas (mm/yr)	0.0	684.3	0.0	0.0	684.3	362.7
Total Run-off (mm/yr)	149.8	684.3	149.8	167.9	684.3	441.6
Total Outputs (mm/yr)	855.40	855.4	855.4	855.4	855.4	855.4
Inputs						
Precipitation (m3/yr)	102,648	0	102,648	62,316	70,271	132,587
Run-on (m3/yr)	0	0	0	0	0	0
Other Inputs (m3/yr)	0	0	0	0	0	0
Total Inputs (m3/yr)	102,648	0	102,648	62,316	70,271	132,587
Outputs						
Precipitation surplus (m3/yr)	32,691	0	32,691	22,237	56,217	78,454
Net surplus (m3/yr)	32,691	0	32,691	22,237	56,217	78,454
Evapotranspiration (m3/yr)	69,957	0	69,957	40,079	14,054	54,133
Inflitration (m3/yr)	14,711	0	14,711	10,007	0	10,007
Infiltration of Pervious Runoff (m3/yr)	0	0	0	0	0	0
Infiltration of Impervious Runoff (m3/yr)	0	0	0	0	0	0
Total Infiltration (m3/yr)	14,711	0	14,711	10,007	0	10,007
Run-off Pervious Areas (m3/yr)	17,980	0	17,980	12,230	0	12,230
Run-off Impervious Areas (m3/yr)	0	0	0	0	56,217	56,217
Total Run-off (m3/yr)	17,980	0	17,980	12,230	56,217	68,447
Total Outputs (m3/yr)	102,648.00	0.00	102,648.00	62,315.89	70,271.11	132,587.00

Notes: 1. Evaporation from impervious areas was assumed to be 20% of precipitation and is within the acceptable range as per the Conservation Authority Guidelines for Hydrogeological Assessment Submissions (June, 2013)

TATHAM ENGINEERING

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Jul-20
Designed By:	OP
Checked By:	JA
Subject:	Water Balance Calculations - OUTLET 3

Catchments: 103, & EXT-1

Average Soil Moisture Capacity (mm) 159 (MECP Table 3.1, HSG 'B')

Thornthwaite Coefficient 1.03

Catchment Area Outlet 3 (ha) 16.50

Infiltration Factors:

Topography Infiltration Factor	0.10
Soil Infiltration Factor	0.30
Land Cover Infiltration Factor	0.15
MECP Infiltration Factor	0.55
Average Infiltration Factor	0.45
Runoff from Impervious Surfaces	0.80

Month	Average Temperature (°C)	Precipitation (mm)	Heat Index	Average Daylight Hours	Number of Days in Month	Unadjusted PET (mm)	Daylight Factor	Adjusted PET (mm)	Accumulated Potential Water Loss (APWL) (mm)	Storage (S) (mm)	Change in Storage (ΔS) (mm)	AET (mm)	Water Surplus (mm)	Potential Infiltration (mm)	Potential Direct Surface Runoff (mm)
January	-8.5	57.4	0.0	9.3	31.0	0.0	0.8	0.0	0	159	0	0	57	26	32
February	-7.0	51.5	0.0	10.4	28.0	0.0	0.9	0.0	0	159	0	0	52	23	28
March	-1.8	56.1	0.0	11.9	31.0	0.0	1.0	0.0	0	159	0	0	56	25	31
April	5.9	68.6	1.3	13.4	30.0	28.8	1.1	32.2	0	159	0	32	36	16	20
May	12.1	81.5	3.8	14.7	31.0	60.3	1.2	76.6	0	159	0	77	5	2	3
June	17.0	79.9	6.4	15.4	30.0	85.6	1.3	110.0	-25	136	-23	103	0	0	0
July	19.6	70.6	7.9	15.1	31.0	99.1	1.3	128.9	-83	81	-55	126	0	0	0
August	18.3	77.0	7.1	14.0	31.0	92.3	1.2	111.1	-118	39	-42	119	0	0	0
September	13.9	85.3	4.7	12.5	30.0	69.6	1.0	72.6	-105	51	13	73	0	0	0
October	7.5	76.9	1.8	11.0	31.0	36.9	0.9	35.0	-63	93	42	35	0	0	0
November	1.9	86.4	0.2	9.7	30.0	9.0	0.8	7.2	0	159	66	7	13	6	7
December	-4.4	64.2	0.0	8.9	31.0	0.0	0.7	0.0	0	159	0	0	64	29	35
Total		**855.4**	**33.3**			**481.5**		**573.6**				**572.0**	**283.4**	**127.5**	**155.9**

TOTAL WATER SURPLUS **283.4**

Note:

1) Source - Peterborough A Climate Normal Data for 1969 - 2006 (Environment Canada).
2) Thornthwaite method used to determine the potential Evapotranspiration.
3) PET - potential evapotranspiration; AET - actual evapotranspiration.

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Jul-20
Designed By:	OP
Checked By:	JA
Subject:	Water Balance Calculations - OUTLET 3

Catchments: 203, EXT-1

Average Soil Moisture Capacity (mm) 107 (MECP Table 3.1, HSG 'B')

Thornthwaite Coefficient 1.03

Catchment Area Outlet 3 (ha) 12.20

Inflitration Factors:

Topography Infiltration Factor	0.10
Soil Infiltration Factor	0.30
Land Cover Infiltration Factor	0.15
MECP Infiltration Factor	0.55
Average Infiltration Factor	0.45
Runoff from Impervious Surfaces	0.80

Month	Average Temperature (°C)	Precipitation (mm)	Heat Index	Average Daylight Hours	Number of Days in Month	Unadjusted PET (mm)	Daylight Factor	Adjusted PET (mm)	Accumulated Potential Water Loss (APWL) (mm)	Storage (S) (mm)	Change in Storage (ΔS)	AET (mm)	Water Surplus (mm)	Potential Infiltration (mm)	Potential Direct Surface Runoff (mm)
January	-8.5	57.4	0.0	9.3	31.0	0.0	0.8	0.0	0	107	0	0	57	26	32
February	-7.0	51.5	0.0	10.4	28.0	0.0	0.9	0.0	0	107	0	0	52	23	28
March	-1.8	56.1	0.0	11.9	31.0	0.0	1.0	0.0	0	107	0	0	56	25	31
April	5.9	68.6	1.3	13.4	30.0	28.8	1.1	32.2	0	107	0	32	36	16	20
May	12.1	81.5	3.8	14.7	31.0	60.3	1.2	76.6	0	107	0	77	5	2	3
June	17.0	79.9	6.4	15.4	30.0	85.6	1.3	110.0	-25	84	-22	102	0	0	0
July	19.6	70.6	7.9	15.1	31.0	99.1	1.3	128.9	-83	39	-46	116	0	0	0
August	18.3	77.0	7.1	14.0	31.0	92.3	1.2	111.1	-118	13	-26	103	0	0	0
September	13.9	85.3	4.7	12.5	30.0	69.6	1.0	72.6	-105	26	13	73	0	0	0
October	7.5	76.9	1.8	11.0	31.0	36.9	0.9	35.0	-63	67	42	35	0	0	0
November	1.9	86.4	0.2	9.7	30.0	9.0	0.8	7.2	0	107	39	7	40	18	22
December	-4.4	64.2	0.0	8.9	31.0	0.0	0.7	0.0	0	107	0	0	64	29	35
Total		**855.4**	**33.3**			**481.5**		**573.6**				**545.1**	**310.3**	**139.6**	**170.6**

TOTAL WATER SURPLUS **310.3**

Note:

1) Source - Peterborough A Climate Normal Data for 1969 - 2006 (Environment Canada).
2) Thornthwaite method used to determine the potential Evapotranspiration.
3) PET - potential evapotranspiration; AET - actual evapotranspiration.

TATHAM ENGINEERING	**Project:**	3358 Lakefield Road Development
	File No.:	517661
	Date:	Jul-20
	Designed By:	OP
	Checked By:	JA
	Subject:	Water Balance Calculations - OUTLET 3

Catchment Designation	Pre-Development			Post-Development		
	Pervious	Impervious	Total	Pervious	Impervious	Total
Catchment Area Outlet 4 (ha)	16.5	0.0	16.5	7.6	4.6	12.2
Infiltration Factors						
Topography Infiltration Factor	0.10	-	-	0.10	-	-
Soil Infiltration Factor	0.30	-	-	0.30	-	-
Land Cover Infiltration Factor	0.15	-	-	0.15	-	-
MOE Infiltration Factor	0.55	-	-	0.55	-	-
Run-Off Coefficient	0.45	-	-	0.45	-	-
Runoff from Impervious Surfaces	0.00	0.80	-	0.00	0.80	-
Inputs						
Precipitation (mm/yr)	855.4	855.4	855.4	855.4	855.4	855.4
Run-on (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Other Inputs (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Total Inputs (mm/yr)	855.4	855.4	855.4	855.4	855.4	855.4
Outputs						
Precipitation surplus (mm/yr)	283.4	684.3	283.4	310.3	684.3	451.8
Net surplus (mm/yr)	283.4	684.3	283.4	310.3	684.3	451.8
Evapotranspiration (mm/yr)	572.0	171.1	572.0	545.1	171.1	403.6
Inflitration (mm/yr)	127.5	0.0	127.5	139.6	0.0	86.8
Infiltration of Pervious Runoff (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Infiltration of Impervious Runoff (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Total Infiltration (mm/yr)	127.5	0.0	127.5	139.6	0.0	86.8
Run-off Pervious Areas (mm/yr)	155.9	0.0	155.9	170.6	0.0	106.1
Run-off Impervious Areas (mm/yr)	0.0	684.3	0.0	0.0	684.3	259.0
Total Run-off (mm/yr)	155.9	684.3	155.9	170.6	684.3	365.0
Total Outputs (mm/yr)	855.40	855.4	855.4	855.4	855.4	855.4
Inputs						
Precipitation (m3/yr)	141,141	0	141,141	64,865	39,494	104,359
Run-on (m3/yr)	0	0	0	0	0	0
Other Inputs (m3/yr)	0	0	0	0	0	0
Total Inputs (m3/yr)	141,141	0	141,141	64,865	39,494	104,359
Outputs						
Precipitation surplus (m3/yr)	46,763	0	46,763	23,527	31,595	55,122
Net surplus (m3/yr)	46,763	0	46,763	23,527	31,595	55,122
Evapotranspiration (m3/yr)	94,378	0	94,378	41,338	7,899	49,237
Inflitration (m3/yr)	21,043	0	21,043	10,587	0	10,587
Infiltration of Pervious Runoff (m3/yr)	0	0	0	0	0	0
Infiltration of Impervious Runoff (m3/yr)	0	0	0	0	0	0
Total Infiltration (m3/yr)	21,043	0	21,043	10,587	0	10,587
Run-off Pervious Areas (m3/yr)	25,720	0	25,720	12,940	0	12,940
Run-off Impervious Areas (m3/yr)	0	0	0	0	31,595	31,595
Total Run-off (m3/yr)	25,720	0	25,720	12,940	31,595	44,535
Total Outputs (m3/yr)	141,141.00	0.00	141,141.00	64,864.98	39,493.82	104,358.80

Notes: 1. Evaporation from impervious areas was assumed to be 20% of precipitation and is within the acceptable range as per the Conservation Authority Guidelines for Hydrogeological Assessment Submissions (June, 2013)

TATHAM ENGINEERING

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Jul-20
Designed By:	OP
Checked By:	JA
Subject:	Water Balance Calculations - OUTLET 4

Catchments: 104, EXT-2, EXT-3

Average Soil Moisture Capacity (mm) 150 (MECP Table 3.1, HSG 'B')

Thornthwaite Coefficient 1.03

Catchment Area Outlet 4 (ha) 22.60

Infiltration Factors:

Topography Infiltration Factor	0.10
Soil Infiltration Factor	0.30
Land Cover Infiltration Factor	0.15
MECP Infiltration Factor	0.55
Average Infiltration Factor	0.45
Runoff from Impervious Surfaces	0.80

Month	Average Temperature (°C)	Precipitation (mm)	Heat Index	Average Daylight Hours	Number of Days in Month	Unadjusted PET (mm)	Daylight Factor	Adjusted PET (mm)	Accumulated Potential Water Loss (APWL) (mm)	Storage (S) (mm)	Change in Storage (ΔS) (mm)	AET (mm)	Water Surplus (mm)	Potential Infiltration (mm)	Potential Direct Surface Runoff (mm)
January	-8.5	57.4	0.0	9.3	31.0	0.0	0.8	0.0	0	150	0	0	57	26	32
February	-7.0	51.5	0.0	10.4	28.0	0.0	0.9	0.0	0	150	0	0	52	23	28
March	-1.8	56.1	0.0	11.9	31.0	0.0	1.0	0.0	0	150	0	0	56	25	31
April	5.9	68.6	1.3	13.4	30.0	28.8	1.1	32.2	0	150	0	32	36	16	20
May	12.1	81.5	3.8	14.7	31.0	60.3	1.2	76.6	0	150	0	77	5	2	3
June	17.0	79.9	6.4	15.4	30.0	85.6	1.3	110.0	-25	127	-23	103	0	0	0
July	19.6	70.6	7.9	15.1	31.0	99.1	1.3	128.9	-83	73	-54	125	0	0	0
August	18.3	77.0	7.1	14.0	31.0	92.3	1.2	111.1	-118	33	-39	116	0	0	0
September	13.9	85.3	4.7	12.5	30.0	69.6	1.0	72.6	-105	46	13	73	0	0	0
October	7.5	76.9	1.8	11.0	31.0	36.9	0.9	35.0	-63	88	42	35	0	0	0
November	1.9	86.4	0.2	9.7	30.0	9.0	0.8	7.2	0	150	62	7	17	8	9
December	-4.4	64.2	0.0	8.9	31.0	0.0	0.7	0.0	0	150	0	0	64	29	35
Total		**855.4**	**33.3**			**481.5**		**573.6**				**568.0**	**287.4**	**129.3**	**158.1**

TOTAL WATER SURPLUS **287.4**

Note:

1) Source - Peterborough A Climate Normal Data for 1969 - 2006 (Environment Canada).
2) Thornthwaite method used to determine the potential Evapotranspiration.
3) PET - potential evapotranspiration; AET - actual evapotranspiration.

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Jul-20
Designed By:	OP
Checked By:	JA
Subject:	Water Balance Calculations - OUTLET 4

Catchments: 204, EXT-2, PEXT-3

Average Soil Moisture Capacity (mm) 93 (MECP Table 3.1, HSG 'B')

Thornthwaite Coefficient 1.03

Catchment Area Outlet 4 (ha) 25.00

Inflitration Factors:

Topography Infiltration Factor	0.10
Soil Infiltration Factor	0.30
Land Cover Infiltration Factor	0.15
MECP Infiltration Factor	0.55
Average Infiltration Factor	0.45
Runoff from Impervious Surfaces	0.80

Month	Average Temperature (°C)	Precipitation (mm)	Heat Index	Average Daylight Hours	Number of Days in Month	Unadjusted PET (mm)	Daylight Factor	Adjusted PET (mm)	Accumulated Potential Water Loss (APWL) (mm)	Storage (S) (mm)	Change in Storage (ΔS)	AET (mm)	Water Surplus (mm)	Potential Infiltration (mm)	Potential Direct Surface Runoff (mm)
January	-8.5	57.4	0.0	9.3	31.0	0.0	0.8	0.0	0	93	0	0	57	26	32
February	-7.0	51.5	0.0	10.4	28.0	0.0	0.9	0.0	0	93	0	0	52	23	28
March	-1.8	56.1	0.0	11.9	31.0	0.0	1.0	0.0	0	93	0	0	56	25	31
April	5.9	68.6	1.3	13.4	30.0	28.8	1.1	32.2	0	93	0	32	36	16	20
May	12.1	81.5	3.8	14.7	31.0	60.3	1.2	76.6	0	93	0	77	5	2	3
June	17.0	79.9	6.4	15.4	30.0	85.6	1.3	110.0	-25	71	-22	102	0	0	0
July	19.6	70.6	7.9	15.1	31.0	99.1	1.3	128.9	-83	29	-42	113	0	0	0
August	18.3	77.0	7.1	14.0	31.0	92.3	1.2	111.1	-118	8	-21	98	0	0	0
September	13.9	85.3	4.7	12.5	30.0	69.6	1.0	72.6	-105	21	13	73	0	0	0
October	7.5	76.9	1.8	11.0	31.0	36.9	0.9	35.0	-63	63	42	35	0	0	0
November	1.9	86.4	0.2	9.7	30.0	9.0	0.8	7.2	0	93	30	7	49	22	27
December	-4.4	64.2	0.0	8.9	31.0	0.0	0.7	0.0	0	93	0	0	64	29	35
Total		**855.4**	**33.3**			**481.5**		**573.6**				**536.0**	**319.4**	**143.7**	**175.6**

TOTAL WATER SURPLUS **319.4**

Note:

1) Source - Peterborough A Climate Normal Data for 1969 - 2006 (Environment Canada).
2) Thornthwaite method used to determine the potential Evapotranspiration.
3) PET - potential evapotranspiration; AET - actual evapotranspiration.

TATHAM ENGINEERING	**Project:**	3358 Lakefield Road Development
	File No.:	517661
	Date:	Jul-20
	Designed By:	OP
	Checked By:	JA
	Subject:	Water Balance Calculations - OUTLET 4

Catchment Designation	Pre-Development			Post-Development		
	Pervious	Impervious	Total	Pervious	Impervious	Total
Catchment Area Outlet 3 (ha)	22.6	0.0	22.6	10.0	15.0	25.0
Inflitration Factors						
Topography Infiltration Factor	0.10	-	-	0.10	-	-
Soil Infiltration Factor	0.30	-	-	0.30	-	-
Land Cover Infiltration Factor	0.15	-	-	0.15	-	-
MOE Infiltration Factor	0.55	-	-	0.55	-	-
Run-Off Coefficient	0.45	-	-	0.45	-	-
Runoff from Impervious Surfaces	0.00	0.80	-	0.00	0.80	-
Inputs						
Precipitation (mm/yr)	855.4	855.4	855.4	855.4	855.4	855.4
Run-on (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Other Inputs (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Total Inputs (mm/yr)	855.4	855.4	855.4	855.4	855.4	855.4
Outputs						
Precipitation surplus (mm/yr)	287.4	684.3	287.4	319.4	684.3	538.4
Net surplus (mm/yr)	287.4	684.3	287.4	319.4	684.3	538.4
Evapotranspiration (mm/yr)	568.0	171.1	568.0	536.0	171.1	317.0
Inflitration (mm/yr)	129.3	0.0	129.3	143.7	0.0	57.5
Infiltration of Pervious Runoff (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Infiltration of Impervious Runoff (mm/yr)	0.0	0.0	0.0	0.0	0.0	0.0
Total Infiltration (mm/yr)	129.3	0.0	129.3	143.7	0.0	57.5
Run-off Pervious Areas (mm/yr)	158.1	0.0	158.1	175.6	0.0	70.2
Run-off Impervious Areas (mm/yr)	0.0	684.3	0.0	0.0	684.3	410.7
Total Run-off (mm/yr)	158.1	684.3	158.1	175.6	684.3	480.9
Total Outputs (mm/yr)	855.40	855.4	855.4	855.4	855.4	855.4
Inputs						
Precipitation (m3/yr)	193,320	0	193,320	85,507	128,343	213,850
Run-on (m3/yr)	0	0	0	0	0	0
Other Inputs (m3/yr)	0	0	0	0	0	0
Total Inputs (m3/yr)	193,320	0	193,320	85,507	128,343	213,850
Outputs						
Precipitation surplus (m3/yr)	64,962	0	64,962	31,923	102,675	134,598
Net surplus (m3/yr)	64,962	0	64,962	31,923	102,675	134,598
Evapotranspiration (m3/yr)	128,358	0	128,358	53,583	25,669	79,252
Inflitration (m3/yr)	29,233	0	29,233	14,366	0	14,366
Infiltration of Pervious Runoff (m3/yr)	0	0	0	0	0	0
Infiltration of Impervious Runoff (m3/yr)	0	0	0	0	0	0
Total Infiltration (m3/yr)	29,233	0	29,233	14,366	0	14,366
Run-off Pervious Areas (m3/yr)	35,729	0	35,729	17,558	0	17,558
Run-off Impervious Areas (m3/yr)	0	0	0	0	102,675	102,675
Total Run-off (m3/yr)	35,729	0	35,729	17,558	102,675	120,233
Total Outputs (m3/yr)	193,320.40	0.00	193,320.40	85,506.64	128,343.36	213,850.00

Notes: 1. Evaporation from impervious areas was assumed to be 20% of precipitation and is within the acceptable range as per the Conservation Authority Guidelines for Hydrogeological Assessment Submissions (June, 2013)

Project:	3358 Lakefield Road Development
File No.:	517661
Date:	Jul-20
Designed By:	OP
Checked By:	JA
Subject:	Water Balance Summary

Mitigation Techniques: 1. Direct rooftop areas from single detached and townhouses to pervious areas

Summary (Post Development)				
	Outlet 1	Outlet 2	Outlet 3	Outlet 4
Inputs				
Precipitation (m3/yr)	18,819	132,587	104,359	213,850
Run-on (m3/yr)	0	0	0	0
Other Inputs (m3/yr)	0	0	0	0
Total Inputs (m3/yr)	18,819	132,587	104,359	213,850
Outputs				
Precipitation surplus (m3/yr)	12,540	78,454	55,122	134,598
Net surplus (m3/yr)	12,540	78,454	55,122	134,598
Evapotranspiration (m3/yr)	6,279	54,133	49,237	79,252
Pre-Development Infiltration (m^3/yr)	2,737	14,711	29,233	29,233
Post-Development Infiltration (m^3/yr)	754	10,007	10,587	14,366
Difference in Infiltration Pre to Post (%)	-72%	-32%	-64%	-51%
Number of rooftops	0	171	121	94
Area of rooftop Downspout Disconnects to Grass (m^2)	0	34,100	24,200	18,800
Roof Runoff (80% of precipitation) directed to grass (m/year)	0.68	0.68	0.68	0.68
Total Volume of Rooftop runoff (m^3/yr)	0	23,335	16,561	12,865
Infiltration of Runoff from Rooftop Disconnection (m^3/yr)	0	11,668	8,280	6,433
Total Infiltration Post Mitigation (m^3/yr)	754	21,674	18,867	20,798
Difference in Infiltration Pre to Post with mitigation (%)	-72%	47%	-35%	-29%
Total Run-off (m3/yr)	11,785	56,780	36,254	113,800
Total Outputs (m3/yr)	18,819	132,587	104,359	213,850

Notes

1.) The area of rooftops is assumed to be 200 m^2.

2.) Only single detached and townhouse units are considered in the roof downspout disconnection calculations.

3.) 50% of rooftop runoff infiltrates based on HSG 'B' type soils (CVC/TRCA LID Manual).

Appendix F: Utility Coordination Correspondence

Haoran Yu

From: Elchyson, Ryan <ryan.elchyson@bell.ca>
Sent: February-12-20 10:44 AM
To: Haoran Yu
Subject: RE: 3358 Lakefield Road Future Development Utility Coordination (Tatham Project# 517651)

Hi Haoran,

Bell have make sure fibre is available for this!

Thank you

Bell Canada
Ryan Elchyson
Access Network Co-ordinator
183 Hunter St W
Peterborough, ON
K9H 2L1
Office: (705) 876 2184
Cell: (705) 927 2872
Fax: (705) 748 9440
E-Mail: ryan.elchyson@bell.ca

Bell

From: Haoran Yu <hyu@tathameng.com>
Sent: February-11-20 11:37 AM
To: Cole Taylor <CTaylor@peterboroughutilities.ca>; Elchyson, Ryan <ryan.elchyson@bell.ca>; Wayne Millett <millett@nexicomgroup.net>; Vince Manzo <Vince.Manzo@enbridge.com>; corey.craney-twolan@canadapost.postescanada.ca
Cc: Jeremy Ash <jash@tathameng.com>; bill@tttholdings.com
Subject: [EXT]3358 Lakefield Road Future Development Utility Coordination (Tatham Project# 517651)

Hello

On behalf of our Client, Triple T Holdings, we are confirming the availability of utilities for a planned development in Lakefield.

Please see the attached Site plan showing the multi-phased mixed use development located in the Lakefield South Secondary Plan Area. Currently, the total number of residential units is 977 which includes a mix of low and medium densities. The number of units is expected to change as the planning advances. Some ground-level commercial uses will also be incorporated. The development will be phased over a number of years however this will only be determined at a later stage. The preliminary civil engineering design is underway in support of zoning by-law and official plan amendments and a Draft Plan of Subdivision.

At this stage we want to confirm the availability of utilities to service this development and to have a very high-level idea of what expansions are likely to be required as development advances. We are not requesting preliminary

designs. This will happen following approval of the initial planning applications and after the development phasing is resolved.

If you have any questions, please let me know,

Thanks

Haoran Yu
Civil Engineering Technologist
Tatham Engineering Limited
5335 Canotek Road, Unit 102 | Ottawa | Ontario | K1J 9L4
T 613-747-3636 x2120 | **C** 613-661-6399 | **E** Hyu@tathameng.com

In conjunction with our 30th year of operations, we are pleased to announce our new name **Tatham Engineering Limited** and website **tathameng.com**. Please update your records accordingly, including email addresses which have also changed.

Haoran Yu

From: Pam Gobby <Pam.Gobby@enbridge.com>
Sent: February-14-20 11:38 AM
To: Haoran Yu
Subject: FW: [External] 3358 Lakefield Road Future Development Utility Coordination (Tatham Project# 517651)
Attachments: 517651-SP02-Layout1.pdf; ATT00001.htm

Good Morning Haoran Yu,

I am currently the Rep looking after Lakefield area. I have compared the site plan with our existing infrastructure map and we have gas along Lakefield Rd and 7th Line.

We will require gas mains through the area in question to service the future development.
We are not able to officially confirm gas is available for the project as it is too preliminary at this time, but it is good news that there is main surrounding the planned area.
Once the project is much further along, please send the below requirements to AreaPlanning40@Enbrige.com and you will be connected with the appropriate Rep. At that time, we will confirm that the existing infrastructure is sufficient for the loads requested and will advise of the required work to supply the development. If there are costs, they would be discussed once the below information is received. Please send the below information all together.

To proceed with a gas design please provide the following;

Completed Builder Information Form
CADD 2007 or earlier – Base, Deep Servicing, Hydro, site Plan
CADD 2007 or earlier – profiles for any culvert crossing
Site plan showing location of gas meters/ building wall elevations showing proposed gas meter locations
JUT detail if applicable
ROW for all streets within the site
Confirmation that the site to be serviced has been cleared on compliance with the SAR act – please provide any environmental comments
Civic addressing when available
Required gas installation timelines
1st closing date

Thank you,

Pam Gobby
Customer Connections, Field Rep

ENBRIDGE GAS INC.
TEL: 905-436-7027
1350 Thornton Rd S, Oshawa ON L1J8C4

enbridgegas.com
Integrity. Safety. Respect.

From: Vince Manzo
Sent: Tuesday, February 11, 2020 11:43 AM
To: Pam Gobby
Subject: Fwd: [External] 3358 Lakefield Road Future Development Utility Coordination (Tatham Project# 517651)

Hey Pam,
New future development in Lakefield for you.

Thanks
Vince

Begin forwarded message:

From: Haoran Yu <hyu@tathameng.com>
Date: February 11, 2020 at 11:37:18 AM EST
To: Cole Taylor <CTaylor@peterboroughutilities.ca>, "Elchyson, Ryan" <ryan.elchyson@bell.ca>, Wayne Millett <millett@nexicomgroup.net>, "Vince Manzo" <Vince.Manzo@enbridge.com>, "corey.craney-twolan@canadapost.postescanada.ca" <corey.craney-twolan@canadapost.postescanada.ca>
Cc: Jeremy Ash <jash@tathameng.com>, "bill@tttholdings.com" <bill@tttholdings.com>
Subject: [External] 3358 Lakefield Road Future Development Utility Coordination (Tatham Project# 517651)

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Haoran Yu

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Haoran Yu

From: Greg Conlin <gconlin@nexicomgroup.net>
Sent: February-12-20 3:04 PM
To: Haoran Yu
Cc: Tina Thornton
Subject: FW: 3358 Lakefield Road Future Development Utility Coordination (Tatham Project# 517651)
Attachments: 517651-SP02-Layout1.pdf

Good Afternoon

We have cable, internet and phone facilities in the area and are interested to serve this new development.

Thanks

Greg

From: Wayne Millett <millett@nexicomgroup.net>
Sent: February 12, 2020 12:32 PM
To: Greg Conlin <gconlin@nexicomgroup.net>
Subject: FW: 3358 Lakefield Road Future Development Utility Coordination (Tatham Project# 517651)

Hi Greg,

Can you please run with this new subdivision.

Thanks
Wayne

From: Haoran Yu <hyu@tathameng.com>
Sent: Tuesday, February 11, 2020 11:37 AM
To: Cole Taylor <CTaylor@peterboroughutilities.ca>; Elchyson, Ryan <ryan.elchyson@bell.ca>; Wayne Millett <millett@nexicomgroup.net>; Vince Manzo <Vince.Manzo@enbridge.com>; corey.craney-twolan@canadapost.postescanada.ca
Cc: Jeremy Ash <jash@tathameng.com>; bill@tttholdings.com
Subject: 3358 Lakefield Road Future Development Utility Coordination (Tatham Project# 517651)

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Haoran Yu

From: Cole Taylor <CTaylor@peterboroughutilities.ca>
Sent: February-13-20 12:53 PM
To: Haoran Yu
Cc: Jeremy Ash; bill@tttholdings.com
Subject: Re: 3358 Lakefield Road Future Development Utility Coordination (Tatham Project# 517651)

Hello Haoran

We are just verifying through our GIS department the service territories boundary of PDI in Lakefield, preliminary review indicated most if not all of this development is in Hydro One territory and thus they get first opportunity to service the development.

If Hydro One could not service the project for some reason and was agreeable a service territory amendment would need to be agreed upon and filed with the Ontario Energy Board, You should confirm the availability of utilities and any limitations or expansion of such with Hydro One.

Once we have confirmed boundaries we will provide a copy of such.

Thanks

Cole Taylor, C.Tech
Senior Electrical Tech
705-748-9301 ext 1252

>>> Haoran Yu <hyu@tathameng.com> 2020-02-11 11:37 AM >>>
Hello

On behalf of our Client, Triple T Holdings, we are confirming the availability of utilities for a planned development in Lakefield.

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PLAN 45M –

I CERTIFY THAT THIS PLAN IS REGISTERED
IN THE LAND REGISTRY OFFICE FOR THE
LAND TITLES DIVISION OF PETERBOROUGH
(No. 45) AT ______ O'CLOCK ON THE ________ DAY OF
____________ 2020 AND ENTERED IN THE
REGISTER FOR PINS ________________________
AND REQUIRED DOCUMENTS ARE REGISTERED
AS PLAN DOCUMENT No. ____________________

____
REPRESENTATIVE FOR THE LAND REGISTRAR

NOTE: THIS PLAN COMPRISES ALL OF PINS 28472-1674, 28472-1687 AND 28472-1689

APPROVED UNDER SECTION 51 OF THE PLANNING ACT
THIS _______ DAY OF _____________ 2020

____
BRIAN WEIR
DIRECTOR OF PLANNING
COUNTY OF PETERBOROUGH

OWNER'S CERTIFICATE

THIS IS TO CERTIFY THAT:

1) LOTS 1 THROUGH 163, AND BLOCKS 174 THROUGH 185, ALL INCLUSIVE HAVE BEEN LAID OUT IN ACCORDANCE WITH MY INSTRUCTIONS.
2) THE STREETS DAVENPORT ROAD, ALLEN DRIVE, CHANDLER CRESECENT AND STREET "A" ARE HEREBY DEDICATED TO THE CITY OF PETERBOROUGH (FORMERLY THE TOWNSHIP OF NORTH MONAGHAN) AS PUBLIC HIGHWAYS.

DATED THIS _______ DAY OF AUGUST 2020

____
WILLIAM TURNER
PRESIDENT
TRIPLE T HOLDINGS INC.

I HAVE THE AUTHORITY TO BIND THE CORPORATION

PLAN OF SUBDIVISION OF

PART OF LOT 26
CONCESSION 7
GEOGRAPHIC TOWNSHIP OF SMITH
TOWNSHIP OF SELWYN
COUNTY OF PETERBOROUGH

0 30 90 150

SCALE: 1:1500

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1) THIS SURVEY AND PLAN ARE CORRECT AND ARE IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2) THE SURVEY WAS COMPLETED ON XX AUGUST 2020

SIGNED AT LAKEFIELD, ONTARIO
THIS XXTH DAY OF AUGUST, 2020

____
CHRISTOPHER E. MUSCLOW
ONTARIO LAND SURVEYOR

LEGEND

■ . . . . DENOTES SURVEY MONUMENT FOUND
□ . . . . DENOTES SURVEY MONUMENT PLANTED
WIT . . . . DENOTES WITNESS
P&P . . . . DENOTES PIERCE & PIERCE, O.L.S.
JBF . . . . DENOTES J.B. FLEGUEL SURVEYORS, O.L.S.
392 . . . . DENOTES J.W. PIERCE, O.L.S.
873 . . . . DENOTES W.A. BENINGER, O.L.S.
1647 . . . . DENOTES J.B. FLEGUEL, O.L.S.
MTO . . . . DENOTES MINISTRY OF TRANSPORTATION ONTARIO
FN . . . . DENOTES FIELD NOTES BY J.W. PIERCE, O.LS., DATED 22ND JANUARY, 1947
DEED. . . . . DENOTES R206744
P1 . . . . DENOTES PLAN 45R-16006
P2 . . . . DENOTES PLAN 45R-14404
P3 . . . . DENOTES REGISTERED PLAN No. 76
P4 . . . . DENOTES PLAN OF SURVEY BY J. W. PIERCE, O.L.S. DATED 22ND JANUARY, 1947
. . . . DENOTES EXPROPRIATION PLAN R382218 (P-1959-98)
P6 . . . . DENOTES PLAN OF SURVEY BY J.W. PIERCE, O.L.S. DATED 1 MAY, 1948
P7 . . . . DENOTES PLAN OF SURVEY BY J.W. PIERCE, O.L.S. DATED 1 MAY, 1948
P8 . . . . DENOTES PLAN OF SURVEY BY G.W. ELLIOTT, O.L.S. DATED 24 JANUARY, 1956
P9 . . . . DENOTES EXPROPRIATION PLAN R382221
P10 . . . . DENOTES PLAN OF SURVEY BY J.W. PIERCE, O.L.S. DATED MAY 1, 1952
P11 . . . . DENOTES PLAN 45R-10012
P12 . . . . DENOTES PLAN 45R-9554
P13 . . . . DENOTES REGISTERED PLAN No. 65

BEARINGS SHOWN HEREON ARE UTM GRID, DERIVED FROM REAL TIME NETWORK (RTN) OBSERVATIONS ON POINTS A AND B LISTED HEREON AND ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 17 (81° WEST LONGITUDE) NAD 83 (CSRS EPOCH 2010.0).

FOR BEARING COMPARISONS, A ROTATION OF 1°54'30" COUNTER CLOCKWISE WAS APPLIED TO BEARINGS SHOWN ON P1 TO P13 INCLUSIVE

DISTANCES SHOWN HEREON ARE GROUND DISTANCES AND CAN BE USED TO COMPUTE GRID DISTANCES BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 1.000138

INTEGRATION DATA

COORDINATES ARE DERIVED FROM GPS RTK OBSERVATIONS USING THE SMARTNET CORRECTION DATA AND ARE REFERRED TO UTM ZONE 17 (81°W LONGITUDE) NAD83 (CSRS EPOCH 2010.0).

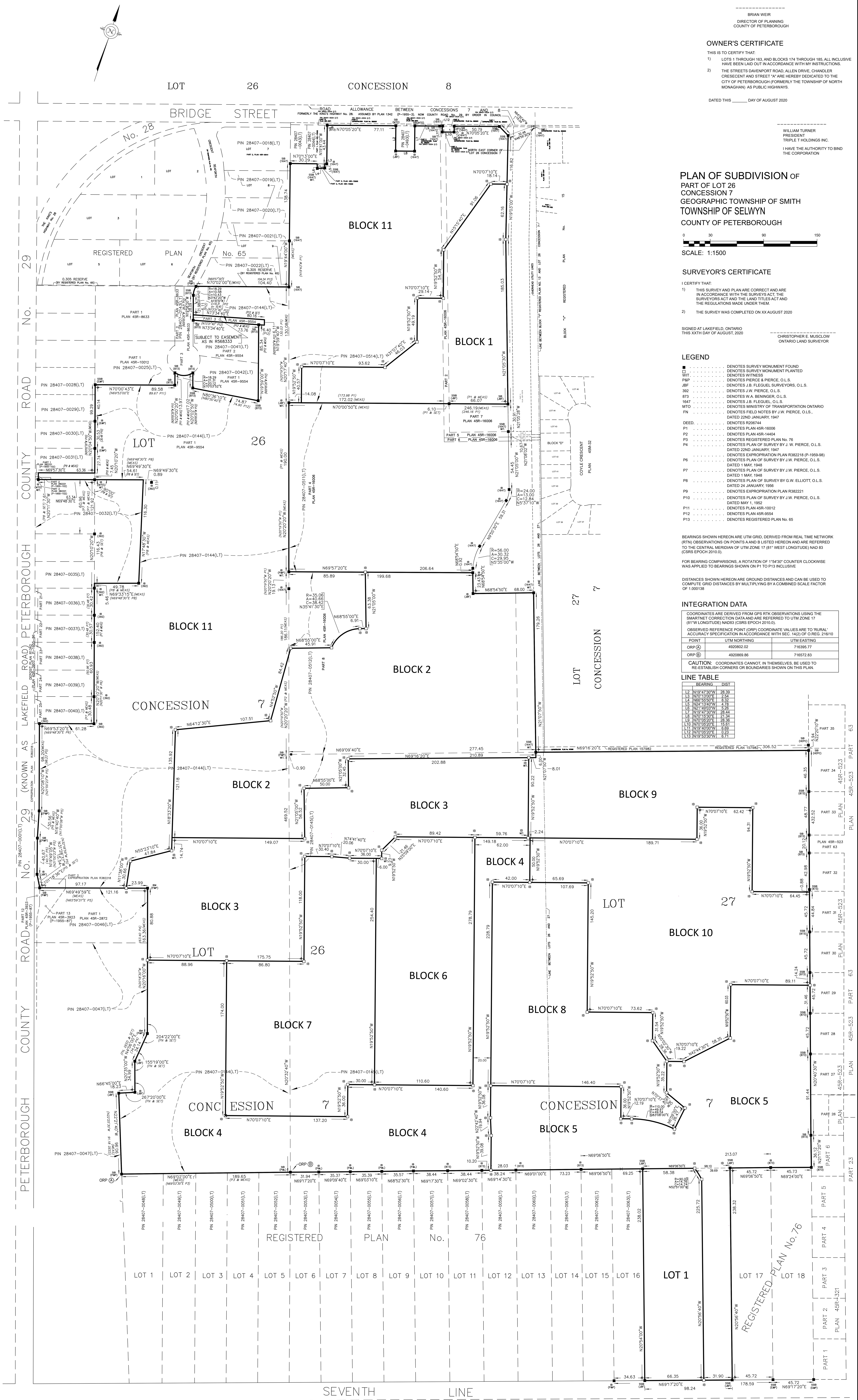
OBSERVED REFERENCE POINT (ORP) COORDINATE VALUES ARE TO 'RURAL' ACCURACY SPECIFICATION IN ACCORDANCE WITH SEC. 14(2) OF O.REG. 216/10

POINT	UTM NORTHING	UTM EASTING
ORP (A)	4920802.02	716395.77
ORP (B)	4920869.86	716572.83

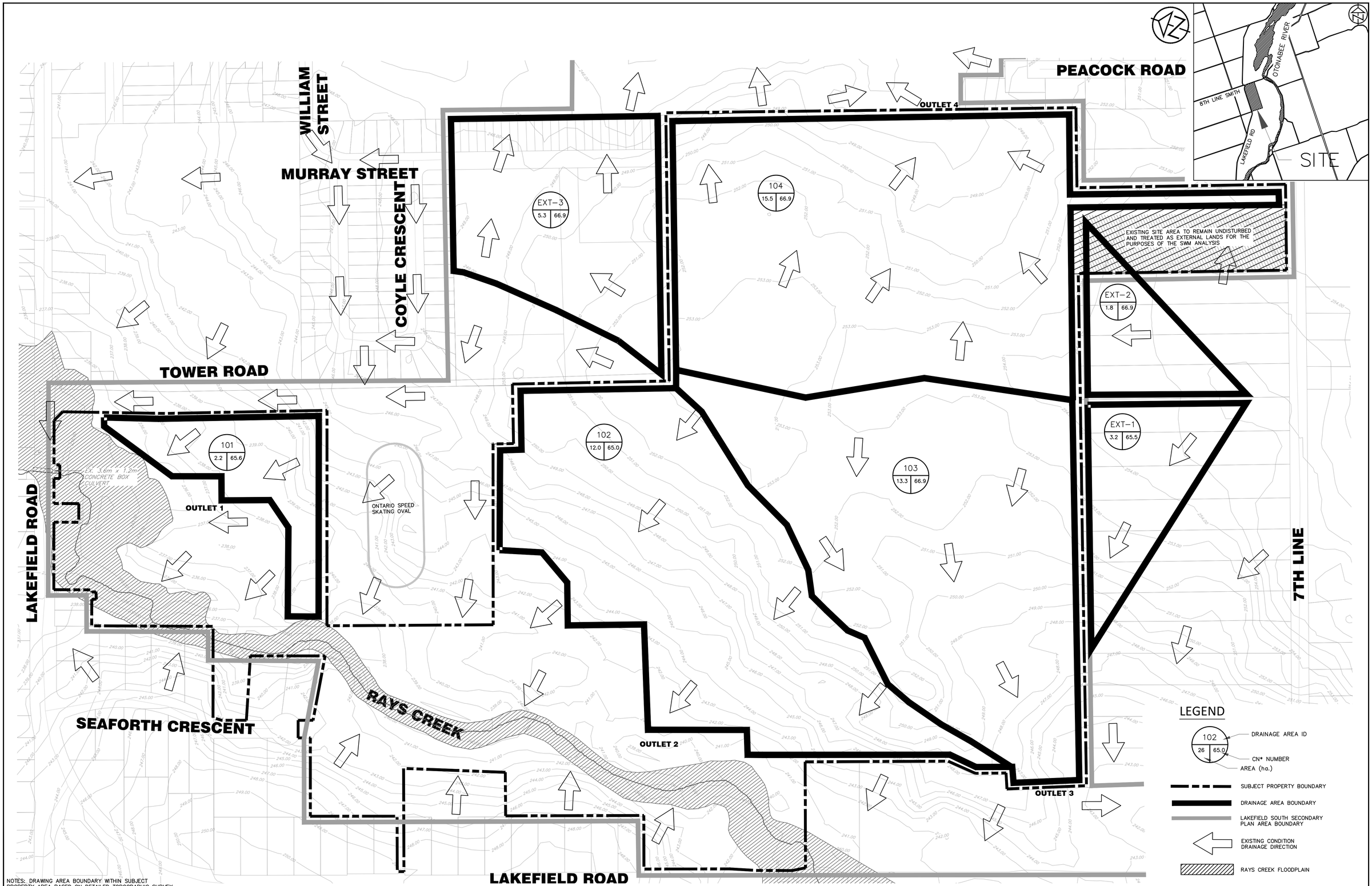
CAUTION: COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

LINE TABLE

	BEARING	DIST
L2	N19°47'30"W	28.39
L3	N70°13'00"E	2.54
L4	N66°55'50"E	8.32
L5	N24°13'40"W	4.78
L6	N21°49'03"W	5.26
L7	N19°47'30"W	28.44
L8	N70°15'30"E	21.34
L9	N70°05'20"E	28.36
L10	N70°05'20"E	15.61
L11	N19°40'00"W	6.69
L12	N70°05'20"E	0.23
L13	N19°53'30"W	6.71



JBF SURVEYORS
44 CLEMENTI ST., BOX 70
LAKEFIELD, ON K0L 2H0
PHONE: 705-652-6198
INFO@JBFSURVEYORS.COM
WWW.JBFSURVEYORS.COM
PROJ. # 7636MPLAN



NOTES: DRAWING AREA BOUNDARY WITHIN SUBJECT PROPERTY AREA BASED ON DETAILED TOPOGRAPHIC SURVEY.

DISCLAIMER AND COPYRIGHT

CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.

CONTOUR INFORMATION OBTAINED FROM LAND INFORMATION ONTARIO (LIO), PROVINCIAL DIGITAL ELEVATION MODEL.

No.	REVISION DESCRIPTION	DATE

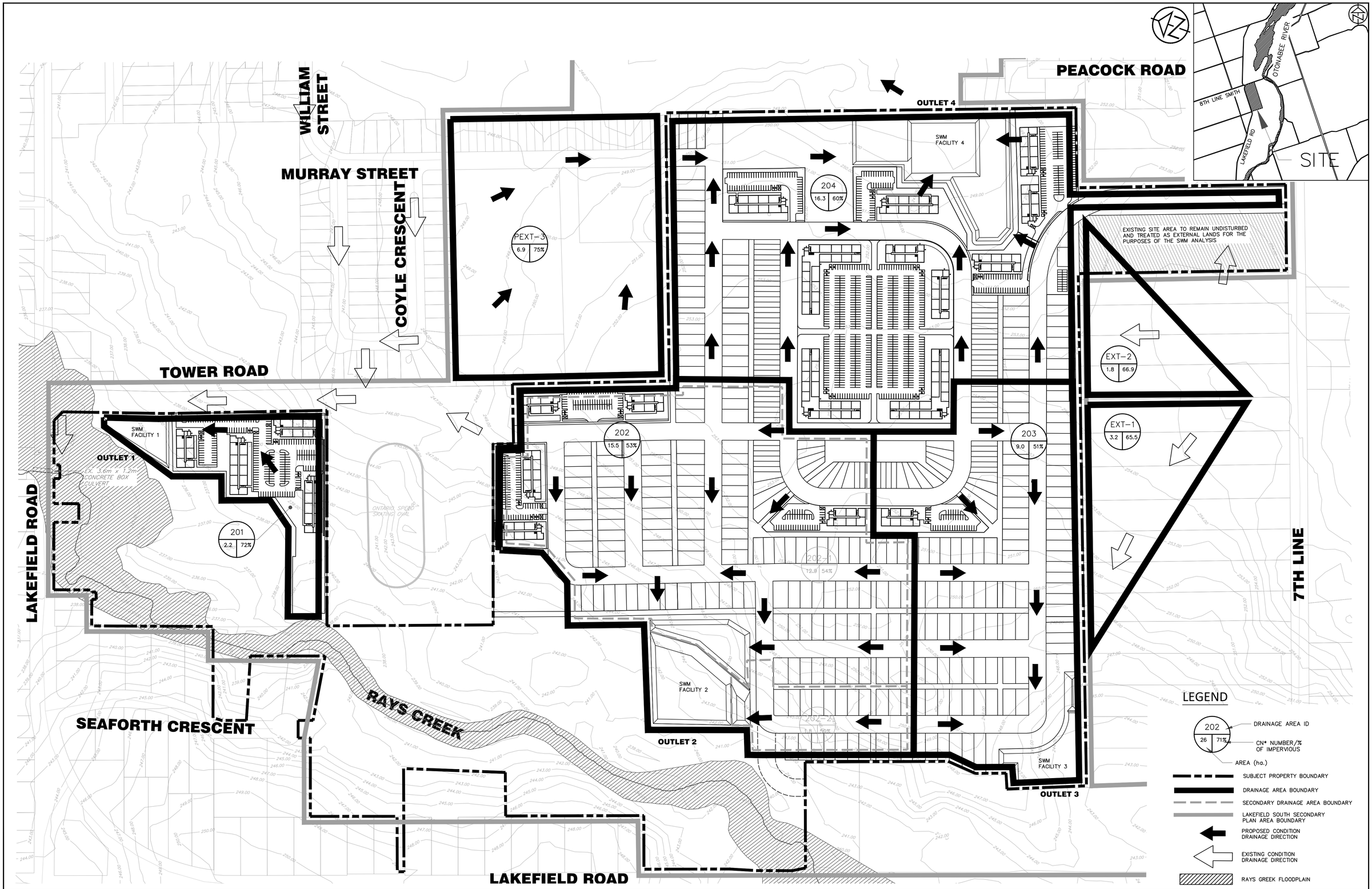
ENGINEER STAMP

3358 LAKEFIELD ROAD
TOWNSHIP OF SELWYN
COUNTY OF PETERBOROUGH

EXISTING CONDITIONS DRAINAGE PLAN

TATHAM ENGINEERING

DESIGN: JA/HY	FILE: 517651	DWG: DP-1
DRAWN: HY	DATE: JULY 2020	
CHECK: JA	SCALE: 1:2000	



No.	REVISION DESCRIPTION	DATE

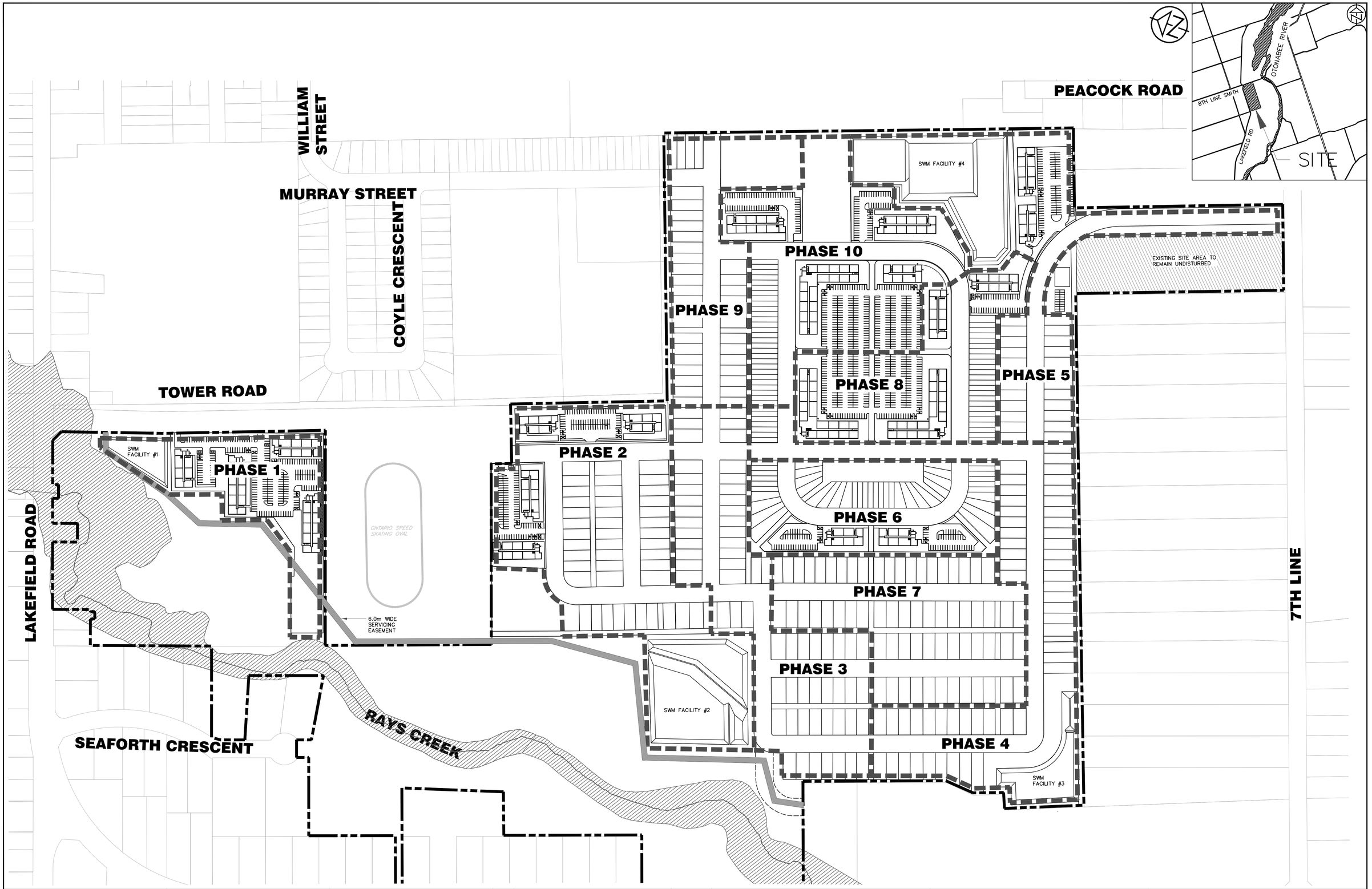
ENGINEER STAMP

3358 LAKEFIELD ROAD
TOWNSHIP OF SELWYN
COUNTY OF PETERBOROUGH

PROPOSED CONDITIONS DRAINAGE PLAN

TATHAM ENGINEERING

DESIGN: JA/HY	FILE: 517651	DWG: **DP-2**
DRAWN: HY	DATE: JULY 2020	
CHECK: JA	SCALE: 1:2000	



No.	REVISION DESCRIPTION	DATE

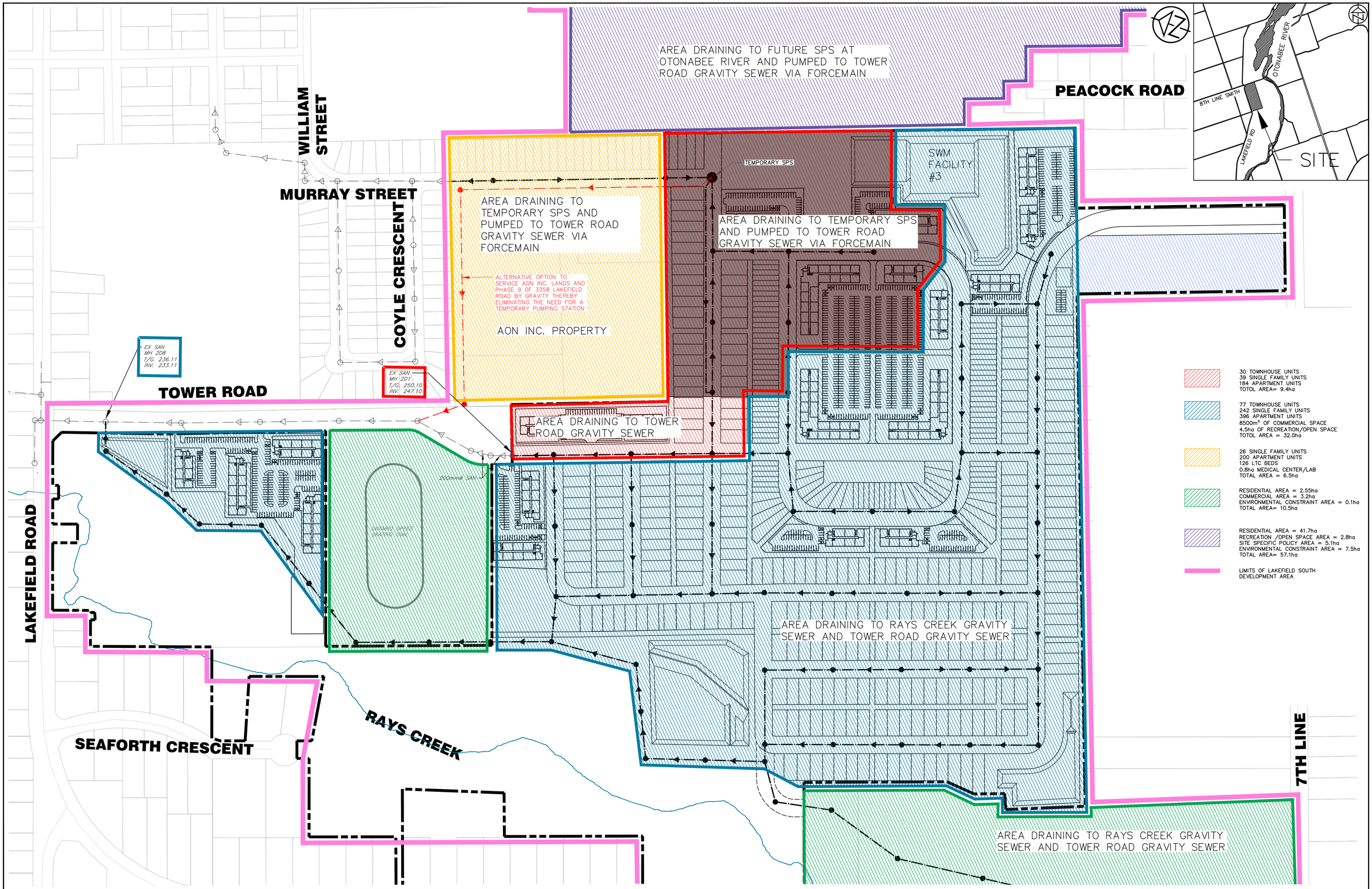
ENGINEER STAMP

3358 LAKEFIELD ROAD
TOWNSHIP OF SELWYN
COUNTY OF PETERBOROUGH

PHASING PLAN

TATHAM ENGINEERING

DESIGN: JA/HY	FILE: 517651	DWG: PH-1
DRAWN: HY	DATE: JULY 2020	
CHECK: JA	SCALE: 1:2000	



No.	REVISION DESCRIPTION	DATE

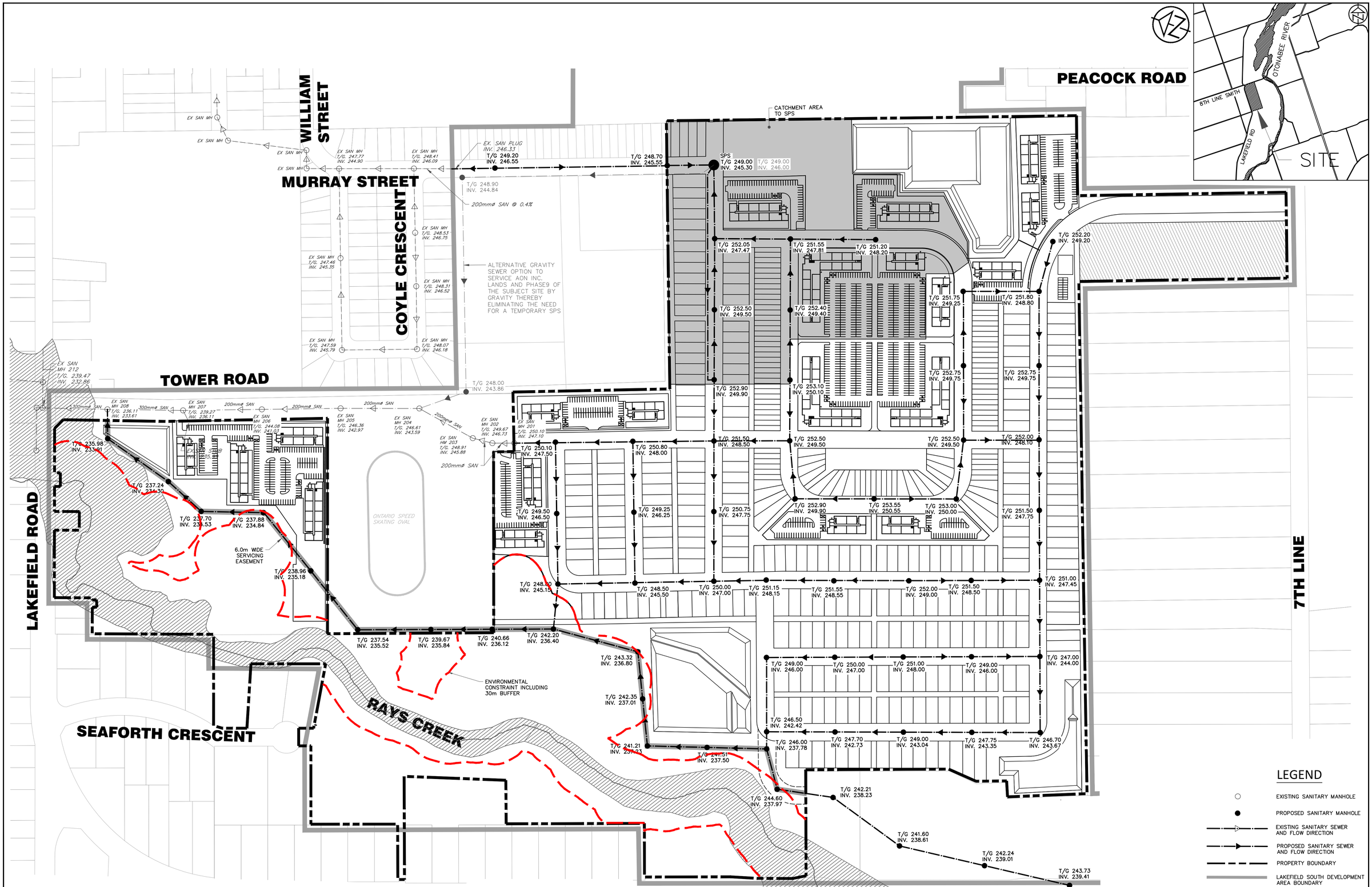
ENGINEER STAMP

3358 LAKEFIELD ROAD
TOWNSHIP OF SELWYN
COUNTY OF PETERBOROUGH

TATHAM ENGINEERING

LSDA SEWER CATCHMENT AREA PLAN

DESIGN: JA/HY	FILE: 517651	DWG: S-1
DRAWN: HY	DATE: JULY 2020	
CHECK: JA	SCALE: 1:2000	



No.	REVISION DESCRIPTION	DATE

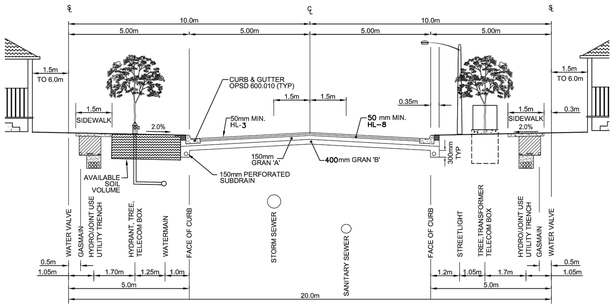
ENGINEER STAMP

3358 LAKEFIELD ROAD
TOWNSHIP OF SELWYN
COUNTY OF PETERBOROUGH

PRELIMINARY SANITARY SERVICING PLAN

TATHAM ENGINEERING

DESIGN: JA/HY	FILE: 517651	DWG: SAN-1
DRAWN: HY	DATE: JULY 2020	
CHECK: JA	SCALE: 1:2000	

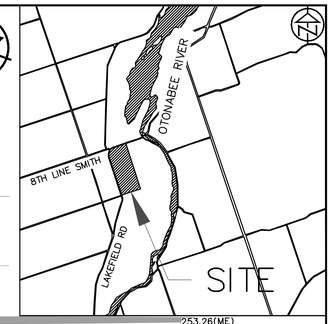


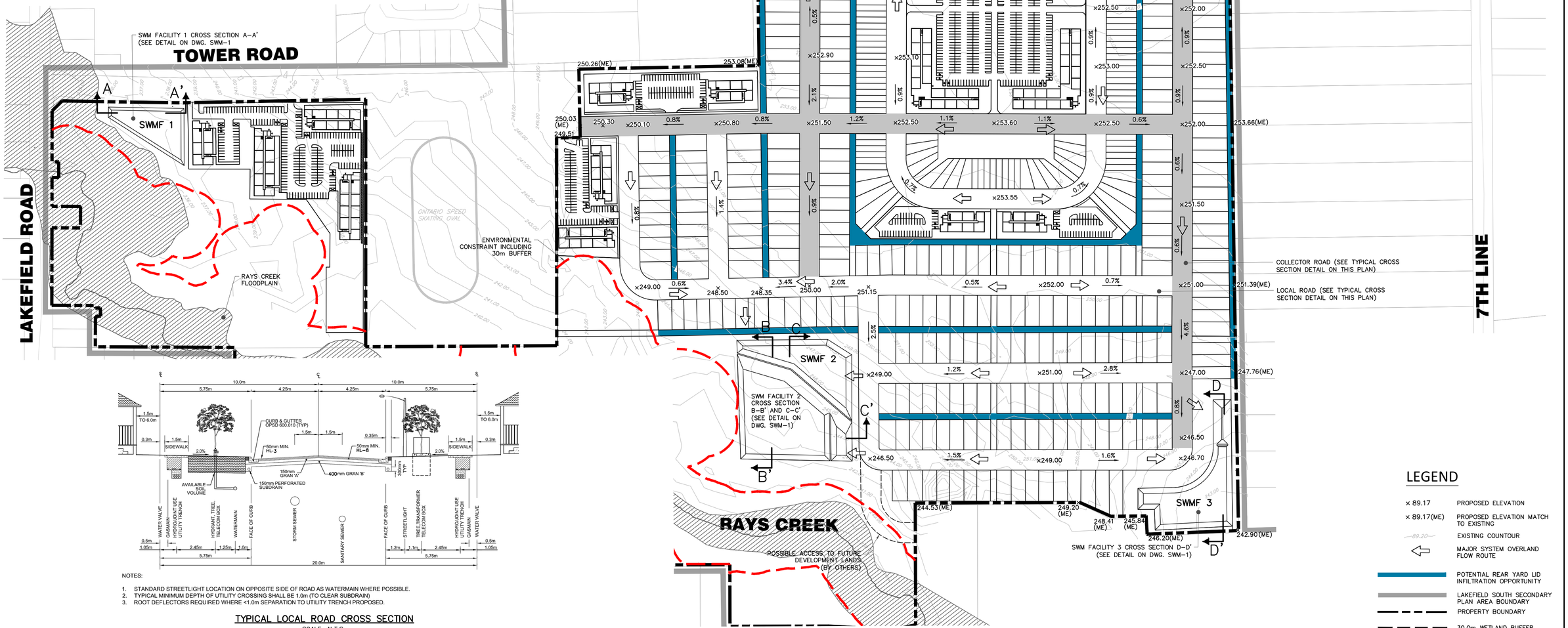
NOTES:

1. STANDARD STREETLIGHT LOCATION ON OPPOSITE SIDE OF ROAD AS WATERMAIN WHERE POSSIBLE.
2. TYPICAL MINIMUM DEPTH OF UTILITY CROSSING SHALL BE 1.0m (TO CLEAR SUBDRAIN)
3. ROOT DEFLECTORS REQUIRED WHERE <1.0m SEPERATION TO UTILITY TRENCH PROPOSED.

TYPICAL COLLECTOR ROAD CROSS SECTION

SCALE: N.T.S





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2. TYPICAL MINIMUM DEPTH OF UTILITY CROSSING SHALL BE 1.0m (TO CLEAR SUBDRAIN)
3. ROOT DEFLECTORS REQUIRED WHERE <1.0m SEPARATION TO UTILITY TRENCH PROPOSED.

TYPICAL LOCAL ROAD CROSS SECTION

SCALE: N.T.S

LEGEND

- × 89.17 — PROPOSED ELEVATION
- × 89.17(ME) — PROPOSED ELEVATION MATCH TO EXISTING
- 89.20 — EXISTING COUNTOUR
- MAJOR SYSTEM OVERLAND FLOW ROUTE
- POTENTIAL REAR YARD LID INFILTRATION OPPORTUNITY
- LAKEFIELD SOUTH SECONDARY PLAN AREA BOUNDARY
- PROPERTY BOUNDARY
- 30.0m WETLAND BUFFER

No.	REVISION DESCRIPTION	DATE

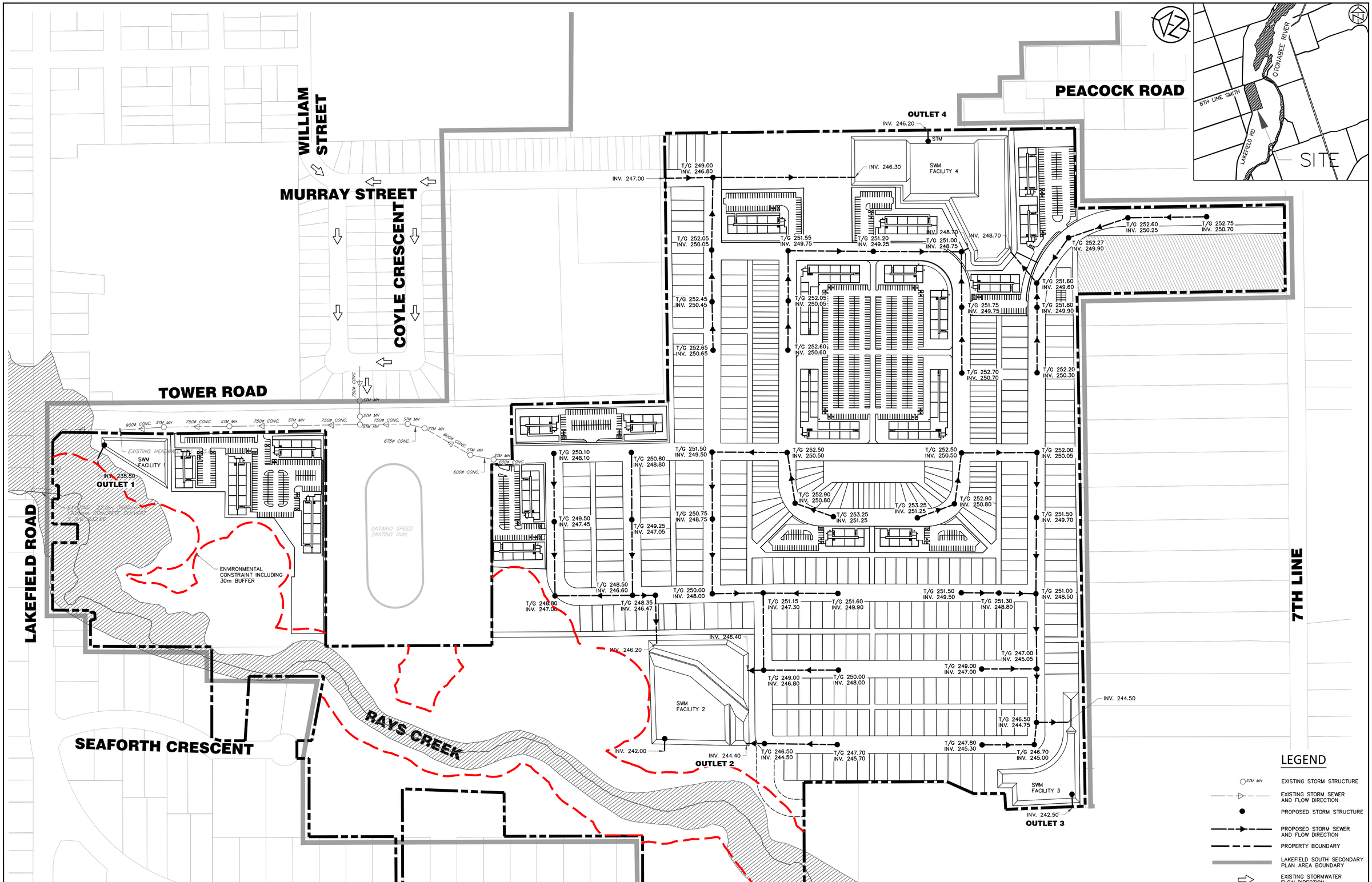
ENGINEER STAMP

3358 LAKEFIELD ROAD
TOWNSHIP OF SELWYN
COUNTY OF PETERBOROUGH

PRELIMINARY SITE GRADING PLAN AND STORMWATER MANAGEMENT

TATHAM ENGINEERING

DESIGN: JA/HY	FILE: 517651	DWG: SG-1
DRAWN: HY	DATE: JULY 2020	
CHECK: JA	SCALE: 1:2000	



No.	REVISION DESCRIPTION	DATE

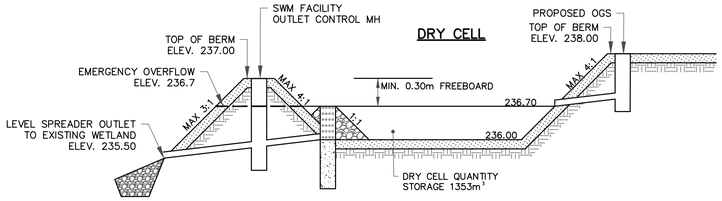
ENGINEER STAMP

3358 LAKEFIELD ROAD
TOWNSHIP OF SELWYN
COUNTY OF PETERBOROUGH

PRELIMINARY STORM SERVICING PLAN

TATHAM ENGINEERING

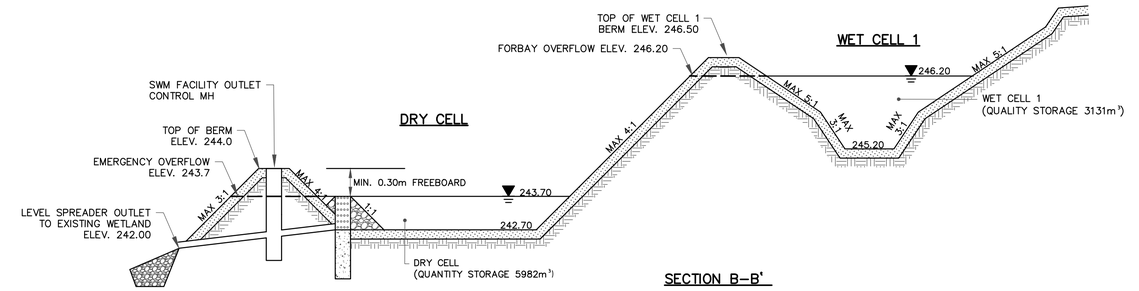
DESIGN: JA/HY	FILE: 517651	DWG: STM-1
DRAWN: HY	DATE: JULY 2020	
CHECK: JA	SCALE: 1:2000	



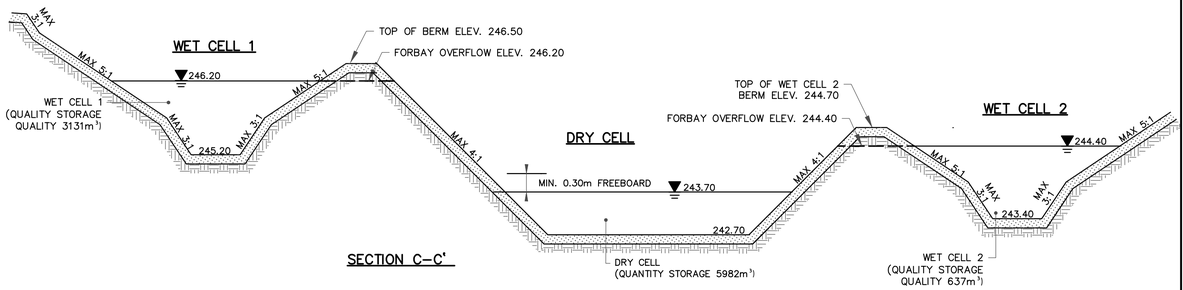
SECTION A–A

SWM FACILITY 1(DRY CELL)

SCALE: N.T.S



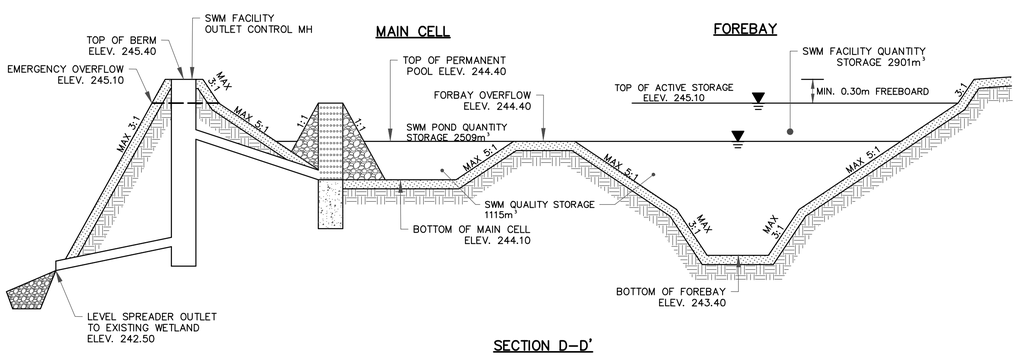
SECTION B–B'



SECTION C–C'

SWM FACILITY 2(HYBRID WET/DRY POND)

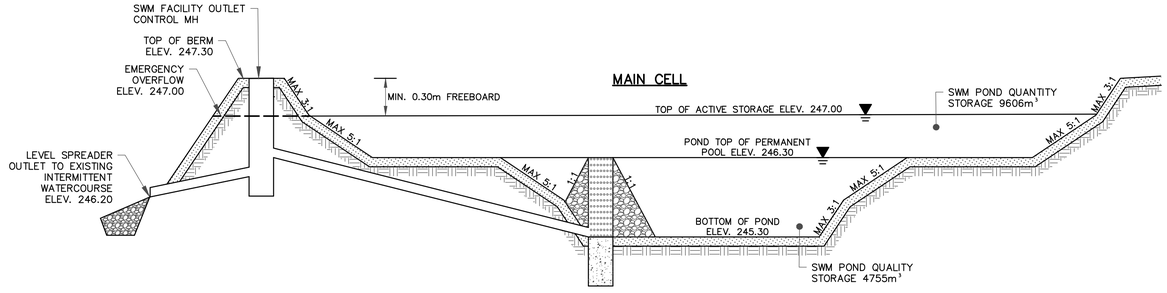
SCALE: N.T.S



SECTION D–D'

SWM FACILITY 3 (WETLAND)

SCALE: N.T.S



SECTION E–E'

SWM FACILITY 4 (WET POND)

SCALE: N.T.S

No.	REVISION DESCRIPTION	DATE

ENGINEER STAMP

3358 LAKEFIELD ROAD
TOWNSHIP OF SELWYN
COUNTY OF PETERBOROUGH

PRELIMINARY STORMWATER MANAGEMENT

TATHAM ENGINEERING

DESIGN: JA/HY	FILE: 517651	DWG: **SWM-1**
DRAWN: HY	DATE: JULY 2020	
CHECK: JA	SCALE: 1:2000	