Preliminary Servicing & Stormwater Management Report

Kettle Creek Golf and Country Club
320 Carlow Road, Port Stanley, Central Elgin, Ontario

Project Number: DEL22-025
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Prepared For:

G-Lover Holdings Inc.

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Statement of Qualifications and Limitations

This report has been prepared for G-Lover Holdings Inc. based upon currently available information, to support the Draft Plan Approval application to be filed for the proposed subdivision development. This report has been prepared for the sole use of G-Lover Holdings Inc. and any reliance upon this information by any third party is made at the risk of that party. Development Engineering (London) Limited assumes no liability for any injury, loss or damage suffered by any third party based upon decisions made or actions that arise due to that party's reliance upon or interpretation of the contents of this report.

This Statement of Qualifications and Limitations is attached to and forms part of the report; any use of the report is subject to the terms contained herein.

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1.0 Introduction

Development Engineering (London) Limited (DevEng) has been retained by G-Lover Holdings Inc. (the Owner) to prepare a Preliminary Servicing & Stormwater Management (SWM) Report to support an application for Draft Approval for a proposed residential subdivision. The development is proposed at 320 Carlow Road in Port Stanley, on a 29.95 ha parcel of land that is currently in use as the Kettle Creek Golf and Country Club.

The Proposed Development Concept (by Monteith Brown Planning Consultants dated February 6, 2025; ref. Appendix A) encompasses 20.21 ha of development land which includes 109 single detached lots (5.87 ha), 26 semi-detached lots (0.90 ha), two medium-density blocks (5.13 ha), a parkland block (1.09 ha), a Stormwater Management Facility (SWMF) block (2.21 ha), open space (2.24 ha), and internal municipal roadways (2.77 ha). The remaining 9.74 ha within the 29.95 ha parcel consists of natural environment/future development (8.21 ha) and an undevelopable *Natural Environment* block (1.53 ha).

The purpose of this report is to support the proposed Draft Plan of Subdivision by demonstrating effective and viable design solutions on a preliminary basis to provide servicing, grading, and stormwater management for the proposed development in accordance with municipal and provincial design standard, guidelines, and policies, as well as industry best-management practices.

2.0 Background Information

2.1 Previous Consultations

A pre-consultation meeting was held with staff from Central Elgin, City of St. Thomas, County of Elgin, Kettle Creek Conservation Authority (KCCA), and Monteith Brown Planning Consultants (MBPC) on July 20, 2022. Notes were prepared by the Owner's planner to document these discussions which have been used as a reference through the preparation of this preliminary engineering design.

2.2 Previous and Concurrent Studies and Reports

The following is a list of background information, studies, and designs referenced in the preparation of this preliminary engineering design:

- Geotechnical Engineering Report by LDS (February 26, 2022)
- Issues Scoping Report by NRSI (February 2023)
- Kettle Creek Hydraulic Study by KCCA (April 2010)
- Marr Drain Report, by Spriet Associates Ltd. (May 1991)
- Engineer Report Lake Road Diversion Drain Improvement by R.J. Burnside & Associates Limited (May 2021)
- Record Drawings of existing services on Carlow Road dated 1972 to 2012 provided by Municipality of Central Elgin (June 16, 2023)
- Slope Assessment by EXP (May 16, 2017)

A residential development known as the Kettle Creek Subdivision (37719 Lake Line, Port Stanley) is proposed north of the subject site. The development proposes external servicing which is to be located within the Kettle

Creek Golf and Country Club lands. The following reports outline the Kettle Creek Subdivision development and the external servicing strategy:

- Detailed Engineering Servicing Report by SBM (July 2024)
- Sanitary Servicing Letter by DevEng (August 2024)
- Functional Stormwater Management Report by DevEng (August 2024)

2.3 Related Design Specifications

- Ministry of Environment, Conservation and Parks (MECP) SWM Planning & Design Manual (March 2003)
- KCCA Plan Input and Review Policy
- Toronto and Region Conservation Authority (TRCA) Erosion and Sediment Control Guide (2019)
- Municipality of Central Elgin Draft Design Guidelines Manual (2023)
- Ontario Building Code (2024)
- Design Guidelines for Drinking-Water Systems (MECP, 2008)
- Design Guidelines for Sewage Works (MECP, 2008)

3.0 Existing Conditions

The 29.95 ha parcel currently contains a full-size golf course, a clubhouse, accessory building, and a parking lot. Adjacent to the east and south limits of the site are open channel municipal drains known as the Marr Drain and Lake Road Diversion Drain, respectively.

3.1 Site Topography and Drainage

Elevation contour mapping was derived from topographical surveys of the site conducted by Callon Dietz on November 28, 2022, and various supplemental surveys by DevEng (July 2023, February 2024, and August 2024). An *Allowable Conditions Drainage Schematic* (Figure SWM-1) is provided in Appendix E to illustrate the various drainage patterns on the subject site.

A 25.39 ha majority of the Kettle Creek Golf and Country Club lands (catchment A3) contains approximately 2% impervious area and conveys runoff directly into an existing decorative pond centrally located within the site, which ultimately outlets to the Marr Drain. The remaining 4.57 ha of the subject site (catchment A2) contains no impervious area and is tributary to the Lake Road Diversion Drain. This area will remain undeveloped but has been included in this analysis as it is located within the subject property.

Approximately 19.08 ha of external lands west of the subject site (catchments EXT. 1 and EXT. 2) drain east through the development lands and this drainage pattern must be maintained under proposed conditions. The 15.86 ha Kettle Creek Subdivision identified in Section 2.2 of this report is indicated by catchment A1, which drains into the Marr Drain.

Both the Marr Drain and Lake Road Diversion Drain convey flows to the east limits of the site towards an existing 1600 mm culvert under Carlow Road, which outlets on the east side of Carlow Road to an open ditch. The ditch then conveys the flows to Kettle Creek, which ultimately outlets to Lake Erie ±2.0 km to the south.

3.2 Soil Conditions

A geotechnical investigation was completed by LDS (project no. GE-00920, dated February 26, 2024). The investigation assessed the subsurface soil and groundwater conditions at the site. Ten boreholes were drilled, while five were equipped with monitoring wells.

Various soil deposits were encountered, subsoil conditions included a natural topsoil layer ranging from 125 mm to 200 mm across the site. Below the topsoil was a natural sand layer, found in all boreholes except for boreholes 3 and 4 (OHSA Type 3 Soils). Below the sand layer, marl (OHSA Type 4 Soils) was identified in boreholes 7, 9, and 10; ranging in depth from 0.2 to 0.7 m. Below the marl, a sand and gravel (OHSA Type 3 Soils) layer was encountered in boreholes 7, 9, and 10; borehole 9 terminated with this layer. A silt layer (OHSA Type 2 Soils) was encountered underlying the topsoil of boreholes 3, 4, and 6; interlayered with the near surface sandy soils of boreholes 1 and 7; while boreholes 1, 3, 4, 5, and 7 terminated with this layer. Lastly, a silt till layer (OHSA Type 2 Soils) was found in boreholes 6, 10, and 11 and terminated these respective boreholes.

The soil permeability was assessed by two methods. The first method completed was a grain size analysis and the second method used was the single well response test. Method 1 resulted in a factored infiltration rate of 11 to 26 mm/hr for silt and sandy silt, 41 mm/hr for the sand layer and 84 mm/hr for the sand and gravel layer. Method 2 resulted in a factored infiltration rate of 16 mm/hr in the sandy silt layer and 8 mm/hr in the sand and gravel and silt layer.

Groundwater is present within the near-surface sandy soils, and/or intermittent sand layers at variable depths throughout the soil strata. Short term groundwater elevations in boreholes range from 225.54 m to 177.77 m above sea level (1.83 m to 4.27 m below the surface). Stabilized groundwater has been observed from May to September 2023; groundwater ranged in depth (below surface) and was measured in BH1/MW from 14.75 m to 15.87 m, in BH4/MW from 2.51 m to 4.14 m, in BH5/MW from 0.32 m to 1.51 m, BH7/MW 0.33 m to 1.67 m, and in BH10/MW from 3.14 m to 8.48 m.

It should be noted that projects requiring positive groundwater control with a removal rate in excess of 50,000 L/day, a submission to the Environmental Activity and Sector Registry (EASR) will be required, and a Permit to Take Water (PTTW) will be required for volumes in excess of 400,000 L/day.

3.3 Existing Roads

Carlow Road is located east of the subject site. In between Carlow Road and the subject site is the Marr Drain, Carlow Road residential lots, the Port Stanley Arena and Community Centre, and the Kettle Creek Public School. Lake Line is located to the north of the subject site beyond the adjacent Kettle Creek Subdivision development. The Carlow Road/Union Road and Lake Line/Warren Street intersection is located ±250 m to the northeast of the site limits.

3.4 Existing Servicing

Based on our review of available record drawings, concurrent design reports, and the various field investigations identified in Section 2.0, the following observations have been made regarding existing servicing in proximity to the subject site.

3.4.1 Watermain

An existing 250 mm diameter watermain is located within the east boulevard of Carlow Road and extends north and southeast beyond the limits of the subject site. This watermain has multiple fire hydrants, including one located directly across from the current Kettle Creek Golf and Country Club entrance. A 200 mm diameter watermain is centrally located within the Lake Line right-of-way (ROW) which extends west toward Scotch Line and east along Warren Street. The existing drinking-water system appears to be well looped to provide supply redundancy in the area.

The Detailed Engineering Servicing Report by SBM (July 2024) includes results of a hydrant flow test that was completed by Hetek Solutions Inc. (dated January 18, 2021) to support the watermain design for the Kettle Creek Subdivision development. The test was completed on the municipal fire hydrant at the northeast corner of the Carlow Road and Warren Street intersection. The static pressure was measured to be 90 psi (621 kPa), and under a single-port test flow of 81.9 L/s (1,298 GPM), the residual pressure was measured to be 76 psi (524 kPa). The results indicate significant static pressure is available in the area for everyday domestic use, and that under a high flow demand like a fire protection scenario, the residual system pressure remains high enough to provide continued and uninterrupted domestic supply. The Hydrant Flow Test Report from the Detailed Engineering Servicing Report by SBM can be found in Appendix A.

3.4.2 Sanitary

There is an existing 300 mm diameter municipal sanitary sewer on Carlow Road along the frontage of the Port Stanley Arena property, as indicated on record drawings provided by Central Elgin (ref. Appendix A). The sanitary sewers convey wastewater to a pumping station located between 367 Carlow Road and 369 Carlow Road (Pumping Station 51) which discharges effluent through an existing 350 mm diameter forcemain along Carlow Road, Lake Line, and Scotch Line, ultimately reaching the existing Wastewater Treatment Plant (WWTP).

Based on the information provided by Central Elgin (ref. coordination with Central Elgin staff in Appendix A), the downstream sewer constraint is the existing 300 mm diameter gravity sewer directly upstream of the pumping station (from SA1018 to SA1820), which has an estimated existing peak inflow of 32.97 L/s. Using measured invert information, the sewer in question is expected to have a total conveyance capacity of 68.38 L/s leaving approximated 35.41 L/s of residual capacity. The Central Elgin correspondence also identifies that Pumping Station 51 has a rated capacity of 107.00 L/s and the existing wastewater design flow to the pumping station is 41.96 L/s, leaving 65.04 L/s of residual capacity.

3.4.3 Storm

According to the received record drawings from Central Elgin and various field investigations, there appears to be no municipal storm sewer on Carlow Road. Drainage relief for the subject site is provided by the municipal drains outlined in Section 3.1.

As per communications with the Owner, there is a valve-controlled outlet used to drain the existing on-site pond into Marr Drain. The size and location of this outlet is currently unknown.

4.0 Proposed Conditions

In addition to providing engineering consulting services to support the proposed Draft Plan of Subdivision, DevEng has also been engaged to complete external works design to support the Kettle Creek Subdivision. The scope of that work includes a trunk sanitary sewer and extended detention wet pond SWMF within the subject site of this application, that will ultimately service both developments. For further details regarding these interim designs, refer to the various reports and letters outlined in Section 2.2.

The development concept for the subject site currently proposes a mixed-use of low and medium density residential, equating to an approximate design population of 738 people, which was calculated using a population density of 3.0 people per single-family lot and 65 people per hectare for the medium-density blocks, all in accordance with Central Elgin Design Guidelines.

4.1 Grading and Drainage Design

Road profile and grading drawings will be provided as part of a future detailed engineering design submission; however, the design is expected to generally follow the existing topography, where reasonable, while providing conveyance of storm runoff in accordance with best engineering practices and regulatory requirements. As previously identified, external lands to the west currently release runoff onto the subject site, which must be accommodated in the grading and drainage design.

A combination of split-drainage, walk-out, and look-out style lot grading is expected to prioritize runoff conveyance to ROW's, while minimizing nuisance ponding in congested post-occupancy side-yards. Runoff will generally be directed towards storm sewer inlets within the roadways and rear-yards, where feasible, with some direct runoff into a proposed SWMF.

Road profiles will be designed to provide adequate protective groundcover over servicing in accordance with Central Elgin requirements, and to safely convey major overland flow to the SWMF. As part of a future detailed engineering submission, critical cross-sections will be assessed using open-channel hydraulic analysis software to confirm ROW capacity for conveyance of major overland flows.

The grading and drainage design will be balanced with earthworks optimization at the detailed design stage to minimize soil import or export. Soil movement on or off property must be conducted in accordance with On-Site and Excess Soil Management regulations (O.Reg. 406/19); however, due to the existing and proposed use, the site may be exempt from certain requirements.

4.2 Roads

The subject development proposes four internal roads with a connection to Carlow Road at the location of the existing entrance and a connection to the proposed Kettle Creek Subdivision roadway which provides secondary access to Lake Line.

There is approximately 1,444 m of local municipal roadway proposed within the subdivision:

- Street 'A'; ±540 m long, beginning at the Kettle Creek Subdivision limits and ending at Carlow Road.
- Street 'B': ±650 m long, beginning at Street A and ending at Street C.

- Street 'C': ±170 m long, beginning at Street B and transitioning into Street B.
- Street 'D': ±84 m long, beginning at Street B and ending at Street C.

The proposed internal road network is expected to consist of 20.0 m ROW's with a standard urban cross section containing an 8.0 m wide road, mountable curb and gutter, and 1.5 m wide concrete sidewalks. Refer to typical cross-section for an urban local road provided in Appendix A.

4.3 Proposed Servicing

New watermain, sanitary sewers, and storm sewers are proposed on-site to service the proposed subdivision; therefore, no groundwater wells, septic systems, or lot-level stormwater management controls will be required.

4.3.1 Watermain

The subdivision will be provided with potable water for domestic use and fire protection via networks of new watermain, with diameters expecting to range between 200mm and 250 mm. The proposed watermain is expected to generally follow the road network creating looping and avoiding any permanent dead-ends to help mitigate water quality degradation, improve system pressures by reducing friction losses, and to help provide redundancy in case of a localized disruption such as a watermain break.

Two connections to external watermains are proposed. The first connection would be proposed at the Carlow Road and Street A intersection, into the existing 250 mm watermain. The second connection would be proposed at the north limit of Street A, connecting into what is currently proposed as a 150mm diameter watermain within the Kettle Creek Subdivision. The Kettle Creek Subdivision watermain is proposed to connect to the existing municipal system outlined in Section 3.4.1 at Lake Line, providing supply redundancy for the subject development.

The per capita domestic demand in Central Elgin is 250 L/person/day (Section 9.2.2.2. in Central Elgin Design Guidelines) which is increased for scenario analysis with a maximum day demand factor of 3.5 and a peak hour demand factor of 7.8. With an anticipated population of 405 people in single-family and 333 in the medium density block, the total population would produce an average day demand of 2.14 L/s (34 GPM), a peak hour demand of 16.67 L/s (264 GPM), and a maximum day plus fire flow demand of 112.48 L/s (1,783 GPM), refer to Appendix B for Water Demand Calculations. Based on the flows and corresponding residual pressure provided in the hydrant flow test report described in Section 3.4.1., the calculated flows for average day, peak hour, and maximum day plus fire flow would yield residual boundary pressures of ~90 psi, ~89 psi, and ~65 psi, respectively. Since these are well above the minimum requirement of 20-40 psi, it can be determined on a preliminary basis that the existing water supply system provides adequate pressures and flows to support the proposed development.

As part of detailed design, the owner should complete a hydrant flow test in proximity to the location of the watermain connection at Carlow Road (hydrant directly across from site entrance) to confirm available flow and residual pressure during test flow. Flow test results will be utilized to establish boundary conditions for a hydraulic model of the proposed water distribution network, which will be completed to optimize watermain sizing and to demonstrate conformance to local, provincial, and regulatory guidelines. A conceptual watermain layout for the purposes of draft plan approval has been included in Appendix B.

4.3.2 Sanitary Sewers

An external works sanitary sewer system is proposed to support the Kettle Creek Subdivision by conveying flow through the subject lands and into an existing 300mm diameter municipal sanitary sewer on Carlow Road. This new sanitary system is also designed to support the subject development.

The proposed subdivision is to be serviced internally through a series of 200 mm diameter sanitary sewers. Upon discharge into the Carlow Road municipal sanitary sewers, sewage will be conveyed by gravity to Pumping Station 51 and then through the existing forcemain to the WWTP.

As part of the external works proposed, an analysis was completed to review the serviceability of the two developments (Kettle Creek Subdivision and Kettle Creek Golf and Country Club). The sanitary flows have been designed following the design criteria in the Draft 2023 Central Elgin Design Guidelines, using: a population density of 3.0 people per lot for all single-family lots and 65 people per hectares for multi-family blocks, Harmon Peaking Factor for deriving peak wet weather sewage flows, an extraneous inflow/infiltration allowance of 0.1 L/s/ha, and a per capita sewage production rate of 250 L/person/day. The total flow from the Kettle Creek Subdivision is 4.43 L/s as noted in the Detailed Engineering Servicing Report by SBM and as confirmed through this analysis. With a proposed population of 738 people for the subject development, the total sanitary flow for the two subdivisions is expected to be on the order of 13.58 L/s (ref. sanitary calculations in Appendix C).

As stated in Section 3.4.2., the existing downstream sanitary sewer system has a residual capacity of 35.41 L/s and Pumping Station 51 has a residual capacity of 65.04 L/s. With a design flow of 13.58 L/s, it can be concluded the existing municipal sanitary conveyance system has sufficient capacity to support the Kettle Creek Subdivision and the subject development.

A sanitary area plan and design sheet will be provided to support these calculations during the detailed design stage.

4.3.3 Storm sewers and Local Drainage

The proposed subdivision will utilize a local storm sewer network with pipe diameters expected to be in the range of 300 mm to 1200 mm for conveyance of 5-year design storm runoff to the proposed SWMF. Conveyance of runoff exceeding the minor system capacity would be routed to the SWMF block through local ROW's and other dedicated overland flow routes as required. A conceptual storm sewer network layout for the purposes of draft plan approval has been included in Appendix D, but a storm area plan and design sheet will be provided during detailed design stage.

5.0 Stormwater Management

As noted in Section 2.2, a Functional Stormwater Management Report (dated August 2024) was completed to support the Kettle Creek Subdivision development. The Functional SWM Report focused on the 'interim condition' which includes the buildout of the Kettle Creek Subdivision and not the Kettle Creek Golf and Country Club lands. However, the SWMF has been designed to accommodate the ultimate condition, which includes the full buildout of both developments, while ensuring the interim condition requirements were satisfied.

The following SWM information and supporting figures in the Appendices will directly reference the Functional SWM Report but will focus on the full buildout of both developments.

5.1 SWM Targets

As stated in Section 3.1, the proposed development will ultimately outlet to the Marr Drain located on the east limits of the subject site. Quantity control is to be provided such that the post-development peak outflows released as rates not exceeding the allowable conditions for the 2-year up to and including the 100-year design storm events.

The Marr Drain was proposed to be reconstructed in 1991 according to the Marr Drain Report by Spriet Associates (May 1991). In accordance with the report (ref. Marr Drain Plan in Appendix A) and an analysis of Southwestern Ontario Orthophotography (SWOOP) contours, the tributary area to the portion of the drain adjacent to the subject development is approximately 60.33 ha, which includes the Kettle Creek Subdivision, Kettle Creek Golf and County Club lands, and external areas. For the purpose of stormwater quantity control, the tributary area (60.33 ha) previously assessed in the Marr Drain report will be utilized to establish target release rates from the subject development. In addition, any areas within the overall tributary area but outside of the subject site will be considered and existing flows will be maintained. Refer to Appendix E for the Allowable Conditions Drainage Schematic.

A Kettle Creek Hydraulic Study was completed by Riggs Engineering Ltd. on behalf of Kettle Creek Conservation Authority (April 2010) which analyzed the entire watershed of the Kettle Creek Harbour. Hydrologic and hydraulic models were utilized to assess flood flow frequency and determine peak flows from a range of return periods. In the analysis, imperviousness percentages were applied to the sub-watersheds to account for future urbanization. To remain consistent with the estimated flows to mitigate adverse impacts to Kettle Creek watercourse, the same imperviousness percentage of 2% established by Riggs Engineering (Table 5) will be maintained and applied to the tributary area (60.33ha) outlined in the Marr Drain report.

As per the Central Elgin Draft Design Guidelines, the proposed development will provide stormwater quality control, targeting Enhanced Level of Protection (80% Total Suspended Solids (TSS) removal) in accordance with the MECP.

5.2 SWM Design Approach

The total tributary area to the proposed SWMF is ~60.33 ha, which includes subject development (29.95 ha), the Kettle Creek Subdivision (11.29 ha), and external tributary lands (19.08 ha). Refer to the Ultimate Conditions Drainage Schematic in Appendix E for details. Due to the size of the tributary area, an extended detention 'wet pond' SWMF is proposed and is sized to provide quality, quantity, and erosion control, servicing subject development and Kettle Creek Subdivision, but accounting for the total tributary area.

The design approach for the proposed SWMF has been developed in accordance with Central Elgin and MECP design standards. Key design considerations include controlled release rates of stormwater peak flows from the SWMF to Marr Drain, optimizing forebay dimensions and permanent pool volume to achieve quality control (TSS removal), extended detention for erosion control, adequate active storage to attenuate flood events, and an outlet to the Marr Drain designed to mitigate scour.

The SWMF will consist of a forebay (quality cell) and quantity cell. The forebay and permanent pool will facilitate long-term suspended solids removal and storage, while the quantity cell is designed with a multi-stage outlet system to provide active storage and achieve the erosion and quantity control targets stated in Section 5.1. In addition, the following criteria was applied to the design strategy:

- Modify the existing decorative pond to achieve MECP requirements; including 5:1 side slopes, adequate SWMF area and depth to achieve the quantity control targets, and adequate permanent pool volume and forebay geometry to provide 'enhanced' level of protection.
- Establish optimal permanent pool elevation based on the elevation of the outlet receiver (Marr Drain design modifications by SBM), required storm sewer sloping, and upstream invert elevations from the Kettle Creek Subdivision design (SBM).

Due to the shallow stabilized groundwater levels identified in the geotechnical report, infiltration-based low-impact development (LID) technology may not be suitable for reducing peak flows in support of quantity control targets and have not been proposed as part of the current design.

5.3 SWM Modeling

The SWM analysis was completed using PCSWMM modelling software by Computer Hydraulics International which utilizes the USEPA's open-source SWMM5 engine. The software's hydrologic modeling component applies design storm hyetographs to subcatchments which utilize various basin characteristics, abstractions (soil saturation, depression storage, etc.), and routing options to compute variable runoff hydrographs over the duration of the simulation period. The runoff is then routed through a hydraulic system utilizing stage storage nodes, orifices, conduits (both uniform flow and pressurized flow), weirs, etc. to determine hydraulic conveyance and storage of the proposed stormwater attenuation system.

The Ministry of Transportation (MTO) Intensity-Duration-Frequency (IDF) parameters for St. Thomas were used, in conjunction with calibration and design parameters, to establish runoff hydrographs in the simulation. For the purposes of establishing curve numbers for hydrograph abstractions, it was assumed the site consisted entirely of sandy silt with a compacted sandy silt surface (hydrologic soil group 'B') as a worst-case condition assuming an average between good and fair conditions of a golf course as per USDA TR-55 classification and a curve number of 65 was conservatively chosen and used during hydraulic analysis. It is noted that the 'allowable' and 'post-development' curve numbers are the same, as compound curve numbers within PCSWMM are not utilized. PCSWMM computes pervious and impervious abstractions separately with an assumed impervious curve number of 98. Therefore, the "post-development" and "allowable" values are the same as it is largely a function of the soil type.

An 'allowable conditions' model was completed to determine the peak runoff rates and establish target peak outflows for the various design storm events (2-year to 100-year return period). Refer to Appendix E for allowable model schematics, inputs, and outputs.

A 'post-development' model was prepared in order to analyze the proposed hydrology, as well as the hydraulic performance of the proposed storm sewers, SWMF active storage, and multi-stage outlet system. The model analyzes the full buildout of the Kettle Creek Golf and Country Club lands as well as the Kettle Creek Subdivision. Post-development hydraulic modeling inputs, outputs, and schematics can be found in Appendix E.

As briefly outlined in previous sections, there are external lands tributary to the proposed SWMF which have been considered within both models (ref. drainage schematics in Appendix E). Within the Kettle Creek Golf and County Club lands there are 6 designated subcatchments representing areas with differing imperviousness values (ref. Site Characteristics table in Appendix E). In addition, one subcatchment has been utilized to represent the Kettle Creek Subdivision (P6).

The Kettle Creek Subdivision subcatchment (P6) does not apply modeling attributes and parameters to generate runoff hydrographs for the model simulation. Modeled outfall hydrographs have been provided by SBM and applied directly to the storage node (SU1) to avoid merging models.

The post-development conditions overall tributary area of 60.33 ha has a total imperviousness of 24% in the ultimate condition. Refer to the Site Characteristics table in Appendix E.

5.4 SWM Facility Design

The proposed SWMF will be centrally located within the Kettle Creek Golf and Country Club lands to utilize the existing pond and maintain the decorative feature and remain consistent with the existing topography. As previously mentioned, modifications are required to the existing pond to make it functional and safe for use as a SWMF. Though the footprint is being modified, the top of pond elevation will be maintained at 178.58 m, refer to the SWMF plan in Appendix E.

The proposed SWMF consists of a forebay and quantity cell, both with a bottom elevation of 174.50 m which is set 1.80 m below the permanent pool elevation of 176.30 m to provide 1.50 m for flow dissipation and particle settling, and 0.30 m for sediment accumulation storage. The design utilizes 5:1 side slopes throughout with a total depth of 4.08 m (1.80 m permanent pool + 2.28 m active storage). The bottom and top areas of the SWMF are approximately 3,367 m^2 and 11,581 m^2, respectively, providing a total available active storage volume of ±20,450 m^3.

The SWMF is proposed to have two minor system inlets into the forebay and a single multi-stage outlet at the east limit of the SWMF's quantity cell.

5.4.1 SWMF Inlet and Outlets

Multiple inlets are proposed within the SWMF, and are outlined below:

- Inlet #1 (Headwall 3) – Consisting of a 1200 mm storm pipe with an end of pipe concrete headwall per OPSD 804.05 with an invert elevation of 176.47 m.
- Inlet #2 (Headwall 4) - Consisting of a 900 mm storm pipe with an end of pipe concrete headwall per OPSD 804.05 with an invert elevation of 176.47 m.
- In addition, two overland flow inlets consisting of rip-rap spillways will be located on the north and south limits of the SWMF to accommodate inflows in excess of the minor system capacity. Elevations and exact locations will be determined during detailed design.

A multi-stage outlet is proposed within the SWMF which outlets to the west into Marr Drain. The outlet configuration is outlined below:

- Outlet #1 (DICB1) – Consisting of a submerged ditch inlet catchbasin with the sill set at 176.00 m and a reversed sloped 450 mm storm pipe outletting at the permanent pool elevation of 176.30. The submerged pipe is set between the sediment storage depth and the ice depth range to mitigate clogging due to ice build up. This outlet serves as the primary outflow as it sets the permanent pool elevation and will convey flows from the more frequent storm events.

- Outlet #2 (Headwall 2) – Consisting of a concrete headwall as per OPSD 804.04 with an inlet elevation of 176.86 m, outletting through a 1200 mm pipe. This outlet serves as the high-level outlet for the SWMF as it will provide an outlet for the major storm events (25 year and above).
- Confluence Maintenance Hole (ST3) – Both Outlet #1 and #2 converge in ST3 and outlet to a 1350 mm storm pipe.
- Outlet # 3 (Headwall 1) – Following ±139.0 m of 1350 mm storm pipe, the outlet to the Marr Drain consists of a concrete headwall as per OPSD 804.05 with an invert elevation of 175.91 m.

Within the inlet and outlet headwalls, baffle blocks are proposed to introduce turbulence and help reduce flow velocity. Rip-rap armouring is also proposed at all inlets and outlets to mitigate long-term scour and erosion.

Inlet #1 and #2 have the same invert elevation which was established with the consideration of ice growth on the permanent pool. Using the MECP SWM Planning and Design Manual, within Section 4.3.1, the thickness of ice can be estimated using Stefan's Equation. The equation utilizes a coefficient of ice growth based on the condition of the water body (Table 4.2, MECP). For the purposes of a SWMF design, a coefficient of 17 was used, which is the lowest value in the range for an 'average lake' condition. The coefficient is utilized in conjunction with the sum of freezing degree-days, which was determined using historical weather data for St. Thomas weather station (Government of Canada – Environment and natural resources). The calculated ice thickness was determined to be 0.14 m thick and was added to the permanent pool elevation to establish the inlet elevations.

As determined within the *Assessment of Marr Drain Flow Depths for Determining Storm Outlet Elevation* (DevEng, August 2023), the proposed outlet elevation of Outlet #3 is 0.16 m above the bottom of the drain. As stated in the assessment, this was determined through an analysis of the Marr Drain water levels during all design storm events. To allow for a free-flowing outlet during the more frequent storm events, the outlet elevation was set at 175.91 m (bottom of channel = ±175.75 m as per SBM design).

5.4.2 SWMF Quantity Control

In accordance with the SWM targets outlined in Section 2.4, the post-development flows shall not exceed the allowable flow rates for all storm events up to and including the 100-year storm event and to safely convey the Hurricane Hazel Flood event to an appropriate legal outlet. Refer to the summary of allowable and post-development flows in Table 1 below. The modeling indicates that the proposed active storage volume and multi-stage outlet system can effectively reduce the post-development peak flow rates to those of the allowable condition, thereby satisfying the quantity control target. Refer to the allowable and post-development outputs in Appendix E.

Table 1: Summary of Pre- and Post-Development Flows

Design Storm Event Return Period	Allowable Peak Runoff Rate (L/s)	Post-Development Peak Release Rate (L/s)
2-year	445	174
5-year	568	311
10-year	648	389
25-year	767	586
50-year	882	765
100-year	1,021	973
Hurricane Hazel	N/A	5,373

Table 2 below summarizes the SWMF depths and active storage volumes by design storm event.

Table 2: Summary of SWMF Depth/Active Storage Volumes Flows

Design Storm Event Return Period	SWMF Depth / Elev. (m)	Active Storage Volume (m^3)
2-year	0.33 / 176.63	2,288
5-year	0.48 / 176.78	3,429
10-year	0.61 / 176.91	4,460
25-year	0.79 / 177.09	5,934
50-year	0.89 / 177.19	6,812
100-year	0.98 / 177.28	7,615
Hurricane Hazel	2.25 / 178.55	20,446

5.4.3 SWMF Quality Control

As previously noted, the subject development is required to provide Enhanced Level of Protection (80% TSS removal). Table 3.3.2 in the MECP SWM Planning and Design Manual was utilized to establish a required water quality storage volume of 96 m^3/ha based on the site's ultimate imperviousness of 24%. Of that volume, it is recommended that 40 m^3/ha be used for extended detention to be drawn down over (>24 hours) to provide downstream erosion control. A permanent pool volume of 56 m^3/Ha is therefore required for the 60.33 Ha tributary drainage area to satisfy the previously established SWM quality targets. Refer to Table 3 below which summarizes the quality control volumes.

Table 3: SWMF Quality/Quantity Target Storage Volumes

	Storage Volume (m3)	
Pond Stage	*Required*	*Provided*
Permanent Pool	*3,378*	*8,438*
Extended Detention (Active)	*2,413*	*6,923*
Total (Perm. Pool + Active)	*5,792*	*15,361*

The forebay area is in minor exceedance of MECP's recommendation that forebays account for up to 33% of the total permanent pool area; however, at 40.5%, the exceedance above this unquantified recommendation is considered reasonable for the retrofitted pond and still considered acceptable to facilitate flow path for quality treatment.

The forebay has an average length of 50.0 m, and the minimum distances required to achieve the quality control target for settling and dispersion are 12.0 m and 40.0 m, respectively. The forebay provides 428 m^3 of sediment storage at a depth of 0.3 m (17% of forebay depth) resulting in a cleanout frequency of approximately 27 years. Refer to the Sediment Forebay Sizing Calculations in Appendix E.

In addition, the SWMF provides an extended detention time to improve suspended solids settling and to facilitate long-term erosion and flood mitigation downstream. The modeling indicates an approximate drawdown time of 36 hours from the 2-year to the 100-year design storm events.

5.5 Major System Conveyance

Due to existing site grading constraints and the centrally located SWMF, a grading strategy to convey flows overland from the SWMF to Marr Drain is not achievable. Therefore, proposed SWMF, outlet configuration, and 1350 mm outlet pipes have been designed to detain and convey the Hurricane Hazel event to Marr Drain. Refer to post-development modeling outputs in Appendix E.

6.0 Erosion and Sediment Control

Complementary to the site servicing and grading design for the on-site development, erosion and sediment control (ESC) details will be included with the detailed Engineering design drawings. Temporary ESC measures will be designed to mitigate the offsite migration of sediments by incorporation of various best management practices and control measures. Typical control measures to be implemented on site include:

- Installation of silt control fencing (light duty/robust) around the site perimeter at down-gradient locations.
- Preventing silt or sediment laden runoff from entering inlets (catchbasins / catchbasin maintenance holes) by installing pre-fabricated temporary inlet filter bags and incorporating straw bale or rock dam flow checks.
- Temporary sediment traps/basins (dewatering stations where required).
- Sodding the invert of swales as soon as possible after being constructed to mitigate erosion and down cutting; in general, minimizing the duration of soil exposure in erosion prone areas by temporary vegetation coverage (i.e. hydro-seeding) is recommended.

- Maintaining sediment and erosion control structures in good repair (including periodic cleaning as required) until such time as the Engineer or the Municipality approves their removal.
- Incorporation of temporary measures at site construction entrances to minimize tracking of mud and debris onto municipal road allowances.
- Scheduling of critical conveyance works during forecasts of little to no precipitation.

Detailed ESC plans will be provided for review by the Municipality of Central Elgin at the detailed engineering stage.

7.0 Summary and Conclusions

Based upon the information provided herein, the following conclusions are provided:

- The 29.95 ha subject site currently consists of an 18-hole golf course (~2% imperviousness), though a total area of 60.33 ha is tributary to the site.
- The proposed development will consist of single-family lots, semi-detached lots, two medium density blocks, a SWMF block, open space blocks, a parkland block, and internal municipal roadways. The total tributary area (60.33 ha) increases imperviousness from 2% to 24%.
- Kettle Creek Subdivision located at 37719 Lake Line, Port Stanley is located north of the subject site limits and forms a portion of the overall servicing strategy.
- Existing grading patterns for the total tributary area direct flows to the existing pond centrally located within the subject site, which ultimately outlets to the municipal open channel known as the Marr Drain.
- There are existing municipal 250 mm and 200 mm watermains on Carlow Road and Lake Line, respectively. These mains will service the subject development and Kettle Creek Subdivision.
- There is an existing municipal 300 mm sanitary sewer on Carlow Road, which conveys flows to Pumping Station 51 on Carlow, which then conveys flows via forcemain to the existing wastewater treatment facility on Scotch Line.
- There is no municipally operated storm infrastructure in proximity of the subject site. A valve-controlled outlet pipe currently conveys flows from the existing pond, though location and size have not been confirmed.
- Proposed on-site grading is to be designed to generally follow the existing topographic constraints and drainage patterns, which will direct stormwater flows to the proposed SWMF location.
- Two watermain connections are proposed for the subject development: one at the main entrance on Carlow Road to the existing municipal watermain and the other at the north limits of the site connecting to the Kettle Creek Subdivision watermain.
- The watermain system will be modeled during detailed design, although based on the hydrant flow test completed in support of the Kettle Creek Subdivision, there appears to be sufficient flows and pressures available to meet water demands and fire protection requirements.
- As part of the external works for the Kettle Creek Subdivision, the proposed sanitary will service both developments and connect into the sanitary sewer network on Carlow Road, which has sufficient capacity to support both developments.
- The designated quantity control is to be provided such that the post-development peak outflows are to those of the allowable conditions for the 2-year up to and including the 100-year design storm events.

- As per the Central Elgin Draft Design Guidelines, the proposed development will provide stormwater quality control, targeting Enhanced Level of Protection (80% Total Suspended Solids (TSS) removal) in accordance with the MECP.
- The proposed SWMF design approach to achieve MECP requirements is to modify the existing pond including footprint modifications, the addition of a berm to establish a forebay and quantity cell, and a multi-stage outlet system.
- The proposed SWMF, outlet configuration, and 1350 mm outlet pipes have been designed to detain and convey the Hurricane Hazel event to Marr Drain.

We trust this report adequately addresses the outlined design constraints and proposed solutions related to stormwater management in support of the Draft Plan of Subdivision approval.

Development Engineering (London) Limited

Appendix A: Background Info & Figures

SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED ______ DAY OF ____________, 20__, THIS DRAFT PLAN IS APPROVED UNDER SECTION 51 OF THE PLANNING ACT THIS ______ DAY OF ____________, 20__.

DATE SIGNATURE

Pt	NORTHING	EASTING
200	4726562.40	409542.50
201	4726579.50	409525.90
202	4726591.50	409514.50
203	4726601.20	409505.00
204	4726607.00	409500.20
205	4726609.90	409495.90
206	4726613.40	409493.40
207	4726616.30	409489.30
208	4726620.10	409486.50
209	4726624.30	409483.00
210	4726628.50	409479.50
211	4726630.70	409476.20
212	4726633.90	409473.30
213	4726638.40	409469.20
214	4726642.70	409465.90
215	4726645.80	409461.40
216	4726648.00	409458.80
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218	4726652.80	409456.50
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221	4726662.10	409449.10
222	4726667.40	409443.50
223	4726672.00	409441.10
224	4726673.80	409439.70
225	4726676.80	409436.80
226	4726678.80	409434.80
227	4726681.60	409434.20
228	4726684.10	409432.70
229	4726687.30	409432.40
230	4726688.60	409431.40
231	4726694.40	409426.30
232	4726698.70	409424.50
233	4726704.60	409419.80
234	4726708.90	409418.60
235	4726711.30	409416.10
236	4726713.70	409415.50
237	4726717.20	409413.10
238	4726725.60	409408.20
239	4726731.00	409404.40
240	4726734.00	409404.10
241	4726737.90	409400.60
242	4726739.70	409399.20
243	4726744.50	409396.30
244	4726752.80	409390.70
245	4726758.70	409386.80
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252	4726770.70	409381.00
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255	4726777.10	409378.20
256	4726779.70	409378.00
257	4726781.10	409376.60
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259	4726783.40	409373.50
260	4726784.20	409371.90
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262	4726786.90	409371.70
263	4726789.60	409370.90
264	4726792.30	409370.20
265	4726795.00	409368.50
266	4726797.60	409366.90
267	4726801.60	409364.20
268	4726805.10	409363.90
269	4726808.50	409363.60
270	4726810.10	409362.60
271	4726811.30	409362.30
272	4726812.70	409362.20
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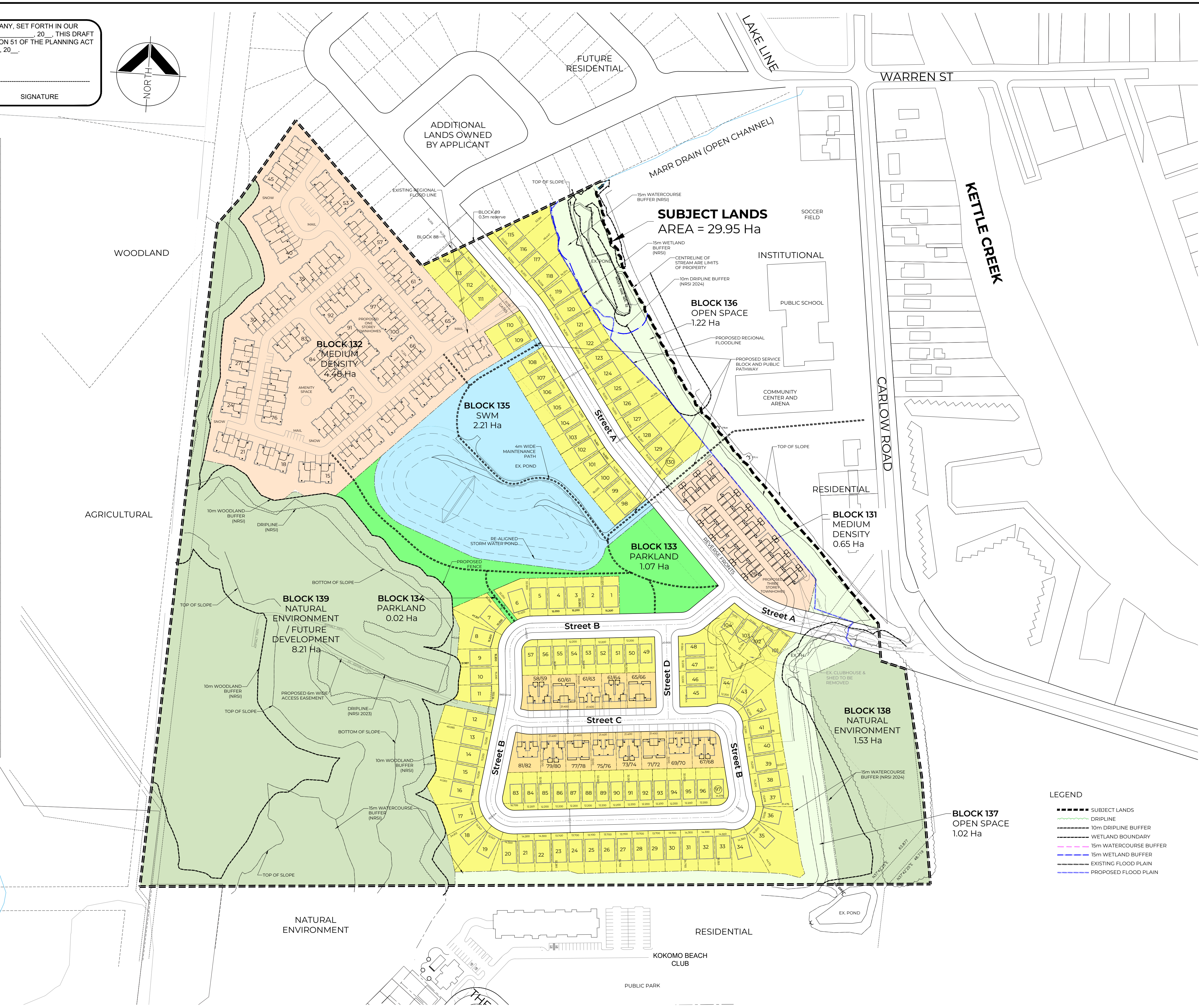
274	4726821.30	409358.80
275	4726825.60	409356.30
276	4726829.70	409357.80



MONTEITH BROWN
PLANNING CONSULTANTS
219 OXFORD STREET WEST, UNIT 302
LONDON, ONTARIO. N6H 1S5 519.686.1300
WWW.MBPC.CA

DRAFT PLAN OF SUBDIVISION

LOT 15 & PART OF LOT 16 CLERGY, RESERVE
LOT D, PART RD ALLOW
RP 11R-7427 PARTS 1 TO 10
(Geographic Township of Southwold)
MUNICIPALITY OF CENTRAL ELGIN,
COUNTY OF ELGIN

KEY PLAN
N.T.S.

OWNER'S CERTIFICATE

I, Jay McGuffin of Monteith Brown Planning Consultants, am authorized to submit this Draft Plan of Subdivision on behalf of the owners.

Jay McGuffin, MCIP, RPP
MBPC, Principal Planner
Date

SURVEYOR'S CERTIFICATE

I hereby certify that the boundary of the lands to be subdivided as shown on this plan and their relationship to the adjacent lands are accurately and correctly shown.

J. Paul Crocker, OLS
Callon Dietz Incorporated
Date

REQUIREMENTS UNDER SECTION 51 (17) OF THE PLANNING ACT, 1990

a) as shown on plan
b) as shown on plan
c) as shown on key plan
d) as shown on land use schedule
e) as shown on plan
f) as shown on plan
g) as shown on plan
h) municipal water
i) silt, sand, sand and gravel, and silt till
j) as shown on plan
k) municipal sewers
l) as shown on plan

LAND USE SCHEDULE

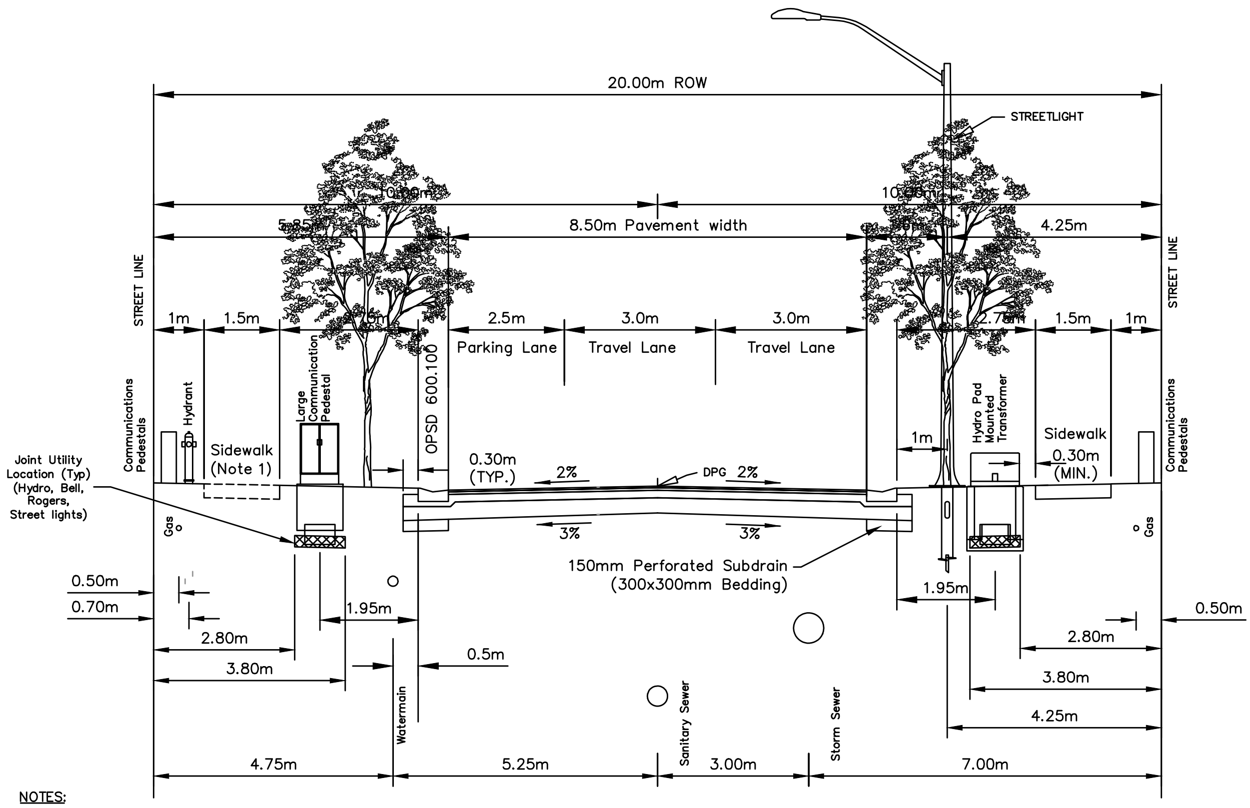
LAND USE	AREA (Ha)	%
SINGLE DETACHED LOTS	5.87	29.0
SEMI DETACHED LOTS	0.90	4.5
MEDIUM DENSITY BLOCKS	5.13	25.4
PARKLAND	1.09	5.4
STORM WATER MANAGEMENT	2.21	10.9
OPEN SPACE	2.24	11.1
STREETS A TO D	2.77	13.7
DEVELOPABLE AREA	20.21	100.0
NATURAL ENVIRONMENT	9.74	
TOTAL SITE AREA	29.95	

No.	Revision	Date	Initial
2	SUBMIT FOR COMMENTS	DEC 2024	BS
1	PRE CONSULTATION	OCT 2024	BS

BAR SCALE
1: 1,500
0 15 30 45 60m

ADDRESS
320 CARLOW ROAD
KETTLE CREEK GOLF COURSE
PORT STANLEY

DRAWN BY: BS	CHECKED BY: PM	PROJECT No. : 22-1800
DESIGNED BY: BS	APPROVED BY: JMC	DRAWING No. 1
SCALE: on 24x36 1:1500	DATE: Feb 06, 2025	



NOTES:

1. SIDEWALK MAY BE INSTALLED ON BOTH SIDES IF FUTURE PEDESTRIAN DEMAND WARRANTS.
2. THE PAVEMENT STRUCTURE IDENTIFIED ARE MINIMUM REQUIREMENTS. ACTUAL PAVEMENT STRUCTURE TO BE RECOMMENDED BY A QUALIFIED GEOTECHNICAL CONSULTANT.
3. PARKING ON ONE SIDE OF STREET ONLY ON OPPOSITE SIDE OF INBOUND LANE.
4. BASE ASPHALT THICKNESS MAY BE INCREASED TO 80mm HL8 DEPENDING ON SUBSEQUENT SUBDIVISION PHASING AND TIMING. A QUALIFIED GEOTECHNICAL CONSULTANT MUST REVIEW IF PAVEMENT STRUCTURE IS SUITABLE FOR LONG TERM TRAFFIC DEMANDS OMITTING SURFACE ASPHALT FROM THE DESIGN CALCULATIONS.

MINIMUM PAVEMENT DESIGN

50mm	HL3
50mm	HL8
150mm	GRANULAR 'A'
450mm	GRANULAR 'B' (TYPE II GRADATION)

Utility	Min cover in Blvd	Min cover for Road crossing
Gas	0.9m	1.0m
Hydro	1.0m	1.0m
Comm.	0.75m	1.0m
Water	1.7m	1.7m
Storm	1.5m	1.5m
Sanitary	2.4m	3.0m

TYPICAL CROSS SECTION

NOT TO SCALE
ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED

MUNICIPALITY OF CENTRAL ELGIN STANDARD DRAWING

URBAN LOCAL ROAD CROSS-SECTION

REVISION DATE: DEC 2022

DRAWING #: R-03

Central Elgin (Port Stanley) Hydrant Flow Test Report

Date: 18-Jan-21 Time: 11;12 AM Operator: Lucas/Hodder

Test Hydrant Information:

Number: 1 Elevation: n/a
N.F.P.A. Colour Code: BLUE Location: 3830 Union Road

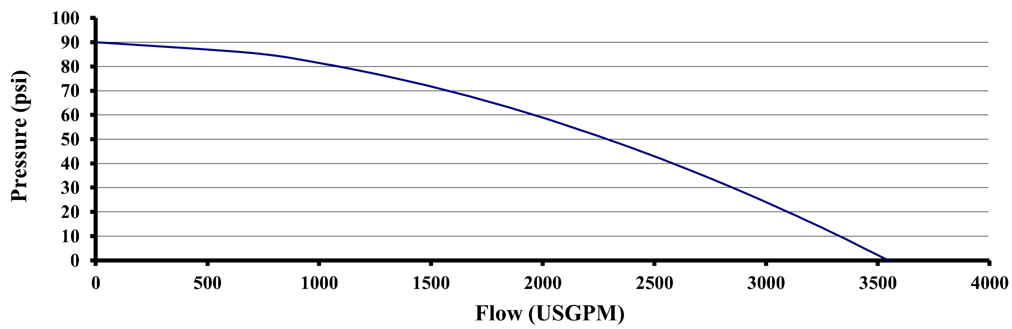
STATIC PRESSURE: 90 psi Hyd# 1
RESIDUAL PRESSURE: 76 psi
HPR S/N: 1199

Flow Hydrants Information:

Hydrant No.	HPR No.	Outlet Dia. (in.)	Coefficient (~0.9)	Pitot Gauge Reading (psi)	Flow (USGPM)
#1	n/a	2.5	0.9	60	1298
				Total Flow (USGPM)	1298

Available Flow At Test Hydrant at 20 psi 3096 USGPM 2559 IGPM
Available Flow At Test Hydrant at 10 psi 3328 USGPM 2750 IGPM

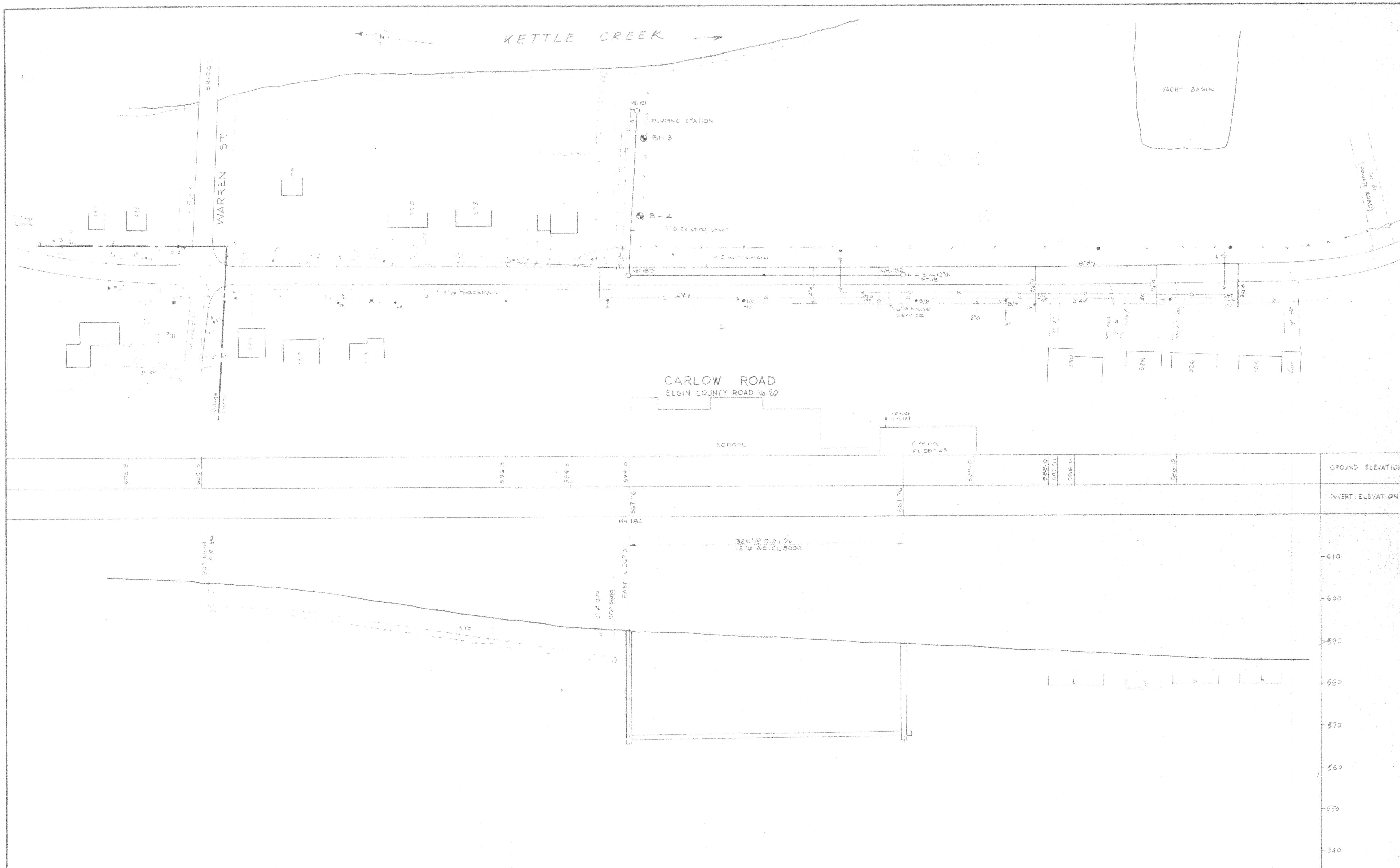
Pressure - Flow Graph at Test Hydrant



Comments/Discrepencies/Diagram:

Fire Hydrant is located at northeast corner of Carlow Road & Warren Street

*NOTE: Graph updated by SBM to show Flow on X axis and Pressure on Y axis.



REVISION	DESCRIPTION	DATE
	AS-CONSTRUCTED	

CANADIAN-BRITISH
ENGINEERING CONSULTANTS LIMITED
801 YORK MILLS RD. DON MILLS, ONTARIO

DRAWN	TRACED	CHECKED	SCALE
D.J.B.	-	E.B.M.	HORIZ: 1" TO 50' VERT: 1" TO 10'

ONTARIO WATER RESOURCES COMMISSION

KETTLE CREEK POLLUTION CONTROL
SYSTEM No. 1 - PORT STANLEY

CARLOW ROAD

PROJECT No. 1-0024-66
CONTRACT No.
DWG. No. 1
FILE No. 1050

Outlook

RE: Consultation Meeting - 320 Carlow Road (Kettle Creek Golf Course) - Follow-up

From Alex Piggott <APiggott@centralelgin.org>
Date Wed 1/24/2024 4:37 PM
To Jason Ross <jross@deveng.net>; 'pdutchak@elgin.ca' <pdutchak@elgin.ca>; Cindy Vermeer <CVermeer@centralelgin.org>
Cc 'Kevin Moniz' <kevin@sbmltd.ca>

Hi Jason:
My apologizes for the delay in responding to you.
Yes, the Municipality does have CLI ECA's for storm, sanitary and stormwater management facilities.
The capacity of Station 51 is 107 l/s.
We have a spreadsheet for the sanitary sewer system in Port Stanley that we use to check available capacity at the pumping stations and the pipe network. We did include some development lands in this spreadsheet as we knew of some development proposals that are being contemplated in Port Stanley. If you can provide your sewer calculations, I can run your numbers through our spreadsheet to confirm capacity and any downstream pinch points.
The drawing you attached is part of our CCTV and flushing contract. That is the current pipe network in the area, but only one of three. Did we provide you with the as constructed drawings for this area?
We have current CCTV inspection reports but no flow monitoring other than the pump run times at Station 51.
Maybe we can have a quick call or teams meeting to have a preliminary review of what you are proposing and offer up some comments at that time.
The other component we will need to clarify is the available capacity at the sewage treatment.

Alex Piggott, C.E.T. CRS-S
Manager of Environmental Services

From: Jason Ross <jross@deveng.net>
Sent: Friday, January 19, 2024 8:09 AM
To: 'pdutchak@elgin.ca' <pdutchak@elgin.ca>; Cindy Vermeer <CVermeer@centralelgin.org>; Alex Piggott <APiggott@centralelgin.org>
Cc: 'Kevin Moniz' <kevin@sbmltd.ca>
Subject: RE: Consultation Meeting - 320 Carlow Road (Kettle Creek Golf Course) - Follow-up

Good morning,
Further to the consultation meeting in October for this file, we are working on preliminary design details for the Kettle Creek Golf course lands and working with the engineer of record (SBM) for the adjacent Lake Line development, owned by the same developer, to establish storm and sanitary outlets for those lands through the golf course.
We are looking for some additional servicing information, hoping the Municipality or County can assist.

- Can you confirm if the County/Municipality has a CLI ECA in place for the construction of storm and sanitary sewers and stormwater management facilities?
- Can you confirm the Carlow Road pump station design capacity? (I believe this is PS 51, according to a 2016 ECA it has 2 dry-pit pumps (one standby) each rated at 66l/s)
- Can you provide any sanitary area plans or design sheets for the pump station catchment so we can establish available capacity?
- Do you have a master sanitary sewer plan for Port Stanley identifying existing pipe network and routing? Attached image was found online, presumably out of date.
- Do you have any reports on the current condition and flow monitoring for the existing PS?

SBM received email confirmation from the Municipality that the PS has capacity for the Lake Line development, but actual flow data was not provided. The ultimate build out of the golf course lands will

Jason Ross

From: Alex Piggott <APiggott@centralelgin.org>
Sent: February 14, 2024 7:56 AM
To: Jason Ross; 'pdutchak@elgin.ca'; Cindy Vermeer
Cc: 'Kevin Moniz'; James Glover (jamesgluv@gmail.com); Jon Bakker; Troy Winger
Subject: RE: Consultation Meeting - 320 Carlow Road (Kettle Creek Golf Course) - Follow-up

Thanks Jason:

Before I do this, can you update your calculations to use 250 l/capita/day and 0.1 l/s/ha, please? We are in the process of updating our design criteria and these are the values we are recommending to use for sewer design.

The sewer on Carlow is not a combined sewer, it’s a regular sanitary sewer.

And with the new flows above, it might change the grade of the sewer to maintain the self cleansing velocity of 0.6m/s.

Here is the clip from the spreadsheet I have for the area:

			INDIVIDIUAL				CUMULATIVE		PEAKING FACTOR	POP.	EXTRAN.
STREET	FROM MH	TO MH	Δ AREA ha.	PER HECT.	NO. LOTS	TOT. PPL. cap.	Δ AREA ha.	TOT. PPL. cap.	M.	Q (p) L/s	Q (i) L/s

-	Carlow Road	PS52	SA1024	-	-	-	-	46.04	1966	3.59	20.43
A-337	Carlow Road	Private Pump	SA1024	1.03	30.00	3.00	9	1.03	9	4.42	0.12
A-338	Carlow Road Condo Corporation	Private	SA1024	2.23	65.00	52.00	125	2.23	125	4.22	1.52
	Future Sod Farm			10.32		97.00	343	10.32	343	4.05	4.02
A-339	Carlow Road	SA1024	SA1022	0.47	30.00	3.00	9	60.09	2452	3.52	24.94
A-340	Carlow Road	SA1022	SA1020	1.30	53.00	2.00	69	61.39	2521	3.51	25.57
A-341	Carlow Road	SA1822	SA1816	0.85	30.00	7.00	21	0.85	21	4.38	0.27
-	Carlow Road	SA1816	SA1020	-	-	-	-	0.85	21	4.38	0.27
A-342	Carlow Road	SA1020	SA1018	3.73	53.00	1.00	198	65.97	2740	3.48	27.55
	Future Flows from 4431 Union Road			22.15			581	22.15	581	3.94	6.62
A-343	Carlow Road	SA1384	SA1382	0.43	30.00	2.00	6	22.58	587	3.94	6.69
A-344	Carlow Road	SA1382	SA1380	0.64	30.00	4.00	12	23.22	599	3.93	6.82
A-345	Carlow Road	SA1380	SA1018	0.71	30.00	4.00	12	23.93	611	3.93	6.94
-	Carlow Road	SA1018	SA1820	-	-	-	-	89.90	3351	3.40	32.97
-	Carlow Road	SA1820	PS51	-	-	-	-	89.90	3351	3.40	32.97

Right now, I don’t have the pipe information for that area in the spreadsheet, but I will add that information to the spreadsheet to verify pipe sizing in the near future.

Plus, your population densities seem high. This is what we are using:

Low Density Population Density (ppl/ha)	30.0
Low Density Population Density (ppl/lot)	3.0
Medium Density Population Density (ppl/ha)	65.0
Medium Density (Semi-detached) (ppl/lot)	6.0
High Density (ppl/ha)	150 - 300 @ 1.6 ppl/unit
Commerical (ppl/ha)	60.0
Institutional (School, etc.)	53.0

Alex Piggott, C.E.T. CRS-S
Manager of Environmental Services

From: Jason Ross <jross@deveng.net>
Sent: Wednesday, February 14, 2024 7:15 AM
To: Alex Piggott <APiggott@centralelgin.org>; 'pdutchak@elgin.ca' <pdutchak@elgin.ca>; Cindy Vermeer <CVermeer@centralelgin.org>
Cc: 'Kevin Moniz' <kevin@sbmltd.ca>; James Glover (jamesgluv@gmail.com) <jamesgluv@gmail.com>; Jon Bakker <JBakker@deveng.net>; Troy Winger <TWinger@deveng.net>
Subject: RE: Consultation Meeting - 320 Carlow Road (Kettle Creek Golf Course) - Follow-up

Hi Alex

We have completed a preliminary sanitary analysis to confirm the total wastewater flows from both proposed developments. Based on the current development concepts we estimate peak sanitary flows of approximately 30.5 L/s following municipal design criteria. We are proposing an easement through the Community Centre property to Carlow Road as previously discussed between SBM and the municipality. This alignment is critical to providing a gravity service to the site.

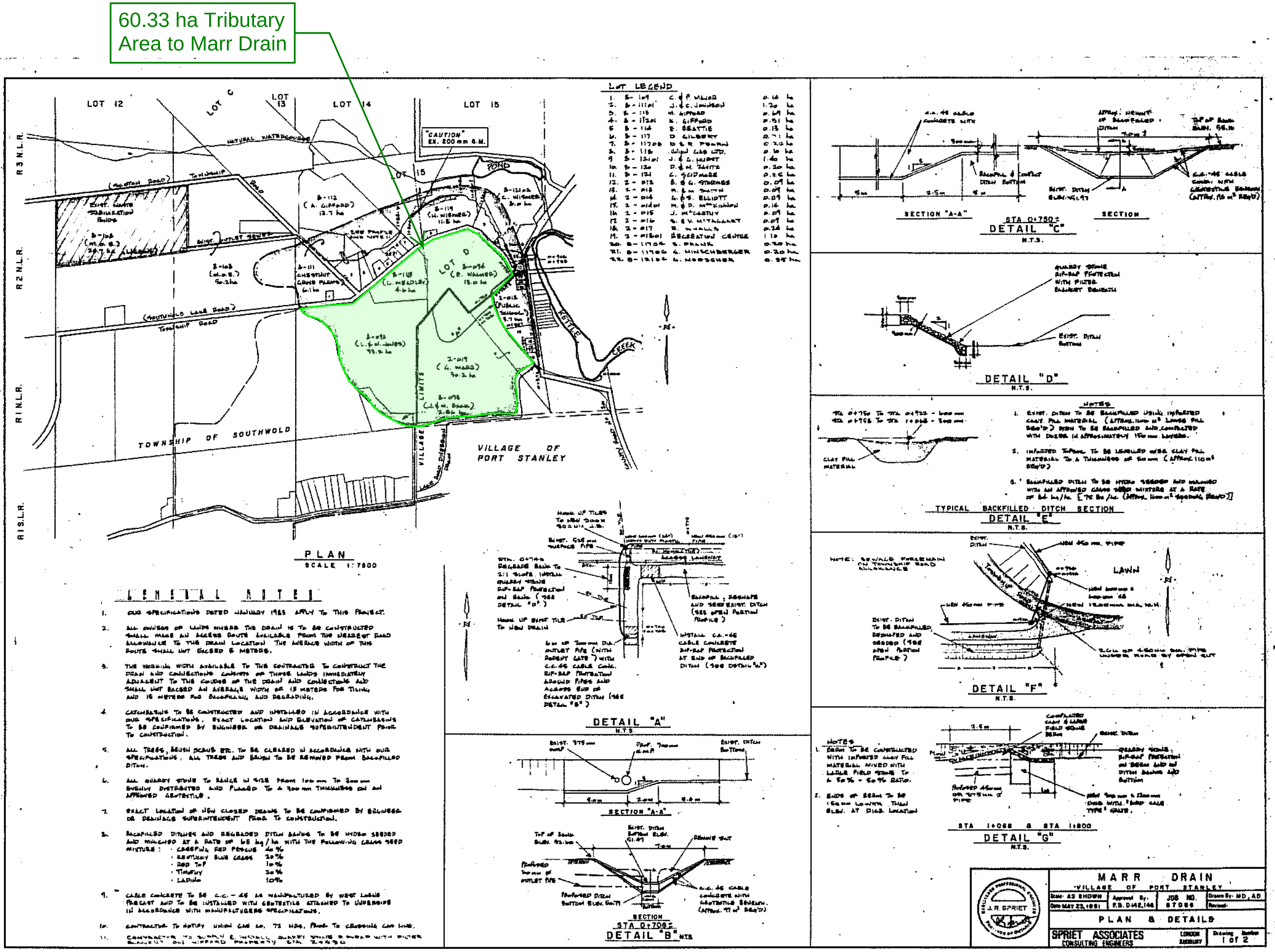
We are proposing a 300mm sanitary sewer at 0.28% through the Community Centre to Carlow Road to carry the 30.5 L/s, keeping the system as flat as possible to limit upstream fill requirements and achieve adequate cover below the Marr Drain. The existing 200mm combined sewer on Carlow Road and existing 300mm connection to the pump station are anticipated to require upsizing to convey the flows from the proposed development in addition to the existing flows. We have tentatively shown them being replaced with a 450mm sewer.

Can the municipality please confirm the existing catchments and flows in the existing Carlow Road system so we can accommodate in the sewer replacement design? If there is any information you could provide regarding the combined sewer that can be accommodated in the design as well it would be appreciated. Otherwise, we can propose some potential strategies for estimating the flows and discuss the impact on sewer sizing.

We’d be happy to meet once you have had a chance to review this information and how it relates to the municipal wastewater model.

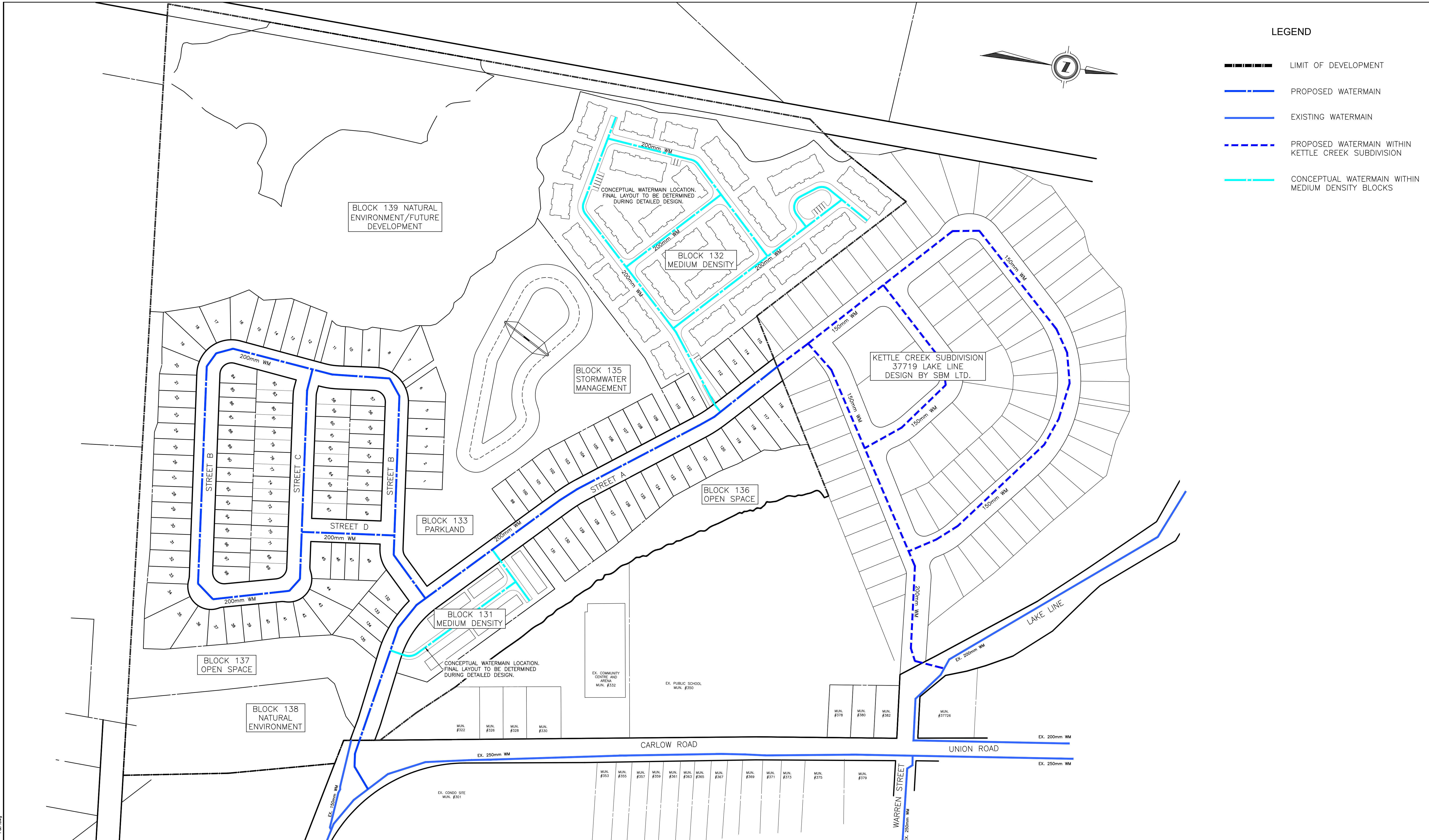
Thank you,

Jason Ross, C.E.T. | Director, Project Manager
Cell: 519-872-7678



60.33 ha Tributary Area to Marr Drain
LOT 12
LOT 13
LOT 14
LOT 15
LOT 'C'
LOT 'D'
LOT LEGEND
R 3 N.L.R.
R 2 N.L.R.
R 1 N.L.R.
R 1 S.L.R.
"CAUTION" EX. 200 mm G.M.
NATURAL WATERCOURSE
POND
KETTLE CREEK
TOWNSHIP OF SOUTHWOLD
VILLAGE OF PORT STANLEY
VILLAGE LIMITS
PLAN
SCALE 1:7500
GENERAL NOTES
SECTION "A-A"
STA 0+750±
DETAIL "C"
N.T.S.
SECTION
DETAIL "D"
N.T.S.
NOTES
TYPICAL BACKFILLED DITCH SECTION
DETAIL "E"
N.T.S.
LAWN
DETAIL "F"
N.T.S.
DETAIL "A"
N.T.S.
SECTION "A-A"
SECTION
STA 0+708±
DETAIL "B" N.T.S.
NOTES
STA 1+068 & STA 1+800
DETAIL "G"
N.T.S.
MARR DRAIN
VILLAGE OF PORT STANLEY
Scale: AS SHOWN
JOB NO. 87058
PLAN & DETAILS
SPRIET ASSOCIATES
CONSULTING ENGINEERS
LONDON
1 of 2
J.R. SPRIET

Appendix B: Water Servicing Figure



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					DRAWN BY BB				
					CHECKED BY PJB				
					F.BK. ***				
					FILE: DEL22-025 – P&P.DWG				

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ENGINEER'S STAMP

MUNICIPALITY OF CENTRAL ELGIN

SCALE
SCALE – 1:1500
15 0 30m
NTS IF REDUCED FROM 22"x34"

TITLE
KETTLE CREEK GOLF AND COUNTRY CLUB
PORT STANLEY, ONTARIO

PRELIMINARY WATER SERVICING

PROJECT No.
DEL22-025

SHEET No.
1

PLAN FILE No.

development engineering (London) Limited
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DEL22-025: Kettle Creek Golf and Country Club

Water Demands Calculations

Date: February 2025
Prepared by: Troy Winger,E.I.T.
Checked by: Jon Bakker, P.Eng.

AREA ID	Low Density (Single Family)			Medium Density			Demand Summary			
	# of Units*	Population	Average Day Demand (L/s)	Area (ha)	Population	Average Day Demand (L/s)	Average Day Demand (L/s)	Max Day Demand (L/s)	Peak Hour Demand (L/s)	Fire Flow (L/s)
1	135	405	1.172	0	0	0.000	1.172	4.102	**9.142**	76.00
2	0	0	0.000	5.130	333	0.965	0.965	3.378	**7.527**	105.00
Totals:	**135**	**405**	**1.172**	**5.130**	**333**	**0.965**	**2.137**	**7.480**	**16.669**	

Assumptions:

Demands [1] :

Water Demands	250	L/capita/day

Population Densities [1] :

Low Density	3	people/unit
Medium Density	65	people/hectare

[(1)] *Assumptions are based on Design Requirements outlined in the Central Elgin Design Guidelines*

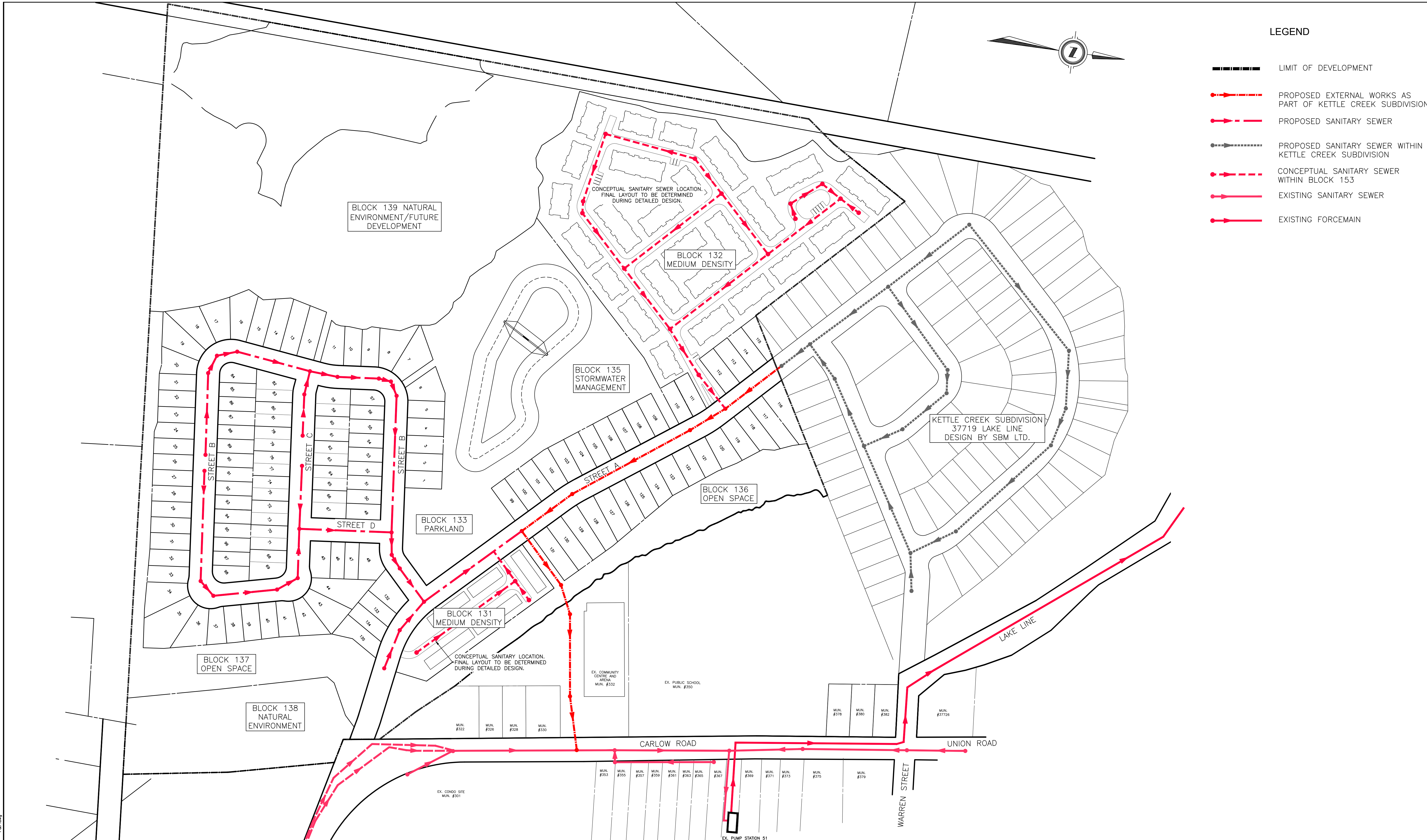
Fire Flow Requirements (assumed):

Low Density	76.00
Medium Density	105.00

Peaking Factors [1] :

Maximum Day	3.5
Peak Hour	7.8

Appendix C: Sanitary Servicing Figure



EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION	DETAILS	No.	REVISIONS	DATE	CONSULTANT
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KETTLE CREEK GOLF AND COUNTRY CLUB
PORT STANLEY, ONTARIO

PRELIMINARY SANITARY SERVICING

PROJECT No. DEL22-025
SHEET No. 2
PLAN FILE No.

RESIDENTIAL POPULATIONS DENSITIES

AREA / ZONING BASIS

MEDIUM DENSITY (MULTI-FAMILY) - 65 people/Ha

LOT BASIS

SINGLE FAMILY - 3 PEOPLE PER UNIT

PEAK SANITARY FLOWS
KETTLE CREEK GOLF AND COUNTRY CLUB

DEL22-025 - Kettle Creek Golf and Country Club

DESIGNED BY: Troy Winger, E.I.T.
CHECKED BY: Jon Bakker, P.Eng
DATE: Feb. 2025

LOCATION		POPULATION					SEWAGE FLOW			
AREA ID	STREET	Δ AREA Ha.	PER Ha.	PER LOT	NO. OF LOTS	TOTAL POP.	INFILTRATION (l/s)	PEAKING FACTOR (M)	SEWAGE (l/s)	TOTAL (l/s)
	REFER TO 'KETTLE CREEK SUBDIVISION' SANITARY DESIGN BY SBM LTD. FOR EXT.1 DESIGN INFORMATION									
EXT1	Kettle Creek Subdivision	8.880		3.0	100	300	0.888	4.078	3.540	4.428
A1	Single Family	7.900		3.0	135	405	0.790	4.020	4.710	5.500
A2	Medium Density	5.130	65			333	0.513	4.058	3.916	4.429
	Total	21.910		3.0	0	1038	2.191	3.789	11.386	13.577

$$Q(peak\ flow\ L/s) = \left(\frac{(population\ x\ per\ capita\ flow\ x\ peaking\ factor\ x\ uncertainty)}{24\ x\ 60\ x\ 60}\right) + infiltration$$

Per Capita Flow = 250 litres/capita/day

Peaking Factor = Harmon Formula $M = 1 + (\frac{14}{4 + P^{0.5}})$

Infiltration Allowance = 8640 litres/hectare/day (0.100L/ha/s)

Appendix D: Storm Servicing Figure

twinger Feb.12/25-2:26pm DEL22-025 – P&P.dwg

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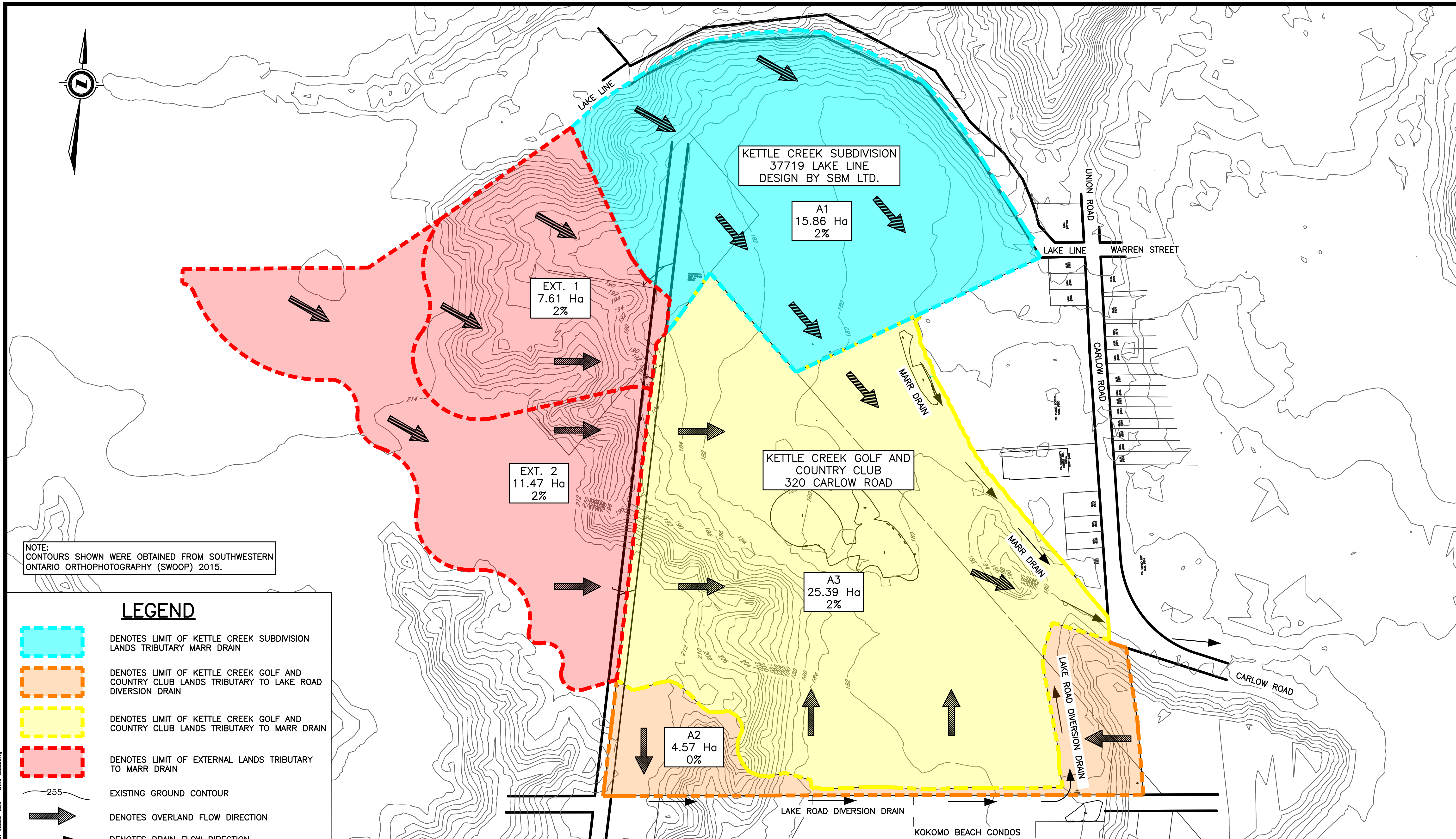
KETTLE CREEK GOLF AND COUNTRY CLUB
PORT STANLEY, ONTARIO

PRELIMINARY STORM SERVICING

PROJECT No. DEL22-025
SHEET No. 3
PLAN FILE No.

Appendix E: SWM Modelling & Figures



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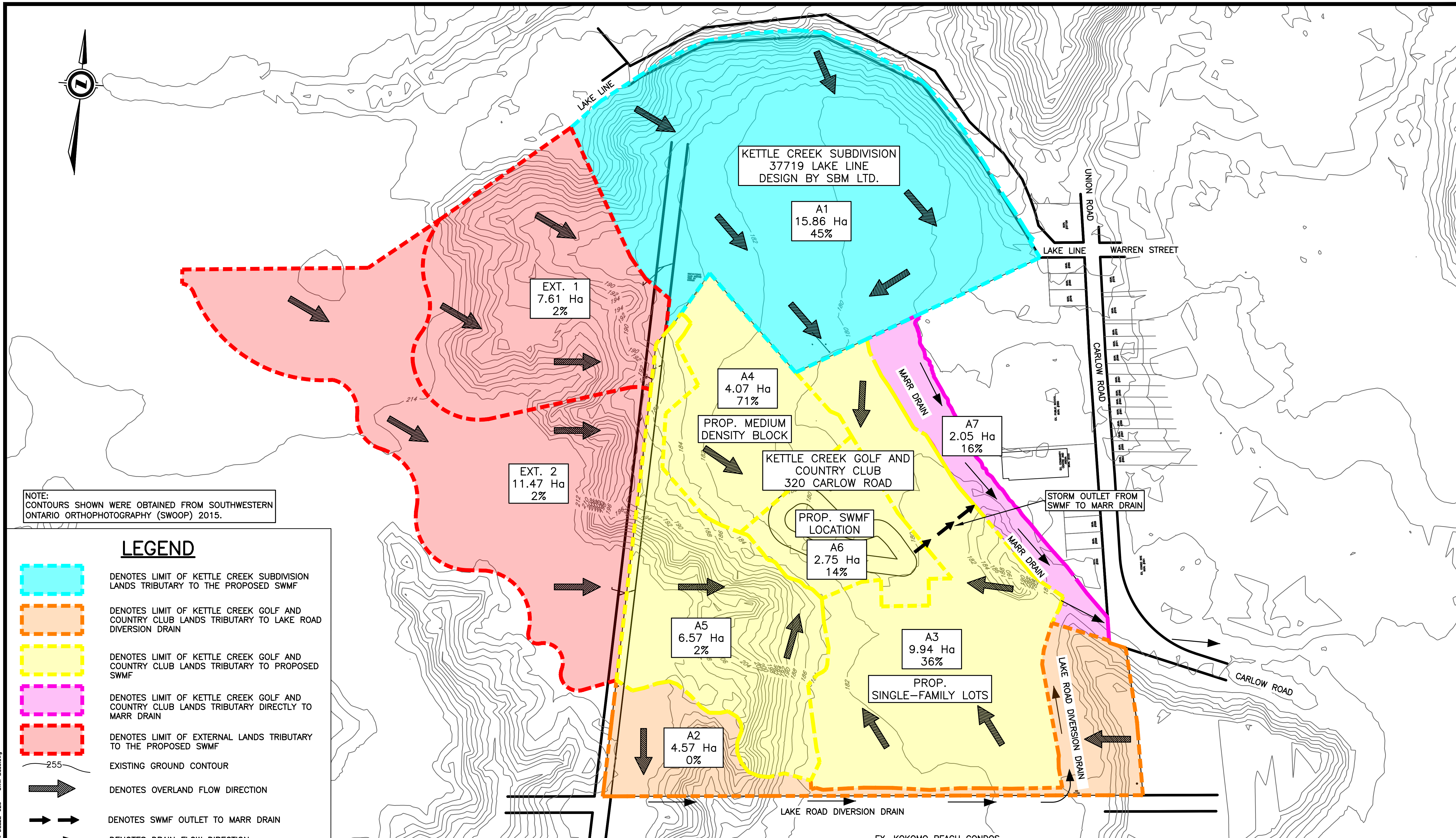
KETTLE CREEK GOLF AND COUNTRY CLUB
PORT STANLEY, ONTARIO

ALLOWABLE CONDITIONS DRAINAGE SCHEMATIC

SCALE	1:4500 11x17
PROJECT N°	DEL22-025
DRAWN BY:	TW
DATE:	NOV. 2024
Figure	SWM-1

Plotted: Nov.05/24–11:50am Name: DEL22-025 – SWM Base.dwg



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KETTLE CREEK GOLF AND COUNTRY CLUB
PORT STANLEY, ONTARIO

ULTIMATE CONDITIONS DRAINAGE SCHEMATIC

SCALE	PROJECT N°	Figure
1:4500 11x17	DEL22-025	SWM-2
	DRAWN BY: TW	
	DATE: NOV. 2024	

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CONSULTING CIVIL ENGINEERS

DEL22-025 - Kettle Creek Subdivision

Prepared By: Brady Baker, E.I.T.

Checked By: Jon Bakker, P.Eng

Date: August 2024

Quality Control Volumes

Ref. MOECC SWM Planning and Design Manual (2003)

Permanent Pool Volume		
Drainage Area	60.33 Ha	← Post-development drainage area
Imperviousness	24%	
Protection Level :		
Enhanced Level of Protection; 80% long-term TSS removal	[Table 3.2 - MOECC Stormwater Management Planning and Design Manual, March 2003]	
SWMP Type	Wet Pond	
Req'd Storage Volume for Impervious Level 24%	56 m3/ Ha	(96 less 40 active) Enhanced Level of Protection
Storage Volume for Drainage Area 60.33 Ha	3,378 m3	
Min. Permanent Pool Volume Required	3,378 m3	***< 8,438m3 Provided***
Erosion Control Volume:		
Required Extended Detention Volume Rate	40 m3/ Ha	
Extended Detention Volume Required for 60.33 Ha	2,413 m3	***< 6,923m3 Provided***
Summary		
Min. Permanent Pool Volume	3,378 m3	
Min. Erosion Control Volume	2,413 m3	
Total Min. (PPL+ACTIVE CONTROL) Volume	5,792 m3	***< 15,361m3 Provided***

Sediment Forebay Sizing Calculations

Ref. MOE SWM Planning and Design Manual (2003)

Settling Length

$$L_{FB} = \sqrt{\frac{r \cdot Q_P}{V_S}} \quad and \quad r = \frac{L_{FB}}{w}$$

$$\therefore L_{FB} = \frac{Q_P}{w \cdot V_S}$$

w = Average Forebay Width (m)	w =	48.7	(Average of bottom width and permanent pool width)
r_{req} = Required Length to Width Ratio (L_{FB}/w)	r_{req}=	0.2	
Q_p = peak basin outflow (m^3/s)	Q_p =	0.171	(2 yr Design Storm Release Rate)
V_s = avg.settling velocity	V_s =	0.0003	(Ref. MECP Manual, s.4.6.2.1)
r_{act} = Actual Length to Width Ratio (L_{FB}/w)	r_{act}=	1.0	

$L_{FB} =$ **12** **m (Required)**

(Actual Forebay Length = 50.0m)

Dispersion Length

$$L_{FB} = \frac{8Q}{d \cdot V_f}$$

$L_{FB} =$ **40** **m (Required)**

(Actual Forebay Length = 50.0m)

y = total depth of forebay from permanent pool (m)	y =	1.80	
Q = peak inlet flow (m^3/s)	Q =	3.69	(10-year peak inflow)
d = depth of perm pool in forebay (m)	d =	1.50	(Less 0.3m of sediment accumulation)
v_f = desired vel in forebay (m/s)	v_f =	0.5	(Ref. MECP Manual, s.4.6.2.2)

Velocity

v = Q/A

= **0.04** **m/s**

W = width (avg) of forebay (m)	W =	48.7	
Q = max. inlet flow (m^3/s)	Q =	3.69	(10-year peak inflow)
A = cross-sectional area (m^2)	A =	88.6	
V_{targ} = Target velocity (m/s) =	V_{targ} =	0.46	Ref. NRCS Ch. 8, Table 8-3

Therefore, **Velocity Target is Satisfied**

Estimated Cleanout Frequency

Table 5.3 MOEE SWMPP Guidelines

Forebay = Vol/(load x A_{sew} x E_{PP} x E_{FB})

= **26.9** **years**

A_{sew} = Contributing tributary Area (ha)	A_{sew} =	60.33	
Actual Imp = Percent Impervious (%)	Imp =	24%	
Load = Sediment Loading (m^3/ha/y)	load =	0.33	(Ref. MECP SWMP&DM, Table 6.3)
Overall SWMF Permanent Pool Removal Efficiency (%)	E_{PP} =	80%	(Based on Target Avg. Settling Velocity)
Targ = Cleanout Frequency Target (years)	Targ =	10	
Forebay Vol. (m3) = volume at 17% of depth (0.3m)	Vol =	428	(1.5m remaining to prevent resuspension)

Therefore, **Cleanout Frequency Target is Satisfied**

Surface Area Check

SA_f/SA_{pp} = **40.5%**

SA_f = Forebay Permanent Pool Surface Area (m^2)	SA_f =	2704
SA_{pp} = Total Permanent Pool Surface Area (m^2)	SA_{pp} =	6673
Targ = Forebay size (as % of Permanent Pool Area)	Targ =	33.3%

Minor Exceedance; however, the forebay is still acceptable to facilitate flow path for quality treatment and the permanent pool volume is well in excess of that required to meet quality control target

CONSULTING CIVIL ENGINEERS

DEL22-025: Kettle Creek Subdivision
Prepared By: Brady Baker, E.I.T.
Checked By: Jon Bakker, P.Eng
Date: August 2024

DEL22-025 - Kettle Creek *Municipality of Central Elgin, Ontario* Site Characteristics				
Runoff Area	Area (m^2)	Area (Ha)	Imp. Area (m^2)	Imperv. (%)
Allowable Conditions				
A1	253,859	25.386	5,077	2%
A2	158,641	15.864	3,173	2%
Ext.1	76,056	7.606	1,521	2%
Ext.2	114,723	11.472	2,294	2%
Total Tributary Area to Marr Drain =	**603,279**	**60.328**	**12,066**	**2%**
A3	45,730	4.573	0	0%
Total Tributary Area to Lake Road Diversion Drain =	**45,730**	**4.573**	**0**	**0%**
Ultimate Conditions				
P1	27,533	2.753	3,933	14%
P2	40,726	4.073	28,508	71%
P3	20,492	2.049	3,250	16%
P4	99,416	9.942	35,506	36%
P5	65,691	6.569	1,314	2%
P6	158,641	15.864	71,388	45%
Ext.1	76,056	7.606	1,521	2%
Ext.2	114,723	11.472	2,294	2%
Total Tributary Area to Marr Drain=	**603,279**	**60.328**	**147,715**	**24%**
P7	45,730	4.573	0	0%
Total Tributary Area to Lake Road Diversion Drain =	**45,730**	**4.573**	**0**	**0%**

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CONSULTING CIVIL ENGINEERS

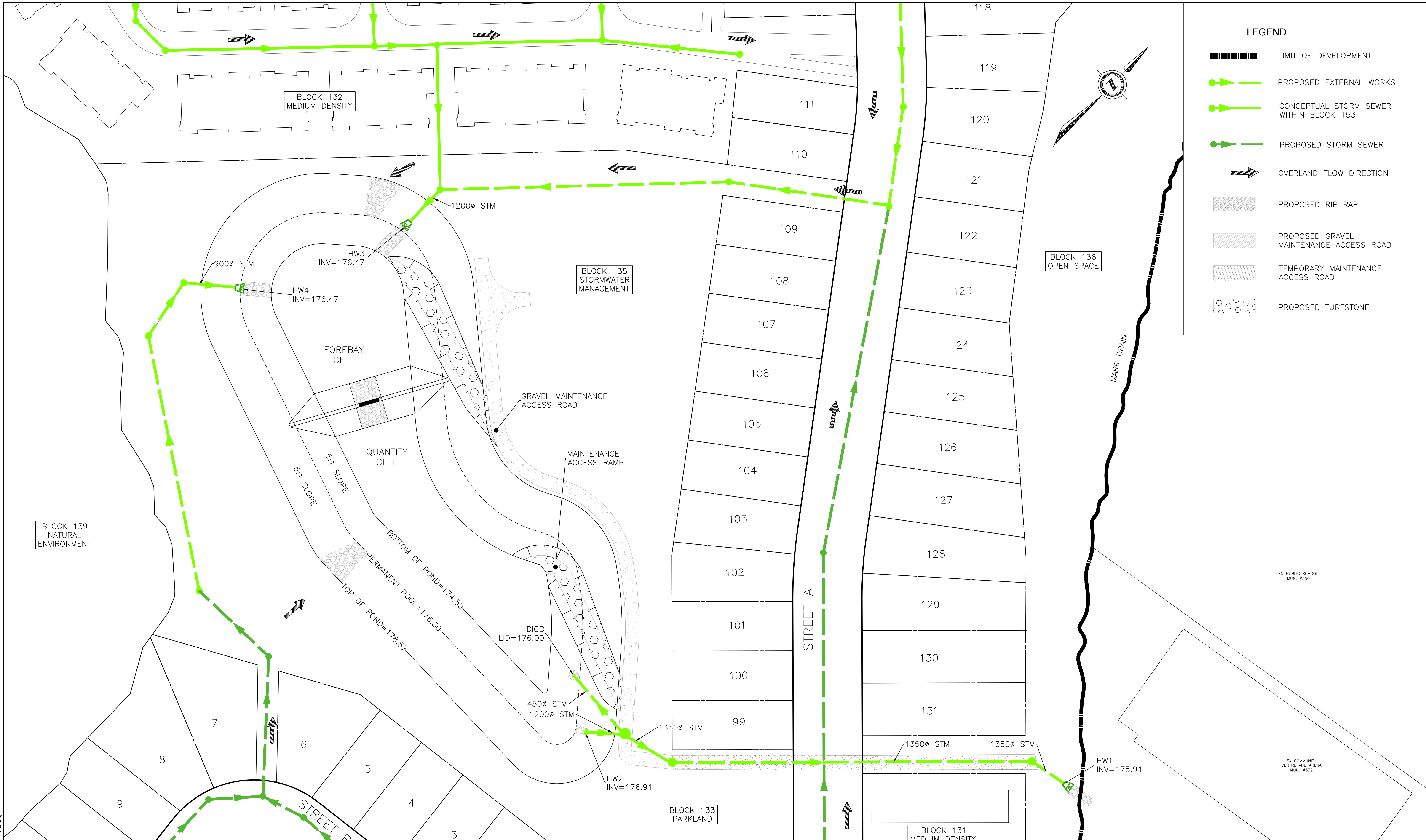
DEL22-025: Kettle Creek Subdivision
Prepared By: Brady Baker, E.I.T.
Checked By: Jon Bakker, P.Eng
Date: August 2024

SUMMARY OF FLOWS

Existing Conditions =	60.328 Ha	% Imperviousness =	2%
Proposed Conditions (Interim) =	60.328 Ha	% Imperviousness =	14%
Proposed Conditions (Ultimate) =	60.328 Ha	% Imperviousness =	24%

Storm Event	Allowable Conditions to Lake Road Diversion	Allowable Conditions to Marr Drain	Ultimate Conditions											
	Peak Site Outflow (L/s)	Peak Site Outflow (L/s)	Uncontrolled Flow to Lake Road Diversion Drain (L/s)	Peak Outflow from SBM SWM Model (L/s)	Total Peak Runoff (L/s)	SWMF Max. Active Storage (m^3)	Max. Depth of Active Storage(m)	Geodetic Active Storage Stage (m)	Approx. Drawdown Time (Hr)	Uncontrolled Flow to Marr Drain (L/s)	Peak Low-Flow Discharge (L/s)	Peak High-Flow Discharge (L/s)	Peak Overflow Discharge (L/s)	Total Peak Site Outflow to Marr Drain (L/s)*
2-yr	4	445	5	696	4,088	2,288	0.33	176.63	36	122	167	0	0	174
5-yr	21	568	21	993	5,683	3,429	0.48	176.78	36	160	298	0	0	311
10-yr	34	648	34	1,071	6,761	4,460	0.61	176.91	36	185	374	0	0	389
25-yr	55	767	55	1,331	8,204	5,934	0.79	177.09	36	225	456	111	0	586
50-yr	75	882	75	1,429	9,317	6,812	0.89	177.19	36	266	470	279	0	765
100-yr	99	1,021	99	1,553	10,470	7,615	0.98	177.28	36	315	471	486	0	973
Hurricane Hazel	N/A	N/A	540	2,016	7,554	20,446	2.25	178.55	70	266	471	4,865	0	5,373

*The total peak site outflows presented in these tables are not a direct sum of the individual contributing flows due to their offset hydrograph peaks. The peak flow rates presented were obtained from composite outflow hydrographs.



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PORT STANLEY, ONTARIO

PRELIMINARY STORMWATER MANAGEMENT FACILITY PLAN

PROJECT No. DEL22–025
SHEET No. 4
PLAN FILE No.

twinger Feb.12/25–2:26pm DEL22–025 – P&P.dwg

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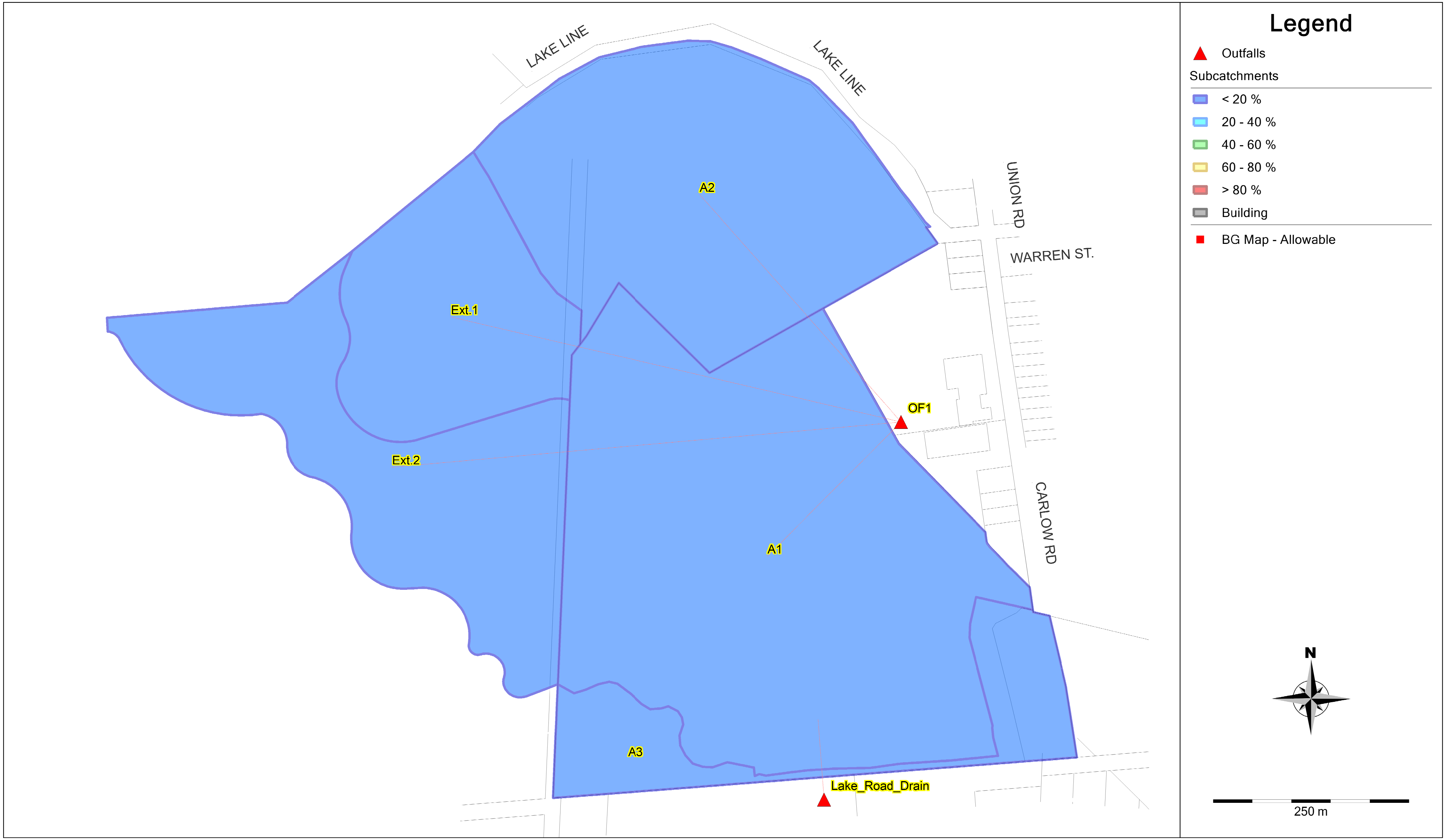
PORT STANLEY, ONTARIO

PRELIMINARY SUBDIVISION GRADING PLAN

PROJECT No. DEL22-025
SHEET No. 6
PLAN FILE No.

twinger Mar.10/25–1:48pm DEL22-025 – Grading.dwg


LAKE LINE
LAKE LINE
UNION RD
WARREN ST.
CARLOW RD
A2
Ext.1
Ext.2
OF1
A1
A3
Lake_Road_Drain
Legend
Outfalls
Subcatchments
< 20 %
20 - 40 %
40 - 60 %
60 - 80 %
> 80 %
Building
BG Map - Allowable
N
250 m

```
[TITLE]
DEL22-025 - Allowable Conditions

[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           LPS
INFILTRATION         CURVE_NUMBER
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           04/10/2015
START_TIME           00:00:00
REPORT_START_DATE    04/10/2015
REPORT_START_TIME    00:00:00
END_DATE             04/12/2015
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         1

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              2

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;               Rain      Time     Snow     Data
;;Name           Type      Intrvl   Catch    Source
;;-------------- --------- -------- -------- ----------
St.Thomas        INTENSITY 0:05     1.0      TIMESERIES St.Thomas-2yr

[SUBCATCHMENTS]
;;                                                  Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
A1               St.Thomas        OF1              25.386   2        576.955  3        0
A2               St.Thomas        OF1              15.864   2        587.556  3        0
A3               St.Thomas        Lake_Road_Drain  4.573    0        457.3    2        0
Ext.1            St.Thomas        OF1              7.606    2        253.533  5        0
Ext.2            St.Thomas        OF1              11.472   2        229.44   5        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
A1               0.012      0.24       2          5          25         OUTLET
A2               0.012      0.24       2          5          25         OUTLET
A3               0.012      0.24       2          5          25         OUTLET
Ext.1            0.012      0.24       2          5          25         OUTLET
Ext.2            0.012      0.24       2          5          25         OUTLET

[INFILTRATION]
;;Subcatchment   CurveNum   HydCon     DryTime
;;-------------- ---------- ---------- ----------
A1               65         12.7       7
A2               65         29.97      7
A3               65         12.7       7
Ext.1            65         12.7       7
Ext.2            65         12.7       7
```

DEL22-025 – Kettle Creek Subdivision
Allowable Conditions - PCSWMM Input

```
[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate     Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
Lake_Road_Drain  175        FREE                        NO
OF1              177.5      FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Hazel-48hr_2024             0          2.0278
Hazel-48hr_2024             1          2.0278
Hazel-48hr_2024             2          2.0278
Hazel-48hr_2024             3          2.0278
Hazel-48hr_2024             4          2.0278
Hazel-48hr_2024             5          2.0278
Hazel-48hr_2024             6          2.0278
Hazel-48hr_2024             7          2.0278
Hazel-48hr_2024             8          2.0278
Hazel-48hr_2024             9          2.0278
Hazel-48hr_2024             10         2.0278
Hazel-48hr_2024             11         2.0278
Hazel-48hr_2024             12         2.0278
Hazel-48hr_2024             13         2.0278
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Hazel-48hr_2024             15         2.0278
Hazel-48hr_2024             16         2.0278
Hazel-48hr_2024             17         2.0278
Hazel-48hr_2024             18         2.0278
Hazel-48hr_2024             19         2.0278
Hazel-48hr_2024             20         2.0278
Hazel-48hr_2024             21         2.0278
Hazel-48hr_2024             22         2.0278
Hazel-48hr_2024             23         2.0278
Hazel-48hr_2024             24         2.0278
Hazel-48hr_2024             25         2.0278
Hazel-48hr_2024             26         2.0278
Hazel-48hr_2024             27         2.0278
Hazel-48hr_2024             28         2.0278
Hazel-48hr_2024             29         2.0278
Hazel-48hr_2024             30         2.0278
Hazel-48hr_2024             31         2.0278
Hazel-48hr_2024             32         2.0278
Hazel-48hr_2024             33         2.0278
Hazel-48hr_2024             34         2.0278
Hazel-48hr_2024             35         2.0278
Hazel-48hr_2024             36         6
Hazel-48hr_2024             37         4
Hazel-48hr_2024             38         6
Hazel-48hr_2024             39         13
Hazel-48hr_2024             40         17
Hazel-48hr_2024             41         13
Hazel-48hr_2024             42         23
Hazel-48hr_2024             43         13
Hazel-48hr_2024             44         13
Hazel-48hr_2024             45         53
Hazel-48hr_2024             46         38
Hazel-48hr_2024             47         13
Hazel-48hr_2024             48         0

St.Thomas-100yr             0:00       7.377
St.Thomas-100yr             0:05       7.837
St.Thomas-100yr             0:10       8.374
St.Thomas-100yr             0:15       9.009
St.Thomas-100yr             0:20       9.776
St.Thomas-100yr             0:25       10.725
St.Thomas-100yr             0:30       11.933
St.Thomas-100yr             0:35       13.536
St.Thomas-100yr             0:40       15.792
St.Thomas-100yr             0:45       19.258
St.Thomas-100yr             0:50       25.477
St.Thomas-100yr             0:55       41.546
St.Thomas-100yr             1:00       291.4
St.Thomas-100yr             1:05       68.16
St.Thomas-100yr             1:10       42.382
St.Thomas-100yr             1:15       31.203
St.Thomas-100yr             1:20       25.266
St.Thomas-100yr             1:25       21.497
St.Thomas-100yr             1:30       18.857
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St.Thomas-100yr	1:35	16.889
St.Thomas-100yr	1:40	15.356
St.Thomas-100yr	1:45	14.122
St.Thomas-100yr	1:50	13.104
St.Thomas-100yr	1:55	12.248
St.Thomas-100yr	2:00	11.517
St.Thomas-100yr	2:05	10.883
St.Thomas-100yr	2:10	10.328
St.Thomas-100yr	2:15	9.837
St.Thomas-100yr	2:20	9.399
St.Thomas-100yr	2:25	9.005
St.Thomas-100yr	2:30	8.65
St.Thomas-100yr	2:35	8.326
St.Thomas-100yr	2:40	8.031
St.Thomas-100yr	2:45	7.76
St.Thomas-100yr	2:50	7.51
St.Thomas-100yr	2:55	7.278
St.Thomas-100yr	3:00	0

St.Thomas-10yr	0:00	5.148
St.Thomas-10yr	0:05	5.469
St.Thomas-10yr	0:10	5.843
St.Thomas-10yr	0:15	6.286
St.Thomas-10yr	0:20	6.822
St.Thomas-10yr	0:25	7.483
St.Thomas-10yr	0:30	8.326
St.Thomas-10yr	0:35	9.445
St.Thomas-10yr	0:40	11.019
St.Thomas-10yr	0:45	13.436
St.Thomas-10yr	0:50	17.774
St.Thomas-10yr	0:55	28.978
St.Thomas-10yr	1:00	203.455
St.Thomas-10yr	1:05	47.521
St.Thomas-10yr	1:10	29.562
St.Thomas-10yr	1:15	21.767
St.Thomas-10yr	1:20	17.627
St.Thomas-10yr	1:25	14.998
St.Thomas-10yr	1:30	13.157
St.Thomas-10yr	1:35	11.784
St.Thomas-10yr	1:40	10.714
St.Thomas-10yr	1:45	9.853
St.Thomas-10yr	1:50	9.144
St.Thomas-10yr	1:55	8.546
St.Thomas-10yr	2:00	8.036
St.Thomas-10yr	2:05	7.594
St.Thomas-10yr	2:10	7.206
St.Thomas-10yr	2:15	6.864
St.Thomas-10yr	2:20	6.558
St.Thomas-10yr	2:25	6.284
St.Thomas-10yr	2:30	6.036
St.Thomas-10yr	2:35	5.81
St.Thomas-10yr	2:40	5.604
St.Thomas-10yr	2:45	5.415
St.Thomas-10yr	2:50	5.24
St.Thomas-10yr	2:55	5.079
St.Thomas-10yr	3:00	0

St.Thomas-25yr	0:00	6.017
St.Thomas-25yr	0:05	6.392
St.Thomas-25yr	0:10	6.831
St.Thomas-25yr	0:15	7.35
St.Thomas-25yr	0:20	7.977
St.Thomas-25yr	0:25	8.751
St.Thomas-25yr	0:30	9.739
St.Thomas-25yr	0:35	11.05
St.Thomas-25yr	0:40	12.893
St.Thomas-25yr	0:45	15.728
St.Thomas-25yr	0:50	20.815
St.Thomas-25yr	0:55	33.969
St.Thomas-25yr	1:00	239.295
St.Thomas-25yr	1:05	55.77
St.Thomas-25yr	1:10	34.654
St.Thomas-25yr	1:15	25.501
St.Thomas-25yr	1:20	20.643
St.Thomas-25yr	1:25	17.559
St.Thomas-25yr	1:30	15.4
St.Thomas-25yr	1:35	13.791
St.Thomas-25yr	1:40	12.537
St.Thomas-25yr	1:45	11.528
St.Thomas-25yr	1:50	10.696

St.Thomas-25yr	1:55	9.997
St.Thomas-25yr	2:00	9.399
St.Thomas-25yr	2:05	8.881
St.Thomas-25yr	2:10	8.427
St.Thomas-25yr	2:15	8.026
St.Thomas-25yr	2:20	7.668
St.Thomas-25yr	2:25	7.347
St.Thomas-25yr	2:30	7.056
St.Thomas-25yr	2:35	6.792
St.Thomas-25yr	2:40	6.551
St.Thomas-25yr	2:45	6.329
St.Thomas-25yr	2:50	6.125
St.Thomas-25yr	2:55	5.936
St.Thomas-25yr	3:00	0

St.Thomas-2yr	0:00	3.364
St.Thomas-2yr	0:05	3.574
St.Thomas-2yr	0:10	3.819
St.Thomas-2yr	0:15	4.109
St.Thomas-2yr	0:20	4.46
St.Thomas-2yr	0:25	4.893
St.Thomas-2yr	0:30	5.445
St.Thomas-2yr	0:35	6.177
St.Thomas-2yr	0:40	7.208
St.Thomas-2yr	0:45	8.792
St.Thomas-2yr	0:50	11.634
St.Thomas-2yr	0:55	18.977
St.Thomas-2yr	1:00	133.955
St.Thomas-2yr	1:05	31.129
St.Thomas-2yr	1:10	19.359
St.Thomas-2yr	1:15	14.251
St.Thomas-2yr	1:20	11.538
St.Thomas-2yr	1:25	9.815
St.Thomas-2yr	1:30	8.609
St.Thomas-2yr	1:35	7.709
St.Thomas-2yr	1:40	7.009
St.Thomas-2yr	1:45	6.445
St.Thomas-2yr	1:50	5.98
St.Thomas-2yr	1:55	5.589
St.Thomas-2yr	2:00	5.255
St.Thomas-2yr	2:05	4.965
St.Thomas-2yr	2:10	4.712
St.Thomas-2yr	2:15	4.487
St.Thomas-2yr	2:20	4.287
St.Thomas-2yr	2:25	4.108
St.Thomas-2yr	2:30	3.945
St.Thomas-2yr	2:35	3.797
St.Thomas-2yr	2:40	3.663
St.Thomas-2yr	2:45	3.539
St.Thomas-2yr	2:50	3.425
St.Thomas-2yr	2:55	3.319
St.Thomas-2yr	3:00	0

St.Thomas-50yr	0:00	6.713
St.Thomas-50yr	0:05	7.132
St.Thomas-50yr	0:10	7.62
St.Thomas-50yr	0:15	8.198
St.Thomas-50yr	0:20	8.896
St.Thomas-50yr	0:25	9.759
St.Thomas-50yr	0:30	10.858
St.Thomas-50yr	0:35	12.318
St.Thomas-50yr	0:40	14.37
St.Thomas-50yr	0:45	17.523
St.Thomas-50yr	0:50	23.18
St.Thomas-50yr	0:55	37.791
St.Thomas-50yr	1:00	265.331
St.Thomas-50yr	1:05	61.973
St.Thomas-50yr	1:10	38.552
St.Thomas-50yr	1:15	28.387
St.Thomas-50yr	1:20	22.988
St.Thomas-50yr	1:25	19.56
St.Thomas-50yr	1:30	17.158
St.Thomas-50yr	1:35	15.368
St.Thomas-50yr	1:40	13.973
St.Thomas-50yr	1:45	12.85
St.Thomas-50yr	1:50	11.924
St.Thomas-50yr	1:55	11.146
St.Thomas-50yr	2:00	10.48
St.Thomas-50yr	2:05	9.903
St.Thomas-50yr	2:10	9.398

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St.Thomas-50yr             2:20       8.553
St.Thomas-50yr             2:25       8.195
St.Thomas-50yr             2:30       7.871
St.Thomas-50yr             2:35       7.577
St.Thomas-50yr             2:40       7.308
St.Thomas-50yr             2:45       7.061
St.Thomas-50yr             2:50       6.834
St.Thomas-50yr             2:55       6.623
St.Thomas-50yr             3:00       0

St.Thomas-5yr              0:00       4.45
St.Thomas-5yr              0:05       4.727
St.Thomas-5yr              0:10       5.051
St.Thomas-5yr              0:15       5.434
St.Thomas-5yr              0:20       5.897
St.Thomas-5yr              0:25       6.469
St.Thomas-5yr              0:30       7.198
St.Thomas-5yr              0:35       8.165
St.Thomas-5yr              0:40       9.525
St.Thomas-5yr              0:45       11.616
St.Thomas-5yr              0:50       15.367
St.Thomas-5yr              0:55       25.06
St.Thomas-5yr              1:00       175.765
St.Thomas-5yr              1:05       41.113
St.Thomas-5yr              1:10       25.564
St.Thomas-5yr              1:15       18.821
St.Thomas-5yr              1:20       15.24
St.Thomas-5yr              1:25       12.967
St.Thomas-5yr              1:30       11.374
St.Thomas-5yr              1:35       10.187
St.Thomas-5yr              1:40       9.262
St.Thomas-5yr              1:45       8.518
St.Thomas-5yr              1:50       7.904
St.Thomas-5yr              1:55       7.388
St.Thomas-5yr              2:00       6.947
St.Thomas-5yr              2:05       6.564
St.Thomas-5yr              2:10       6.229
St.Thomas-5yr              2:15       5.933
St.Thomas-5yr              2:20       5.669
St.Thomas-5yr              2:25       5.432
St.Thomas-5yr              2:30       5.217
St.Thomas-5yr              2:35       5.022
St.Thomas-5yr              2:40       4.844
St.Thomas-5yr              2:45       4.68
St.Thomas-5yr              2:50       4.53
St.Thomas-5yr              2:55       4.39
St.Thomas-5yr              3:00       0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       408384.2687      4726161.76565    409743.5233      4727225.42935
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
Lake_Road_Drain  409359.679       4726210.114
OF1              409457.95        4726691.316

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
A1               409358.18        4726835.847
A1               409455.049       4726663.755
A1               409510.139       4726607.361
A1               409565.38        4726550.808
A1               409566.076       4726544.93
A1               409566.93        4726538.872
A1               409567.585       4726536.562
A1               409570.838       4726532.174
A1               409582.136       4726520.643
A1               409587.541       4726515.127
A1               409593.977       4726508.013
A1               409602.683       4726499.673
A1               409621.428       4726480.542
A1               409625.563       4726451.926
A1               409553.456       4726468.243
A1               409545.736       4726434.059
A1               409545.091       4726416.343
A1               409574.327       4726304.953
A1               409574.094       4726301.157
A1               409575.331       4726289.257
A1               409581.441       4726265.908
A1               409523.695       4726260.267
A1               409493.174       4726258.347
A1               409454.993       4726255.564
A1               409418.13        4726250.624
A1               409371.898       4726249.702
A1               409336.254       4726247.267
A1               409285.689       4726240.868
A1               409276.97        4726242.655
A1               409271.455       4726240.312
A1               409270.157       4726251.08
A1               409236.656       4726257.671
A1               409217.648       4726251.417
A1               409205.142       4726251.913
A1               409192.289       4726256.028
A1               409182.913       4726266.562
A1               409176.487       4726279.237
A1               409175.659       4726291.912
A1               409180.114       4726305.734
A1               409178.624       4726314.956
A1               409173.416       4726322.766
A1               409161.406       4726329.021
A1               409152.181       4726326.385
A1               409138.35        4726325.403
A1               409127.484       4726331.988
A1               409113.322       4726344.994
A1               409096.195       4726357.669
A1               409085.75        4726360.416
A1               409071.799       4726356.985
A1               409055.725       4726350.146
A1               409041.232       4726345.667
A1               409020.686       4726357.078
A1               409038.309       4726776.43
A1               409056.914       4726800.678
A1               409097.888       4726868.608
A1               409213.454       4726753.926
A1               409312.904       4726810.219
A1               409358.18        4726835.847
A2               409504.503       4726918.672
A2               409489.492       4726939.316
A2               409494.973       4726940.153
A2               409488.612       4726945.874
A2               409478.903       4726959.268
A2               409467.485       4726974.582
A2               409457.517       4726986.986
A2               409441.624       4727008.879
A2               409427.286       4727028.977
A2               409411.697       4727050.411
A2               409396.275       4727072.084
A2               409371.226       4727097.739
A2               409351.945       4727117.363
A2               409340.88        4727126.7
A2               409278.702       4727154.217
A2               409241.884       4727168.594
A2               409214.925       4727176.164
A2               409185.902       4727177.081
A2               409127.725       4727169.205
A2               409073.036       4727155.766
A2               409022.632       4727128.518
A2               408993.165       4727106.037
A2               408947.049       4727070.809
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A2               408923.735       4727017.815
A2               408932.487       4727004.183
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A2	408979.886	4726916.247
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A2	409019.734	4726855.43
A2	409050.74	4726833.178
A2	409048.953	4726790.315
A2	409056.914	4726800.678
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A2	409097.888	4726868.608
A2	409213.454	4726753.926
A2	409312.905	4726810.22
A2	409359.509	4726836.6
A2	409504.503	4726918.672
A2	409504.503	4726918.672
A3	409670.238	4726337.583
A3	409668.885	4726346.23
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A3	409667.871	4726352.716
A3	409667.702	4726353.797
A3	409667.475	4726354.878
A3	409659.469	4726389.456
A3	409651.463	4726424.034
A3	409647.461	4726441.323
A3	409646.804	4726444.16
A3	409646.773	4726444.171
A3	409646.71	4726444.186
A3	409646.46	4726444.246
A3	409645.459	4726444.485
A3	409643.458	4726444.964
A3	409627.446	4726448.793
A3	409625.952	4726449.15
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A3	409625.562	4726451.926
A3	409553.456	4726468.243
A3	409545.736	4726434.059
A3	409545.091	4726416.343
A3	409574.327	4726304.953
A3	409574.094	4726301.157
A3	409575.331	4726289.257
A3	409581.441	4726265.908
A3	409526.869	4726260.582
A3	409517.51	4726259.653
A3	409493.174	4726258.347
A3	409478.904	4726257.357
A3	409454.993	4726255.564
A3	409418.13	4726250.624
A3	409371.898	4726249.702
A3	409364.759	4726249.243
A3	409350.489	4726248.254
A3	409336.254	4726247.267
A3	409317.182	4726244.996
A3	409285.689	4726240.868
A3	409276.97	4726242.655
A3	409271.455	4726240.312
A3	409270.157	4726251.08
A3	409236.656	4726257.671
A3	409217.648	4726251.417
A3	409205.142	4726251.913
A3	409192.289	4726256.028
A3	409182.913	4726266.562
A3	409176.487	4726279.237
A3	409175.659	4726291.912
A3	409180.114	4726305.734
A3	409178.624	4726314.956
A3	409173.416	4726322.766
A3	409161.406	4726329.021
A3	409152.181	4726326.385
A3	409138.35	4726325.403
A3	409127.484	4726331.988
A3	409113.322	4726344.994
A3	409096.195	4726357.669
A3	409085.75	4726360.416
A3	409071.799	4726356.985
A3	409055.725	4726350.146
A3	409041.232	4726345.667
A3	409020.685	4726357.079
A3	409019.659	4726332.658
A3	409018.829	4726312.915
A3	409018.414	4726303.043
A3	409018.207	4726298.107

DEL22-025 – Kettle Creek Subdivision
Allowable Conditions - PCSWMM Input

A3	409018.155	4726296.873
A3	409018.148	4726296.719
A3	409018.145	4726296.641
A3	409018.14	4726296.515
A3	409018.129	4726296.261
A3	409018.086	4726295.248
A3	409015.36	4726230.396
A3	409014.678	4726214.183
A3	409014.636	4726213.169
A3	409014.599	4726212.283
A3	409014.6	4726212.243
A3	409014.607	4726212.243
A3	409014.85	4726212.262
A3	409015.334	4726212.3
A3	409016.304	4726212.375
A3	409020.183	4726212.677
A3	409024.061	4726212.978
A3	409024.546	4726213.016
A3	409024.667	4726213.025
A3	409024.697	4726213.028
A3	409024.871	4726213.041
A3	409025.101	4726213.059
A3	409025.56	4726213.095
A3	409026.479	4726213.166
A3	409030.154	4726213.451
A3	409044.854	4726214.592
A3	409103.654	4726219.155
A3	409221.254	4726228.281
A3	409456.455	4726246.533
A3	409574.055	4726255.659
A3	409632.855	4726260.222
A3	409636.53	4726260.508
A3	409636.989	4726260.543
A3	409637.482	4726260.582
A3	409638.016	4726260.623
A3	409639.083	4726260.706
A3	409641.217	4726260.871
A3	409675.369	4726263.522
A3	409679.638	4726263.853
A3	409680.705	4726263.936
A3	409681.739	4726264.016
A3	409681.733	4726264.078
A3	409681.056	4726268.401
A3	409678.352	4726285.697
A3	409672.942	4726320.287
A3	409670.238	4726337.583
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Ext.1	408923.735	4727017.815
Ext.1	408932.487	4727004.183
Ext.1	408998.576	4726881.216
Ext.1	409019.734	4726855.43
Ext.1	409050.74	4726833.178
Ext.1	409049.027	4726790.285
Ext.1	409038.377	4726776.403
Ext.1	409035.891	4726718.903
Ext.1	409032.787	4726719.787
Ext.1	409029.631	4726720.461
Ext.1	409026.437	4726720.92
Ext.1	409023.218	4726721.163
Ext.1	409019.991	4726721.189
Ext.1	409016.769	4726720.997
Ext.1	409013.568	4726720.588
Ext.1	409010.401	4726719.965
Ext.1	409007.284	4726719.13
Ext.1	408838.134	4726667.653
Ext.1	408832.486	4726666.634
Ext.1	408826.781	4726666.006
Ext.1	408821.047	4726665.774
Ext.1	408815.31	4726665.938
Ext.1	408809.598	4726666.498
Ext.1	408803.938	4726667.451
Ext.1	408798.358	4726668.792
Ext.1	408792.884	4726670.515
Ext.1	408787.541	4726672.612
Ext.1	408782.356	4726675.072
Ext.1	408777.353	4726677.885
Ext.1	408772.557	4726681.036
Ext.1	408767.989	4726684.511

Ext.1	408763.672	4726688.292
Ext.1	408759.626	4726692.363
Ext.1	408755.871	4726696.703
Ext.1	408752.424	4726701.292
Ext.1	408749.303	4726706.108
Ext.1	408746.521	4726711.128
Ext.1	408744.092	4726716.328
Ext.1	408742.028	4726721.683
Ext.1	408740.339	4726727.168
Ext.1	408739.543	4726730.576
Ext.1	408738.988	4726734.031
Ext.1	408738.677	4726737.517
Ext.1	408738.609	4726741.016
Ext.1	408738.787	4726744.511
Ext.1	408739.208	4726747.985
Ext.1	408739.872	4726751.421
Ext.1	408740.774	4726754.802
Ext.1	408741.911	4726758.112
Ext.1	408743.276	4726761.334
Ext.1	408744.864	4726764.453
Ext.1	408746.665	4726767.453
Ext.1	408748.619	4726770.7
Ext.1	408750.349	4726774.071
Ext.1	408751.846	4726777.552
Ext.1	408753.104	4726781.127
Ext.1	408754.116	4726784.778
Ext.1	408754.878	4726788.49
Ext.1	408755.387	4726792.245
Ext.1	408755.64	4726796.026
Ext.1	408755.635	4726799.815
Ext.1	408755.374	4726803.596
Ext.1	408754.858	4726807.35
Ext.1	408754.087	4726811.06
Ext.1	408753.067	4726814.709
Ext.1	408751.802	4726818.281
Ext.1	408750.297	4726821.759
Ext.1	408748.066	4726826.941
Ext.1	408744.734	4726837.715
Ext.1	408743.652	4726843.253
Ext.1	408742.965	4726848.853
Ext.1	408742.795	4726860.129
Ext.1	408743.311	4726865.748
Ext.1	408744.225	4726871.316
Ext.1	408745.533	4726876.804
Ext.1	408747.229	4726882.186
Ext.1	408749.302	4726887.433
Ext.1	408758.758	4726909.076
Ext.2	409035.891	4726718.903
Ext.2	409020.686	4726357.078
Ext.2	409020.686	4726357.078
Ext.2	408980.096	4726341.806
Ext.2	408980.096	4726341.806
Ext.2	408978.671	4726341.325
Ext.2	408977.216	4726340.945
Ext.2	408975.738	4726340.666
Ext.2	408974.244	4726340.489
Ext.2	408972.742	4726340.417
Ext.2	408971.238	4726340.449
Ext.2	408969.74	4726340.585
Ext.2	408968.255	4726340.824
Ext.2	408966.79	4726341.166
Ext.2	408965.352	4726341.608
Ext.2	408963.949	4726342.149
Ext.2	408962.586	4726342.785
Ext.2	408961.27	4726343.515
Ext.2	408960.009	4726344.334
Ext.2	408958.807	4726345.238
Ext.2	408957.67	4726346.223
Ext.2	408956.604	4726347.284
Ext.2	408955.615	4726348.417
Ext.2	408954.706	4726349.615
Ext.2	408953.882	4726350.874
Ext.2	408953.148	4726352.187
Ext.2	408953.148	4726352.187
Ext.2	408952.615	4726353.316
Ext.2	408952.162	4726354.48
Ext.2	408951.792	4726355.672
Ext.2	408951.505	4726356.887
Ext.2	408951.303	4726358.119
Ext.2	408951.188	4726359.363

DEL22-025 – Kettle Creek Subdivision
Allowable Conditions - PCSWMM Input

Ext.2	408951.16	4726360.611
Ext.2	408951.219	4726361.858
Ext.2	408951.364	4726363.098
Ext.2	408951.595	4726364.325
Ext.2	408951.911	4726365.533
Ext.2	408951.911	4726365.533
Ext.2	408952.331	4726367.133
Ext.2	408952.638	4726368.759
Ext.2	408952.831	4726370.402
Ext.2	408952.91	4726372.055
Ext.2	408952.874	4726373.709
Ext.2	408952.724	4726375.357
Ext.2	408952.459	4726376.99
Ext.2	408952.082	4726378.601
Ext.2	408951.594	4726380.181
Ext.2	408950.998	4726381.725
Ext.2	408950.295	4726383.223
Ext.2	408949.491	4726384.668
Ext.2	408948.588	4726386.055
Ext.2	408947.591	4726387.375
Ext.2	408946.505	4726388.623
Ext.2	408945.335	4726389.793
Ext.2	408944.087	4726390.879
Ext.2	408942.766	4726391.875
Ext.2	408941.379	4726392.777
Ext.2	408939.933	4726393.581
Ext.2	408938.435	4726394.283
Ext.2	408936.892	4726394.879
Ext.2	408935.311	4726395.367
Ext.2	408933.7	4726395.743
Ext.2	408932.066	4726396.007
Ext.2	408930.419	4726396.157
Ext.2	408928.765	4726396.193
Ext.2	408927.112	4726396.113
Ext.2	408925.469	4726395.919
Ext.2	408923.844	4726395.611
Ext.2	408922.243	4726395.192
Ext.2	408922.243	4726395.192
Ext.2	408921.455	4726394.985
Ext.2	408920.654	4726394.834
Ext.2	408919.844	4726394.74
Ext.2	408919.03	4726394.702
Ext.2	408918.215	4726394.721
Ext.2	408917.404	4726394.797
Ext.2	408916.599	4726394.93
Ext.2	408915.806	4726395.119
Ext.2	408915.029	4726395.363
Ext.2	408914.27	4726395.66
Ext.2	408913.534	4726396.01
Ext.2	408912.824	4726396.41
Ext.2	408912.143	4726396.859
Ext.2	408911.496	4726397.355
Ext.2	408910.885	4726397.894
Ext.2	408910.313	4726398.475
Ext.2	408909.784	4726399.095
Ext.2	408909.299	4726399.749
Ext.2	408908.86	4726400.437
Ext.2	408908.471	4726401.153
Ext.2	408908.133	4726401.895
Ext.2	408907.848	4726402.658
Ext.2	408907.617	4726403.44
Ext.2	408907.441	4726404.236
Ext.2	408907.321	4726405.042
Ext.2	408907.257	4726405.854
Ext.2	408907.251	4726406.669
Ext.2	408907.302	4726407.483
Ext.2	408907.409	4726408.291
Ext.2	408907.409	4726408.291
Ext.2	408907.982	4726412.617
Ext.2	408908.249	4726416.972
Ext.2	408908.206	4726421.335
Ext.2	408907.856	4726425.684
Ext.2	408907.199	4726429.998
Ext.2	408906.239	4726434.254
Ext.2	408904.98	4726438.432
Ext.2	408903.43	4726442.511
Ext.2	408901.595	4726446.469
Ext.2	408899.485	4726450.289
Ext.2	408897.11	4726453.949
Ext.2	408894.483	4726457.433

Ext.2	408891.616	4726460.722
Ext.2	408888.523	4726463.8
Ext.2	408885.221	4726466.653
Ext.2	408881.726	4726469.264
Ext.2	408878.054	4726471.622
Ext.2	408874.226	4726473.715
Ext.2	408870.259	4726475.532
Ext.2	408866.173	4726477.064
Ext.2	408861.99	4726478.304
Ext.2	408857.729	4726479.245
Ext.2	408853.412	4726479.882
Ext.2	408849.062	4726480.213
Ext.2	408849.062	4726480.213
Ext.2	408826.184	4726479.1
Ext.2	408826.184	4726479.1
Ext.2	408821.659	4726479.036
Ext.2	408817.14	4726479.284
Ext.2	408812.648	4726479.842
Ext.2	408808.206	4726480.709
Ext.2	408803.834	4726481.88
Ext.2	408799.553	4726483.349
Ext.2	408795.384	4726485.11
Ext.2	408791.345	4726487.154
Ext.2	408787.458	4726489.471
Ext.2	408783.739	4726492.05
Ext.2	408780.206	4726494.88
Ext.2	408776.877	4726497.946
Ext.2	408773.767	4726501.235
Ext.2	408770.891	4726504.73
Ext.2	408768.263	4726508.414
Ext.2	408765.895	4726512.271
Ext.2	408763.798	4726516.282
Ext.2	408761.983	4726520.428
Ext.2	408760.458	4726524.69
Ext.2	408759.229	4726529.046
Ext.2	408758.304	4726533.476
Ext.2	408757.686	4726537.96
Ext.2	408757.379	4726542.475
Ext.2	408757.384	4726547.001
Ext.2	408757.7	4726551.516
Ext.2	408757.7	4726551.516
Ext.2	408758.011	4726555.967
Ext.2	408758.013	4726560.428
Ext.2	408757.707	4726564.879
Ext.2	408757.092	4726569.298
Ext.2	408756.174	4726573.664
Ext.2	408754.955	4726577.956
Ext.2	408753.442	4726582.153
Ext.2	408751.642	4726586.235
Ext.2	408749.564	4726590.183
Ext.2	408747.217	4726593.978
Ext.2	408744.613	4726597.601
Ext.2	408741.765	4726601.034
Ext.2	408738.685	4726604.263
Ext.2	408735.39	4726607.27
Ext.2	408731.894	4726610.042
Ext.2	408728.215	4726612.566
Ext.2	408724.369	4726614.828
Ext.2	408720.377	4726616.819
Ext.2	408716.256	4726618.528
Ext.2	408712.026	4726619.949
Ext.2	408707.709	4726621.072
Ext.2	408707.709	4726621.072
Ext.2	408704.99	4726621.779
Ext.2	408702.325	4726622.669
Ext.2	408699.728	4726623.739
Ext.2	408697.209	4726624.984
Ext.2	408694.782	4726626.399
Ext.2	408692.457	4726627.975
Ext.2	408690.245	4726629.707
Ext.2	408688.156	4726631.585
Ext.2	408686.201	4726633.602
Ext.2	408684.387	4726635.748
Ext.2	408682.725	4726638.012
Ext.2	408681.221	4726640.385
Ext.2	408679.882	4726642.855
Ext.2	408678.715	4726645.411
Ext.2	408677.726	4726648.04
Ext.2	408676.918	4726650.731
Ext.2	408676.296	4726653.47

DEL22-025 – Kettle Creek Subdivision
Allowable Conditions - PCSWMM Input

Ext.2	408675.863	4726656.246
Ext.2	408675.62	4726659.044
Ext.2	408675.568	4726661.853
Ext.2	408675.568	4726661.853
Ext.2	408675.514	4726664.661
Ext.2	408675.261	4726667.458
Ext.2	408674.811	4726670.23
Ext.2	408674.167	4726672.964
Ext.2	408673.332	4726675.645
Ext.2	408672.309	4726678.26
Ext.2	408671.105	4726680.797
Ext.2	408669.724	4726683.243
Ext.2	408668.174	4726685.584
Ext.2	408666.463	4726687.811
Ext.2	408664.598	4726689.911
Ext.2	408662.591	4726691.875
Ext.2	408660.449	4726693.692
Ext.2	408658.185	4726695.353
Ext.2	408655.809	4726696.85
Ext.2	408653.333	4726698.176
Ext.2	408650.77	4726699.323
Ext.2	408648.132	4726700.287
Ext.2	408645.433	4726701.062
Ext.2	408642.686	4726701.645
Ext.2	408642.686	4726701.645
Ext.2	408630.659	4726700.274
Ext.2	408618.566	4726699.749
Ext.2	408606.466	4726700.074
Ext.2	408594.419	4726701.247
Ext.2	408582.483	4726703.262
Ext.2	408570.719	4726706.109
Ext.2	408559.183	4726709.775
Ext.2	408547.932	4726714.241
Ext.2	408537.023	4726719.485
Ext.2	408526.508	4726725.482
Ext.2	408516.44	4726732.201
Ext.2	408506.868	4726739.61
Ext.2	408497.839	4726747.672
Ext.2	408489.398	4726756.347
Ext.2	408481.586	4726765.594
Ext.2	408474.443	4726775.365
Ext.2	408468.002	4726785.614
Ext.2	408462.296	4726796.289
Ext.2	408462.296	4726796.289
Ext.2	408461.692	4726797.421
Ext.2	408461.01	4726798.507
Ext.2	408460.254	4726799.544
Ext.2	408459.428	4726800.525
Ext.2	408458.536	4726801.447
Ext.2	408457.582	4726802.304
Ext.2	408456.57	4726803.093
Ext.2	408455.506	4726803.81
Ext.2	408454.395	4726804.451
Ext.2	408453.242	4726805.013
Ext.2	408452.052	4726805.493
Ext.2	408450.832	4726805.889
Ext.2	408449.587	4726806.2
Ext.2	408448.324	4726806.423
Ext.2	408447.048	4726806.557
Ext.2	408447.048	4726806.557
Ext.2	408446.053	4726823.971
Ext.2	408446.053	4726823.971
Ext.2	408675.644	4726843.402
Ext.2	408675.644	4726843.402
Ext.2	408758.758	4726909.076
Ext.2	408758.758	4726909.076
Ext.2	408749.302	4726887.433
Ext.2	408749.302	4726887.433
Ext.2	408747.229	4726882.186
Ext.2	408745.533	4726876.804
Ext.2	408744.225	4726871.316
Ext.2	408743.311	4726865.748
Ext.2	408742.795	4726860.129
Ext.2	408742.679	4726854.488
Ext.2	408742.965	4726848.853
Ext.2	408743.652	4726843.253
Ext.2	408744.734	4726837.715
Ext.2	408746.208	4726832.269
Ext.2	408748.066	4726826.941
Ext.2	408750.297	4726821.759

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Ext.2            408750.297       4726821.759
Ext.2            408751.802       4726818.281
Ext.2            408753.067       4726814.709
Ext.2            408754.087       4726811.06
Ext.2            408754.858       4726807.35
Ext.2            408755.374       4726803.596
Ext.2            408755.635       4726799.815
Ext.2            408755.64        4726796.026
Ext.2            408755.387       4726792.245
Ext.2            408754.878       4726788.49
Ext.2            408754.116       4726784.778
Ext.2            408753.104       4726781.127
Ext.2            408751.846       4726777.552
Ext.2            408750.349       4726774.071
Ext.2            408748.619       4726770.7
Ext.2            408746.665       4726767.453
Ext.2            408746.665       4726767.453
Ext.2            408744.864       4726764.453
Ext.2            408743.276       4726761.334
Ext.2            408741.911       4726758.112
Ext.2            408740.774       4726754.802
Ext.2            408739.872       4726751.421
Ext.2            408739.208       4726747.985
Ext.2            408738.787       4726744.511
Ext.2            408738.609       4726741.016
Ext.2            408738.677       4726737.517
Ext.2            408738.988       4726734.031
Ext.2            408739.543       4726730.576
Ext.2            408740.339       4726727.168
Ext.2            408740.339       4726727.168
Ext.2            408742.028       4726721.683
Ext.2            408744.092       4726716.328
Ext.2            408746.521       4726711.128
Ext.2            408749.303       4726706.108
Ext.2            408752.424       4726701.292
Ext.2            408755.871       4726696.703
Ext.2            408759.626       4726692.363
Ext.2            408763.672       4726688.292
Ext.2            408767.989       4726684.511
Ext.2            408772.557       4726681.036
Ext.2            408777.353       4726677.885
Ext.2            408782.356       4726675.072
Ext.2            408787.541       4726672.612
Ext.2            408792.884       4726670.515
Ext.2            408798.358       4726668.792
Ext.2            408803.938       4726667.451
Ext.2            408809.598       4726666.498
Ext.2            408815.31        4726665.938
Ext.2            408821.047       4726665.774
Ext.2            408826.781       4726666.006
Ext.2            408832.486       4726666.634
Ext.2            408838.134       4726667.653
Ext.2            408838.134       4726667.653
Ext.2            409007.284       4726719.13
Ext.2            409007.284       4726719.13
Ext.2            409010.401       4726719.965
Ext.2            409013.568       4726720.588
Ext.2            409016.769       4726720.997
Ext.2            409019.991       4726721.189
Ext.2            409023.218       4726721.163
Ext.2            409026.437       4726720.92
Ext.2            409029.631       4726720.461
Ext.2            409032.787       4726719.787
Ext.2            409035.891       4726718.903
Ext.2            409035.891       4726718.903

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

DEL22-025 - Allowable Conditions


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 5
Number of nodes ........... 2
Number of links ........... 0
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                     Data       Recording
Name                 Data Source                     Type       Interval
------------------------------------------------------------------------
St.Thomas            St.Thomas-2yr                   INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A1                        25.39    576.96      2.00    3.0000 St.Thomas            OF1
A2                        15.86    587.56      2.00    3.0000 St.Thomas            OF1
A3                         4.57    457.30      0.00    2.0000 St.Thomas            Lake_Road_Drain
Ext.1                      7.61    253.53      2.00    5.0000 St.Thomas            OF1
Ext.2                     11.47    229.44      2.00    5.0000 St.Thomas            OF1


************
Node Summary
************
                                           Invert      Max.    Ponded    External
Name                 Type                   Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
Lake_Road_Drain      OUTFALL               175.00      0.00       0.0
OF1                  OUTFALL               177.50      0.00       0.0


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Starting Date ............ 04/10/2015 00:00:00
Ending Date .............. 04/12/2015 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         2.127        32.778
```



```
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         2.003        30.864
Surface Runoff ...........         0.043         0.664
Final Storage ............         0.081         1.252
Continuity Error (%) .....        -0.006


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.043         0.431
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.043         0.431
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


***************************
Subcatchment Runoff Summary
***************************

---------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total       Total     Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                   mm         mm         mm         mm         mm    10^6 ltr      LPS
---------------------------------------------------------------------------------------------------------
A1                          32.78       0.00       0.00      30.85       0.69        0.17   188.92   0.021
A2                          32.78       0.00       0.00      30.82       0.72        0.11   118.06   0.022
A3                          32.78       0.00       0.00      31.34       0.18        0.01     3.72   0.006
Ext.1                       32.78       0.00       0.00      30.78       0.73        0.06    56.60   0.022
Ext.2                       32.78       0.00       0.00      30.82       0.69        0.08    85.37   0.021


Analysis begun on:  Fri Aug 02 13:45:41 2024
Analysis ended on:  Fri Aug 02 13:45:41 2024
Total elapsed time: < 1 sec
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

DEL22-025 - Allowable Conditions


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 5
Number of nodes ........... 2
Number of links ........... 0
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                               Data       Recording
Name                 Data Source               Type       Interval
------------------------------------------------------------------------
St.Thomas            St.Thomas-5yr             INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A1                        25.39    576.96      2.00    3.0000 St.Thomas            OF1
A2                        15.86    587.56      2.00    3.0000 St.Thomas            OF1
A3                         4.57    457.30      0.00    2.0000 St.Thomas            Lake_Road_Drain
Ext.1                      7.61    253.53      2.00    5.0000 St.Thomas            OF1
Ext.2                     11.47    229.44      2.00    5.0000 St.Thomas            OF1


************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
Lake_Road_Drain      OUTFALL             175.00      0.00       0.0
OF1                  OUTFALL             177.50      0.00       0.0


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Starting Date ............ 04/10/2015 00:00:00
Ending Date .............. 04/12/2015 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         2.804        43.210
```

DEL22-025 Kettle Creek Subdivision
5-Year Design Storm Event - Allowable Conditions - PCSWMM Output

```
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         2.578        39.723
Surface Runoff ...........         0.146         2.245
Final Storage ............         0.081         1.244
Continuity Error (%) .....        -0.006


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.146         1.457
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.146         1.457
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


***************************
Subcatchment Runoff Summary
***************************

--------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total       Total     Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                   mm         mm         mm         mm         mm    10^6 ltr      LPS
--------------------------------------------------------------------------------------------------------
A1                          43.21       0.00       0.00      39.97       2.00        0.51   247.88   0.046
A2                          43.21       0.00       0.00      39.51       2.46        0.39   154.90   0.057
A3                          43.21       0.00       0.00      39.43       2.54        0.12    21.26   0.059
Ext.1                       43.21       0.00       0.00      39.35       2.62        0.20    74.26   0.061
Ext.2                       43.21       0.00       0.00      39.84       2.11        0.24   112.02   0.049


Analysis begun on:  Fri Aug 02 13:47:26 2024
Analysis ended on:  Fri Aug 02 13:47:26 2024
Total elapsed time: < 1 sec
```

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------

  DEL22-025 - Allowable Conditions


  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 5
  Number of nodes ........... 2
  Number of links ........... 0
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                      Data       Recording
  Name                 Data Source                    Type       Interval 
  ------------------------------------------------------------------------
  St.Thomas            St.Thomas-10yr                 INTENSITY    5 min.   


  ********************
  Subcatchment Summary
  ********************
  Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet              
  -----------------------------------------------------------------------------------------------------------
  A1                        25.39    576.96      2.00    3.0000 St.Thomas            OF1                 
  A2                        15.86    587.56      2.00    3.0000 St.Thomas            OF1                 
  A3                         4.57    457.30      0.00    2.0000 St.Thomas            Lake_Road_Drain     
  Ext.1                      7.61    253.53      2.00    5.0000 St.Thomas            OF1                 
  Ext.2                     11.47    229.44      2.00    5.0000 St.Thomas            OF1                 


  ************
  Node Summary
  ************
                                             Invert      Max.    Ponded    External
  Name                 Type                   Elev.     Depth      Area    Inflow  
  -------------------------------------------------------------------------------
  Lake_Road_Drain      OUTFALL               175.00      0.00       0.0
  OF1                  OUTFALL               177.50      0.00       0.0


  *********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,  
  not just on results from each reporting time step.
  *********************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... LPS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... NO
    Water Quality .......... NO
  Infiltration Method ...... CURVE_NUMBER
  Starting Date ............ 04/10/2015 00:00:00
  Ending Date .............. 04/12/2015 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:01:00
  Dry Time Step ............ 00:01:00


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         3.244        49.990
```

DEL22-025 Kettle Creek Subdivision
10-Year Design Storm Event - Allowable Conditions - PCSWMM Output

```
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         2.899        44.667
  Surface Runoff ...........         0.264         4.064
  Final Storage ............         0.082         1.263
  Continuity Error (%) .....        -0.006


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.264         2.637
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         0.264         2.637
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....         0.000


  ***************************
  Subcatchment Runoff Summary
  ***************************

  ---------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total       Total     Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
  Subcatchment                 mm         mm         mm         mm         mm    10^6 ltr      LPS
  ---------------------------------------------------------------------------------------------------------
  A1                        49.99       0.00       0.00      45.14       3.60        0.91   286.94   0.072
  A2                        49.99       0.00       0.00      44.29       4.44        0.70   179.30   0.089
  A3                        49.99       0.00       0.00      43.83       4.93        0.23    33.84   0.099
  Ext.1                     49.99       0.00       0.00      44.02       4.70        0.36    85.96   0.094
  Ext.2                     49.99       0.00       0.00      44.91       3.81        0.44   129.67   0.076


  Analysis begun on:  Fri Aug 02 13:47:59 2024
  Analysis ended on:  Fri Aug 02 13:47:59 2024
  Total elapsed time: < 1 sec
```

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------

  DEL22-025 - Allowable Conditions


  *************
  Element Count
  *************
  Number of rain gages ...... 1
  Number of subcatchments ... 5
  Number of nodes ........... 2
  Number of links ........... 0
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                    Data       Recording
  Name                 Data Source                  Type       Interval 
  ------------------------------------------------------------------------
  St.Thomas            St.Thomas-25yr               INTENSITY    5 min.


  ********************
  Subcatchment Summary
  ********************
  Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet              
  -----------------------------------------------------------------------------------------------------------
  A1                        25.39    576.96      2.00    3.0000 St.Thomas            OF1                 
  A2                        15.86    587.56      2.00    3.0000 St.Thomas            OF1                 
  A3                         4.57    457.30      0.00    2.0000 St.Thomas            Lake_Road_Drain     
  Ext.1                      7.61    253.53      2.00    5.0000 St.Thomas            OF1                 
  Ext.2                     11.47    229.44      2.00    5.0000 St.Thomas            OF1                 


  ************
  Node Summary
  ************
                                           Invert      Max.    Ponded    External
  Name                 Type                 Elev.     Depth      Area    Inflow  
  -------------------------------------------------------------------------------
  Lake_Road_Drain      OUTFALL             175.00      0.00       0.0
  OF1                  OUTFALL             177.50      0.00       0.0


  *********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,  
  not just on results from each reporting time step.
  *********************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... LPS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... NO
    Water Quality .......... NO
  Infiltration Method ...... CURVE_NUMBER
  Starting Date ............ 04/10/2015 00:00:00
  Ending Date .............. 04/12/2015 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:01:00
  Dry Time Step ............ 00:01:00


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         3.804        58.618
```

DEL22-025 Kettle Creek Subdivision
25-Year Design Storm Event - Allowable Conditions - PCSWMM Output

```
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         3.265        50.305
  Surface Runoff ...........         0.459         7.069
  Final Storage ............         0.081         1.248
  Continuity Error (%) .....        -0.006


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         0.459         4.588
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........         0.459         4.588
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......         0.000         0.000
  Continuity Error (%) .....         0.000


  ***************************
  Subcatchment Runoff Summary
  ***************************

  ---------------------------------------------------------------------------------------------------------
                          Total      Total      Total      Total      Total       Total     Peak  Runoff
                         Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
  Subcatchment               mm         mm         mm         mm         mm    10^6 ltr      LPS
  ---------------------------------------------------------------------------------------------------------
  A1                      58.62       0.00       0.00      51.05       6.34        1.61   342.73   0.108
  A2                      58.62       0.00       0.00      49.72       7.63        1.21   216.21   0.130
  A3                      58.62       0.00       0.00      48.79       8.56        0.39    54.91   0.146
  Ext.1                   58.62       0.00       0.00      49.34       8.03        0.61   104.08   0.137
  Ext.2                   58.62       0.00       0.00      50.72       6.68        0.77   155.20   0.114


  Analysis begun on:  Fri Aug 02 13:48:35 2024
  Analysis ended on:  Fri Aug 02 13:48:35 2024
  Total elapsed time: < 1 sec
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

DEL22-025 - Allowable Conditions


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 5
Number of nodes ........... 2
Number of links ........... 0
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                    Data       Recording
Name                 Data Source                    Type       Interval
------------------------------------------------------------------------
St.Thomas            St.Thomas-50yr                 INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A1                        25.39    576.96      2.00    3.0000 St.Thomas            OF1
A2                        15.86    587.56      2.00    3.0000 St.Thomas            OF1
A3                         4.57    457.30      0.00    2.0000 St.Thomas            Lake_Road_Drain
Ext.1                      7.61    253.53      2.00    5.0000 St.Thomas            OF1
Ext.2                     11.47    229.44      2.00    5.0000 St.Thomas            OF1


************
Node Summary
************
                                           Invert      Max.    Ponded    External
Name                 Type                   Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
Lake_Road_Drain      OUTFALL               175.00      0.00       0.0
OF1                  OUTFALL               177.50      0.00       0.0


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Starting Date ............ 04/10/2015 00:00:00
Ending Date .............. 04/12/2015 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         4.231        65.194
```

DEL22-025 Kettle Creek Subdivision
50-Year Design Storm Event - Allowable Conditions - PCSWMM Output

```
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         3.516        54.181
Surface Runoff ...........         0.634         9.772
Final Storage ............         0.081         1.244
Continuity Error (%) .....        -0.007


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.634         6.342
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.634         6.342
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


***************************
Subcatchment Runoff Summary
***************************

-----------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total       Total     Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                   mm         mm         mm         mm         mm    10^6 ltr      LPS
-----------------------------------------------------------------------------------------------------------
A1                          65.19       0.00       0.00      55.08       8.86        2.25   392.50   0.136
A2                          65.19       0.00       0.00      53.49      10.47        1.66   252.40   0.161
A3                          65.19       0.00       0.00      52.30      11.67        0.53    75.21   0.179
Ext.1                       65.19       0.00       0.00      52.99      10.95        0.83   122.47   0.168
Ext.2                       65.19       0.00       0.00      54.68       9.29        1.07   178.49   0.142


Analysis begun on:  Fri Aug 02 13:49:13 2024
Analysis ended on:  Fri Aug 02 13:49:13 2024
Total elapsed time: < 1 sec
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

DEL22-025 - Allowable Conditions


*************
Element Count
*************
Number of rain gages ...... 1
Number of subcatchments ... 5
Number of nodes ........... 2
Number of links ........... 0
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                   Data       Recording
Name                 Data Source                   Type       Interval 
------------------------------------------------------------------------
St.Thomas            St.Thomas-100yr               INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
A1                        25.39    576.96      2.00    3.0000 St.Thomas            OF1
A2                        15.86    587.56      2.00    3.0000 St.Thomas            OF1
A3                         4.57    457.30      0.00    2.0000 St.Thomas            Lake_Road_Drain
Ext.1                      7.61    253.53      2.00    5.0000 St.Thomas            OF1
Ext.2                     11.47    229.44      2.00    5.0000 St.Thomas            OF1


************
Node Summary
************
                                           Invert      Max.    Ponded    External
Name                 Type                   Elev.     Depth      Area    Inflow  
-------------------------------------------------------------------------------
Lake_Road_Drain      OUTFALL               175.00      0.00       0.0
OF1                  OUTFALL               177.50      0.00       0.0


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,  
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Starting Date ............ 04/10/2015 00:00:00
Ending Date .............. 04/12/2015 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         4.649        71.637
```



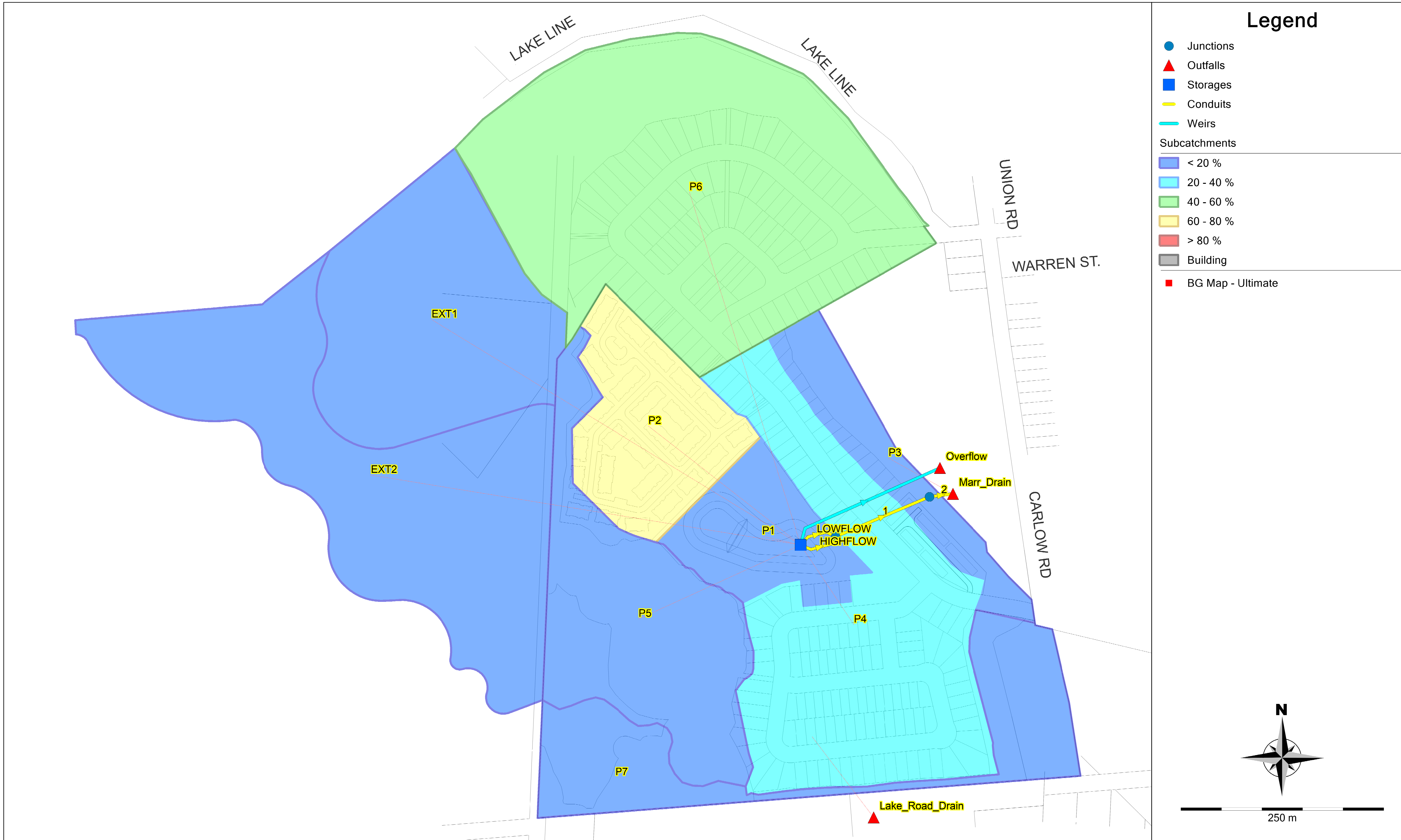
```
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         3.742        57.657
Surface Runoff ...........         0.826        12.728
Final Storage ............         0.082         1.257
Continuity Error (%) .....        -0.007


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.826         8.261
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.826         8.261
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


***************************
Subcatchment Runoff Summary
***************************

---------------------------------------------------------------------------------------------------------
                          Total      Total      Total      Total      Total       Total     Peak  Runoff
                         Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                 mm         mm         mm         mm         mm    10^6 ltr      LPS
---------------------------------------------------------------------------------------------------------
A1                        71.64       0.00       0.00      58.73      11.66        2.96   449.25   0.163
A2                        71.64       0.00       0.00      56.83      13.55        2.15   295.61   0.189
A3                        71.64       0.00       0.00      55.43      14.96        0.68    98.93   0.209
Ext.1                     71.64       0.00       0.00      56.32      14.09        1.07   144.78   0.197
Ext.2                     71.64       0.00       0.00      58.21      12.17        1.40   205.36   0.170


Analysis begun on:  Fri Aug 02 13:49:53 2024
Analysis ended on:  Fri Aug 02 13:49:54 2024
Total elapsed time: 00:00:01
```



LAKE LINE
LAKE LINE
UNION RD
WARREN ST.
CARLOW RD
P6
EXT1
P2
EXT2
P3
Overflow
Marr_Drain
2
1
P1
LOWFLOW
HIGHFLOW
P5
P4
P7
Lake_Road_Drain
Legend
Junctions
Outfalls
Storages
Conduits
Weirs
Subcatchments
< 20 %
20 - 40 %
40 - 60 %
60 - 80 %
> 80 %
Building
BG Map - Ultimate
N
250 m

```
[TITLE]
DEL22-025 - Post-Development - Ultimate

[OPTIONS]
;;Options            Value
;;------------------ ------------
FLOW_UNITS           LPS
INFILTRATION         CURVE_NUMBER
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         ELEVATION
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           04/10/2015
START_TIME           00:00:00
REPORT_START_DATE    04/10/2015
REPORT_START_TIME    00:00:00
END_DATE             04/13/2015
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         1

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              2

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;               Rain      Time     Snow     Data
;;Name           Type      Intrvl   Catch    Source
;;-------------- --------- -------- -------- ----------
SBM-Development  CUMULATIVE 0:01     1.0      TIMESERIES SubcatchmentOff
St.Thomas        INTENSITY 0:05     1.0      TIMESERIES St.Thomas-2yr

[SUBCATCHMENTS]
;;                                               Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
EXT1             St.Thomas        SU1              7.606    2        253.533  5        0
EXT2             St.Thomas        SU1              11.472   2        229.44   5        0
P1               St.Thomas        SU1              2.753    14       275.3    1        0
P2               St.Thomas        SU1              4.073    71       169.708  1        0
P3               St.Thomas        Marr_Drain       2.049    16       683      4        0
P4               St.Thomas        SU1              9.942    36       397.68   1        0
P5               St.Thomas        SU1              6.569    2        243.296  15       0
P6               SBM-Development  SU1              15.864   45       396.6    2        0
P7               St.Thomas        Lake_Road_Drain  4.573    0        457.3    2        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
EXT1             0.012      0.24       2          5          25         OUTLET
EXT2             0.012      0.24       2          5          25         OUTLET
P1               0.012      0.24       2          5          25         OUTLET
P2               0.012      0.24       2          5          25         OUTLET
P3               0.012      0.24       2          5          25         OUTLET
P4               0.012      0.24       2          5          25         OUTLET
P5               0.012      0.24       2          5          25         OUTLET
P6               0.012      0.24       2          5          25         OUTLET
P7               0.012      0.24       2          5          25         OUTLET
```

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```
[INFILTRATION]
;;Subcatchment   CurveNum   HydCon     DryTime
;;-------------- ---------- ---------- ----------
EXT1             65         12.7       7
EXT2             65         12.7       7
P1               65         12.7       7
P2               65         12.7       7
P3               65         12.7       7
P4               65         12.7       7
P5               65         12.7       7
P6               65         12.7       7
P7               65         12.7       7

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
J1               176        2.6        0          0          0
J2               175.5      2          0          0          0

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate     Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
Lake_Road_Drain  175        FREE                        NO
Marr_Drain       175        FREE                        NO
Overflow         175.5      FREE                        NO

[STORAGE]
;;               Invert   Max.       Init.      Storage    Curve                                    Evap.
;;Name           Elev.    Depth      Depth      Curve      Params                                   Frac.
Infiltration parameters
;;-------------- -------- ---------- ---------- ---------- --------- --------- -------- -------- -------- ---
--------------------
SU1              174.5    4.07       1.8        TABULAR    FullPondArea               0        0

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet      Outlet     Init.
Max.
;;Name           Node             Node             Length     N          Offset     Offset     Flow
Flow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ---
-------
1                J1               J2               123.2      0.013      176.24     175.97     0          0
2                J2               Marr_Drain       9.2        0.013      175.93     175.91     0          0
HIGHFLOW         SU1              J1               15         0.013      176.91     176.86     0          0
LOWFLOW          SU1              J1               18.6       0.013      175.56     176.3      0          0

[WEIRS]
;;               Inlet            Outlet           Weir         Crest      Disch.     Flap     End      End
;;Name           Node             Node             Type         Height     Coeff.     Gate     Con.
Coeff.     Surcharge  RoadWidth  RoadSurf
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- -------- -----
----- ---------- ---------- ----------
OVERFLOW         SU1              Overflow         TRANSVERSE   178.57     1.84       NO       0        0
YES

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ----------
1                CIRCULAR     1.35             0          0          0          1
2                CIRCULAR     1.35             0          0          0          1
HIGHFLOW         CIRCULAR     1.2              0          0          0          1
LOWFLOW          CIRCULAR     0.45             0          0          0          1
OVERFLOW         RECT_OPEN    0.5              7          0          0

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate  SeepageRate
;;-------------- ---------- ---------- ---------- ---------- ----------

[INFLOWS]
;;                                                 Param    Units    Scale    Baseline Baseline
;;Node           Parameter        Time Series      Type     Factor   Factor   Value    Pattern
;;-------------- ---------------- ---------------- -------- -------- -------- -------- --------
SU1              FLOW             SBM-2yr          FLOW     1.0      1        0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
```

```
FullPondArea     Storage    0          3367
FullPondArea                1.8        6673
FullPondArea                4.07       11581

PondArea         Storage    0          6672
PondArea                    2.27       11581

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Hazel_48hr_2024             0          2.0278
Hazel_48hr_2024             1          2.0278
Hazel_48hr_2024             2          2.0278
Hazel_48hr_2024             3          2.0278
Hazel_48hr_2024             4          2.0278
Hazel_48hr_2024             5          2.0278
Hazel_48hr_2024             6          2.0278
Hazel_48hr_2024             7          2.0278
Hazel_48hr_2024             8          2.0278
Hazel_48hr_2024             9          2.0278
Hazel_48hr_2024             10         2.0278
Hazel_48hr_2024             11         2.0278
Hazel_48hr_2024             12         2.0278
Hazel_48hr_2024             13         2.0278
Hazel_48hr_2024             14         2.0278
Hazel_48hr_2024             15         2.0278
Hazel_48hr_2024             16         2.0278
Hazel_48hr_2024             17         2.0278
Hazel_48hr_2024             18         2.0278
Hazel_48hr_2024             19         2.0278
Hazel_48hr_2024             20         2.0278
Hazel_48hr_2024             21         2.0278
Hazel_48hr_2024             22         2.0278
Hazel_48hr_2024             23         2.0278
Hazel_48hr_2024             24         2.0278
Hazel_48hr_2024             25         2.0278
Hazel_48hr_2024             26         2.0278
Hazel_48hr_2024             27         2.0278
Hazel_48hr_2024             28         2.0278
Hazel_48hr_2024             29         2.0278
Hazel_48hr_2024             30         2.0278
Hazel_48hr_2024             31         2.0278
Hazel_48hr_2024             32         2.0278
Hazel_48hr_2024             33         2.0278
Hazel_48hr_2024             34         2.0278
Hazel_48hr_2024             35         2.0278
Hazel_48hr_2024             36         6
Hazel_48hr_2024             37         4
Hazel_48hr_2024             38         6
Hazel_48hr_2024             39         13
Hazel_48hr_2024             40         17
Hazel_48hr_2024             41         13
Hazel_48hr_2024             42         23
Hazel_48hr_2024             43         13
Hazel_48hr_2024             44         13
Hazel_48hr_2024             45         53
Hazel_48hr_2024             46         38
Hazel_48hr_2024             47         13
Hazel_48hr_2024             48         0

SBM-100yr                   0:01       0
SBM-100yr                   0:02       0
SBM-100yr                   0:03       0
SBM-100yr                   0:04       0
SBM-100yr                   0:05       0
SBM-100yr                   0:06       0
SBM-100yr                   0:07       0
SBM-100yr                   0:08       0
SBM-100yr                   0:09       0
SBM-100yr                   0:10       0
SBM-100yr                   0:11       0
......
Too many data points (4320 in total).

SBM-10yr                    0:01       0
SBM-10yr                    0:02       0
SBM-10yr                    0:03       0
SBM-10yr                    0:04       0
SBM-10yr                    0:05       0
SBM-10yr                    0:06       0
```

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```
SBM-10yr                    0:07       0
SBM-10yr                    0:08       0
SBM-10yr                    0:09       0
SBM-10yr                    0:10       0
SBM-10yr                    0:11       0
......
Too many data points (4320 in total).

SBM-25yr                    0:01       0
SBM-25yr                    0:02       0
SBM-25yr                    0:03       0
SBM-25yr                    0:04       0
SBM-25yr                    0:05       0
SBM-25yr                    0:06       0
SBM-25yr                    0:07       0
SBM-25yr                    0:08       0
SBM-25yr                    0:09       0
SBM-25yr                    0:10       0
SBM-25yr                    0:11       0
......
Too many data points (4320 in total).

SBM-2yr                     0:01       0
SBM-2yr                     0:02       0
SBM-2yr                     0:03       0
SBM-2yr                     0:04       0
SBM-2yr                     0:05       0
SBM-2yr                     0:06       0
SBM-2yr                     0:07       0
SBM-2yr                     0:08       0
SBM-2yr                     0:09       0
SBM-2yr                     0:10       0
SBM-2yr                     0:11       0
......
Too many data points (4320 in total).

SBM-50yr                    0:01       0
SBM-50yr                    0:02       0
SBM-50yr                    0:03       0
SBM-50yr                    0:04       0
SBM-50yr                    0:05       0
SBM-50yr                    0:06       0
SBM-50yr                    0:07       0
SBM-50yr                    0:08       0
SBM-50yr                    0:09       0
SBM-50yr                    0:10       0
SBM-50yr                    0:11       0
......
Too many data points (4320 in total).

SBM-5yr                     0:01       0
SBM-5yr                     0:02       0
SBM-5yr                     0:03       0
SBM-5yr                     0:04       0
SBM-5yr                     0:05       0
SBM-5yr                     0:06       0
SBM-5yr                     0:07       0
SBM-5yr                     0:08       0
SBM-5yr                     0:09       0
SBM-5yr                     0:10       0
SBM-5yr                     0:11       0
......
Too many data points (4320 in total).

SBM-Hazel                   0:01       0
SBM-Hazel                   0:02       0
SBM-Hazel                   0:03       0
SBM-Hazel                   0:04       0
SBM-Hazel                   0:05       0
SBM-Hazel                   0:06       0
SBM-Hazel                   0:07       0
SBM-Hazel                   0:08       0
SBM-Hazel                   0:09       0
SBM-Hazel                   0:10       0
SBM-Hazel                   0:11       0
......
Too many data points (4320 in total).

St.Thomas-100yr             0:00       7.377
St.Thomas-100yr             0:05       7.837
```

St.Thomas-100yr	0:10	8.374
St.Thomas-100yr	0:15	9.009
St.Thomas-100yr	0:20	9.776
St.Thomas-100yr	0:25	10.725
St.Thomas-100yr	0:30	11.933
St.Thomas-100yr	0:35	13.536
St.Thomas-100yr	0:40	15.792
St.Thomas-100yr	0:45	19.258
St.Thomas-100yr	0:50	25.477
St.Thomas-100yr	0:55	41.546
St.Thomas-100yr	1:00	291.4
St.Thomas-100yr	1:05	68.16
St.Thomas-100yr	1:10	42.382
St.Thomas-100yr	1:15	31.203
St.Thomas-100yr	1:20	25.266
St.Thomas-100yr	1:25	21.497
St.Thomas-100yr	1:30	18.857
St.Thomas-100yr	1:35	16.889
St.Thomas-100yr	1:40	15.356
St.Thomas-100yr	1:45	14.122
St.Thomas-100yr	1:50	13.104
St.Thomas-100yr	1:55	12.248
St.Thomas-100yr	2:00	11.517
St.Thomas-100yr	2:05	10.883
St.Thomas-100yr	2:10	10.328
St.Thomas-100yr	2:15	9.837
St.Thomas-100yr	2:20	9.399
St.Thomas-100yr	2:25	9.005
St.Thomas-100yr	2:30	8.65
St.Thomas-100yr	2:35	8.326
St.Thomas-100yr	2:40	8.031
St.Thomas-100yr	2:45	7.76
St.Thomas-100yr	2:50	7.51
St.Thomas-100yr	2:55	7.278
St.Thomas-100yr	3:00	0

St.Thomas-10yr	0:00	5.148
St.Thomas-10yr	0:05	5.469
St.Thomas-10yr	0:10	5.843
St.Thomas-10yr	0:15	6.286
St.Thomas-10yr	0:20	6.822
St.Thomas-10yr	0:25	7.483
St.Thomas-10yr	0:30	8.326
St.Thomas-10yr	0:35	9.445
St.Thomas-10yr	0:40	11.019
St.Thomas-10yr	0:45	13.436
St.Thomas-10yr	0:50	17.774
St.Thomas-10yr	0:55	28.978
St.Thomas-10yr	1:00	203.455
St.Thomas-10yr	1:05	47.521
St.Thomas-10yr	1:10	29.562
St.Thomas-10yr	1:15	21.767
St.Thomas-10yr	1:20	17.627
St.Thomas-10yr	1:25	14.998
St.Thomas-10yr	1:30	13.157
St.Thomas-10yr	1:35	11.784
St.Thomas-10yr	1:40	10.714
St.Thomas-10yr	1:45	9.853
St.Thomas-10yr	1:50	9.144
St.Thomas-10yr	1:55	8.546
St.Thomas-10yr	2:00	8.036
St.Thomas-10yr	2:05	7.594
St.Thomas-10yr	2:10	7.206
St.Thomas-10yr	2:15	6.864
St.Thomas-10yr	2:20	6.558
St.Thomas-10yr	2:25	6.284
St.Thomas-10yr	2:30	6.036
St.Thomas-10yr	2:35	5.81
St.Thomas-10yr	2:40	5.604
St.Thomas-10yr	2:45	5.415
St.Thomas-10yr	2:50	5.24
St.Thomas-10yr	2:55	5.079
St.Thomas-10yr	3:00	0

St.Thomas-25yr	0:00	6.017
St.Thomas-25yr	0:05	6.392
St.Thomas-25yr	0:10	6.831
St.Thomas-25yr	0:15	7.35
St.Thomas-25yr	0:20	7.977
St.Thomas-25yr	0:25	8.751

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St.Thomas-25yr	0:30	9.739
St.Thomas-25yr	0:35	11.05
St.Thomas-25yr	0:40	12.893
St.Thomas-25yr	0:45	15.728
St.Thomas-25yr	0:50	20.815
St.Thomas-25yr	0:55	33.969
St.Thomas-25yr	1:00	239.295
St.Thomas-25yr	1:05	55.77
St.Thomas-25yr	1:10	34.654
St.Thomas-25yr	1:15	25.501
St.Thomas-25yr	1:20	20.643
St.Thomas-25yr	1:25	17.559
St.Thomas-25yr	1:30	15.4
St.Thomas-25yr	1:35	13.791
St.Thomas-25yr	1:40	12.537
St.Thomas-25yr	1:45	11.528
St.Thomas-25yr	1:50	10.696
St.Thomas-25yr	1:55	9.997
St.Thomas-25yr	2:00	9.399
St.Thomas-25yr	2:05	8.881
St.Thomas-25yr	2:10	8.427
St.Thomas-25yr	2:15	8.026
St.Thomas-25yr	2:20	7.668
St.Thomas-25yr	2:25	7.347
St.Thomas-25yr	2:30	7.056
St.Thomas-25yr	2:35	6.792
St.Thomas-25yr	2:40	6.551
St.Thomas-25yr	2:45	6.329
St.Thomas-25yr	2:50	6.125
St.Thomas-25yr	2:55	5.936
St.Thomas-25yr	3:00	0

St.Thomas-2yr	0:00	3.364
St.Thomas-2yr	0:05	3.574
St.Thomas-2yr	0:10	3.819
St.Thomas-2yr	0:15	4.109
St.Thomas-2yr	0:20	4.46
St.Thomas-2yr	0:25	4.893
St.Thomas-2yr	0:30	5.445
St.Thomas-2yr	0:35	6.177
St.Thomas-2yr	0:40	7.208
St.Thomas-2yr	0:45	8.792
St.Thomas-2yr	0:50	11.634
St.Thomas-2yr	0:55	18.977
St.Thomas-2yr	1:00	133.955
St.Thomas-2yr	1:05	31.129
St.Thomas-2yr	1:10	19.359
St.Thomas-2yr	1:15	14.251
St.Thomas-2yr	1:20	11.538
St.Thomas-2yr	1:25	9.815
St.Thomas-2yr	1:30	8.609
St.Thomas-2yr	1:35	7.709
St.Thomas-2yr	1:40	7.009
St.Thomas-2yr	1:45	6.445
St.Thomas-2yr	1:50	5.98
St.Thomas-2yr	1:55	5.589
St.Thomas-2yr	2:00	5.255
St.Thomas-2yr	2:05	4.965
St.Thomas-2yr	2:10	4.712
St.Thomas-2yr	2:15	4.487
St.Thomas-2yr	2:20	4.287
St.Thomas-2yr	2:25	4.108
St.Thomas-2yr	2:30	3.945
St.Thomas-2yr	2:35	3.797
St.Thomas-2yr	2:40	3.663
St.Thomas-2yr	2:45	3.539
St.Thomas-2yr	2:50	3.425
St.Thomas-2yr	2:55	3.319
St.Thomas-2yr	3:00	0

St.Thomas-50yr	0:00	6.713
St.Thomas-50yr	0:05	7.132
St.Thomas-50yr	0:10	7.62
St.Thomas-50yr	0:15	8.198
St.Thomas-50yr	0:20	8.896
St.Thomas-50yr	0:25	9.759
St.Thomas-50yr	0:30	10.858
St.Thomas-50yr	0:35	12.318
St.Thomas-50yr	0:40	14.37
St.Thomas-50yr	0:45	17.523

```
St.Thomas-50yr             0:50       23.18
St.Thomas-50yr             0:55       37.791
St.Thomas-50yr             1:00       265.331
St.Thomas-50yr             1:05       61.973
St.Thomas-50yr             1:10       38.552
St.Thomas-50yr             1:15       28.387
St.Thomas-50yr             1:20       22.988
St.Thomas-50yr             1:25       19.56
St.Thomas-50yr             1:30       17.158
St.Thomas-50yr             1:35       15.368
St.Thomas-50yr             1:40       13.973
St.Thomas-50yr             1:45       12.85
St.Thomas-50yr             1:50       11.924
St.Thomas-50yr             1:55       11.146
St.Thomas-50yr             2:00       10.48
St.Thomas-50yr             2:05       9.903
St.Thomas-50yr             2:10       9.398
St.Thomas-50yr             2:15       8.951
St.Thomas-50yr             2:20       8.553
St.Thomas-50yr             2:25       8.195
St.Thomas-50yr             2:30       7.871
St.Thomas-50yr             2:35       7.577
St.Thomas-50yr             2:40       7.308
St.Thomas-50yr             2:45       7.061
St.Thomas-50yr             2:50       6.834
St.Thomas-50yr             2:55       6.623
St.Thomas-50yr             3:00       0

St.Thomas-5yr              0:00       4.45
St.Thomas-5yr              0:05       4.727
St.Thomas-5yr              0:10       5.051
St.Thomas-5yr              0:15       5.434
St.Thomas-5yr              0:20       5.897
St.Thomas-5yr              0:25       6.469
St.Thomas-5yr              0:30       7.198
St.Thomas-5yr              0:35       8.165
St.Thomas-5yr              0:40       9.525
St.Thomas-5yr              0:45       11.616
St.Thomas-5yr              0:50       15.367
St.Thomas-5yr              0:55       25.06
St.Thomas-5yr              1:00       175.765
St.Thomas-5yr              1:05       41.113
St.Thomas-5yr              1:10       25.564
St.Thomas-5yr              1:15       18.821
St.Thomas-5yr              1:20       15.24
St.Thomas-5yr              1:25       12.967
St.Thomas-5yr              1:30       11.374
St.Thomas-5yr              1:35       10.187
St.Thomas-5yr              1:40       9.262
St.Thomas-5yr              1:45       8.518
St.Thomas-5yr              1:50       7.904
St.Thomas-5yr              1:55       7.388
St.Thomas-5yr              2:00       6.947
St.Thomas-5yr              2:05       6.564
St.Thomas-5yr              2:10       6.229
St.Thomas-5yr              2:15       5.933
St.Thomas-5yr              2:20       5.669
St.Thomas-5yr              2:25       5.432
St.Thomas-5yr              2:30       5.217
St.Thomas-5yr              2:35       5.022
St.Thomas-5yr              2:40       4.844
St.Thomas-5yr              2:45       4.68
St.Thomas-5yr              2:50       4.53
St.Thomas-5yr              2:55       4.39
St.Thomas-5yr              3:00       0

SubcatchmentOff  0         0          0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       408384.2687      4726164.0011      409743.5233      4727225.3229
```

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```
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
J1               409380.656       4726557.934
J2               409496.134       4726607.018
Lake_Road_Drain  409427.439       4726212.834
Marr_Drain       409524.981       4726610.699
Overflow         409509.094       4726642.465
SU1              409337.823       4726547.929

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
HIGHFLOW         409350.384       4726542.229
HIGHFLOW         409375.844       4726549.032
LOWFLOW          409347.032       4726557.676
LOWFLOW          409369.503       4726563.601
OVERFLOW         409343.269       4726568.237

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
EXT1             408758.758       4726909.076
EXT1             408912.976       4727035.45
EXT1             408998.576       4726881.216
EXT1             409019.734       4726855.43
EXT1             409050.74        4726833.178
EXT1             409048.959       4726790.311
EXT1             409038.309       4726776.44
EXT1             409035.891       4726718.903
EXT1             409032.787       4726719.787
EXT1             409029.631       4726720.461
EXT1             409026.437       4726720.92
EXT1             409023.218       4726721.163
EXT1             409019.991       4726721.189
EXT1             409016.769       4726720.997
EXT1             409013.568       4726720.588
EXT1             409010.401       4726719.965
EXT1             409007.284       4726719.13
EXT1             408838.134       4726667.653
EXT1             408826.781       4726666.006
EXT1             408815.31        4726665.938
EXT1             408803.938       4726667.451
EXT1             408798.358       4726668.792
EXT1             408792.884       4726670.515
EXT1             408787.541       4726672.612
EXT1             408777.353       4726677.885
EXT1             408775.403       4726679.166
EXT1             408767.989       4726684.511
EXT1             408763.672       4726688.292
EXT1             408759.626       4726692.363
EXT1             408755.871       4726696.703
EXT1             408752.424       4726701.292
EXT1             408746.521       4726711.128
EXT1             408744.092       4726716.328
EXT1             408742.028       4726721.683
EXT1             408740.339       4726727.168
EXT1             408739.543       4726730.576
EXT1             408738.988       4726734.031
EXT1             408738.677       4726737.517
EXT1             408738.609       4726741.016
EXT1             408738.787       4726744.511
EXT1             408739.208       4726747.985
EXT1             408739.872       4726751.421
EXT1             408740.774       4726754.802
EXT1             408741.911       4726758.112
EXT1             408743.276       4726761.334
EXT1             408744.864       4726764.453
EXT1             408746.665       4726767.453
EXT1             408748.619       4726770.7
EXT1             408750.349       4726774.071
EXT1             408751.846       4726777.552
EXT1             408753.104       4726781.127
EXT1             408754.116       4726784.778
EXT1             408754.878       4726788.49
EXT1             408755.387       4726792.245
EXT1             408755.64        4726796.026
EXT1             408755.635       4726799.815
```

EXT1	408755.374	4726803.596
EXT1	408755.093	4726805.636
EXT1	408754.087	4726811.06
EXT1	408753.067	4726814.709
EXT1	408751.802	4726818.281
EXT1	408750.297	4726821.759
EXT1	408748.741	4726825.373
EXT1	408746.208	4726832.269
EXT1	408744.734	4726837.715
EXT1	408743.652	4726843.253
EXT1	408742.965	4726848.853
EXT1	408742.746	4726853.167
EXT1	408742.707	4726855.855
EXT1	408742.795	4726860.129
EXT1	408743.311	4726865.748
EXT1	408743.592	4726867.459
EXT1	408744.225	4726871.316
EXT1	408745.533	4726876.804
EXT1	408747.229	4726882.186
EXT1	408749.302	4726887.433
EXT1	408758.758	4726909.076
EXT2	409035.891	4726718.903
EXT2	409020.686	4726357.078
EXT2	409020.686	4726357.078
EXT2	408980.096	4726341.806
EXT2	408980.096	4726341.806
EXT2	408978.671	4726341.325
EXT2	408977.216	4726340.945
EXT2	408975.738	4726340.666
EXT2	408974.244	4726340.489
EXT2	408972.742	4726340.417
EXT2	408971.238	4726340.449
EXT2	408969.74	4726340.585
EXT2	408968.255	4726340.824
EXT2	408966.79	4726341.166
EXT2	408965.352	4726341.608
EXT2	408963.949	4726342.149
EXT2	408962.586	4726342.785
EXT2	408961.27	4726343.515
EXT2	408960.009	4726344.334
EXT2	408958.807	4726345.238
EXT2	408957.67	4726346.223
EXT2	408956.604	4726347.284
EXT2	408955.615	4726348.417
EXT2	408954.706	4726349.615
EXT2	408953.882	4726350.874
EXT2	408953.148	4726352.187
EXT2	408953.148	4726352.187
EXT2	408952.615	4726353.316
EXT2	408952.162	4726354.48
EXT2	408951.792	4726355.672
EXT2	408951.505	4726356.887
EXT2	408951.303	4726358.119
EXT2	408951.188	4726359.363
EXT2	408951.16	4726360.611
EXT2	408951.219	4726361.858
EXT2	408951.364	4726363.098
EXT2	408951.595	4726364.325
EXT2	408951.911	4726365.533
EXT2	408951.911	4726365.533
EXT2	408952.331	4726367.133
EXT2	408952.638	4726368.759
EXT2	408952.831	4726370.402
EXT2	408952.91	4726372.055
EXT2	408952.874	4726373.709
EXT2	408952.724	4726375.357
EXT2	408952.459	4726376.99
EXT2	408952.082	4726378.601
EXT2	408951.594	4726380.181
EXT2	408950.998	4726381.725
EXT2	408950.295	4726383.223
EXT2	408949.491	4726384.668
EXT2	408948.588	4726386.055
EXT2	408947.591	4726387.375
EXT2	408946.505	4726388.623
EXT2	408945.335	4726389.793
EXT2	408944.087	4726390.879
EXT2	408942.766	4726391.875
EXT2	408941.379	4726392.777
EXT2	408939.933	4726393.581

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EXT2	408938.435	4726394.283
EXT2	408936.892	4726394.879
EXT2	408935.311	4726395.367
EXT2	408933.7	4726395.743
EXT2	408932.066	4726396.007
EXT2	408930.419	4726396.157
EXT2	408928.765	4726396.193
EXT2	408927.112	4726396.113
EXT2	408925.469	4726395.919
EXT2	408923.844	4726395.611
EXT2	408922.243	4726395.192
EXT2	408922.243	4726395.192
EXT2	408921.455	4726394.985
EXT2	408920.654	4726394.834
EXT2	408919.844	4726394.74
EXT2	408919.03	4726394.702
EXT2	408918.215	4726394.721
EXT2	408917.404	4726394.797
EXT2	408916.599	4726394.93
EXT2	408915.806	4726395.119
EXT2	408915.029	4726395.363
EXT2	408914.27	4726395.66
EXT2	408913.534	4726396.01
EXT2	408912.824	4726396.41
EXT2	408912.143	4726396.859
EXT2	408911.496	4726397.355
EXT2	408910.885	4726397.894
EXT2	408910.313	4726398.475
EXT2	408909.784	4726399.095
EXT2	408909.299	4726399.749
EXT2	408908.86	4726400.437
EXT2	408908.471	4726401.153
EXT2	408908.133	4726401.895
EXT2	408907.848	4726402.658
EXT2	408907.617	4726403.44
EXT2	408907.441	4726404.236
EXT2	408907.321	4726405.042
EXT2	408907.257	4726405.854
EXT2	408907.251	4726406.669
EXT2	408907.302	4726407.483
EXT2	408907.409	4726408.291
EXT2	408907.409	4726408.291
EXT2	408907.982	4726412.617
EXT2	408908.249	4726416.972
EXT2	408908.206	4726421.335
EXT2	408907.856	4726425.684
EXT2	408907.199	4726429.998
EXT2	408906.239	4726434.254
EXT2	408904.98	4726438.432
EXT2	408903.43	4726442.511
EXT2	408901.595	4726446.469
EXT2	408899.485	4726450.289
EXT2	408897.11	4726453.949
EXT2	408894.483	4726457.433
EXT2	408891.616	4726460.722
EXT2	408888.523	4726463.8
EXT2	408885.221	4726466.653
EXT2	408881.726	4726469.264
EXT2	408878.054	4726471.622
EXT2	408874.226	4726473.715
EXT2	408870.259	4726475.532
EXT2	408866.173	4726477.064
EXT2	408861.99	4726478.304
EXT2	408857.729	4726479.245
EXT2	408853.412	4726479.882
EXT2	408849.062	4726480.213
EXT2	408849.062	4726480.213
EXT2	408826.184	4726479.1
EXT2	408826.184	4726479.1
EXT2	408821.659	4726479.036
EXT2	408817.14	4726479.284
EXT2	408812.648	4726479.842
EXT2	408808.206	4726480.709
EXT2	408803.834	4726481.88
EXT2	408799.553	4726483.349
EXT2	408795.384	4726485.11
EXT2	408791.345	4726487.154
EXT2	408787.458	4726489.471
EXT2	408783.739	4726492.05
EXT2	408780.206	4726494.88

EXT2	408776.877	4726497.946
EXT2	408773.767	4726501.235
EXT2	408770.891	4726504.73
EXT2	408768.263	4726508.414
EXT2	408765.895	4726512.271
EXT2	408763.798	4726516.282
EXT2	408761.983	4726520.428
EXT2	408760.458	4726524.69
EXT2	408759.229	4726529.046
EXT2	408758.304	4726533.476
EXT2	408757.686	4726537.96
EXT2	408757.379	4726542.475
EXT2	408757.384	4726547.001
EXT2	408757.7	4726551.516
EXT2	408757.7	4726551.516
EXT2	408758.011	4726555.967
EXT2	408758.013	4726560.428
EXT2	408757.707	4726564.879
EXT2	408757.092	4726569.298
EXT2	408756.174	4726573.664
EXT2	408754.955	4726577.956
EXT2	408753.442	4726582.153
EXT2	408751.642	4726586.235
EXT2	408749.564	4726590.183
EXT2	408747.217	4726593.978
EXT2	408744.613	4726597.601
EXT2	408741.765	4726601.034
EXT2	408738.685	4726604.263
EXT2	408735.39	4726607.27
EXT2	408731.894	4726610.042
EXT2	408728.215	4726612.566
EXT2	408724.369	4726614.828
EXT2	408720.377	4726616.819
EXT2	408716.256	4726618.528
EXT2	408712.026	4726619.949
EXT2	408707.709	4726621.072
EXT2	408707.709	4726621.072
EXT2	408704.99	4726621.779
EXT2	408702.325	4726622.669
EXT2	408699.728	4726623.739
EXT2	408697.209	4726624.984
EXT2	408694.782	4726626.399
EXT2	408692.457	4726627.975
EXT2	408690.245	4726629.707
EXT2	408688.156	4726631.585
EXT2	408686.201	4726633.602
EXT2	408684.387	4726635.748
EXT2	408682.725	4726638.012
EXT2	408681.221	4726640.385
EXT2	408679.882	4726642.855
EXT2	408678.715	4726645.411
EXT2	408677.726	4726648.04
EXT2	408676.918	4726650.731
EXT2	408676.296	4726653.47
EXT2	408675.863	4726656.246
EXT2	408675.62	4726659.044
EXT2	408675.568	4726661.853
EXT2	408675.568	4726661.853
EXT2	408675.514	4726664.661
EXT2	408675.261	4726667.458
EXT2	408674.811	4726670.23
EXT2	408674.167	4726672.964
EXT2	408673.332	4726675.645
EXT2	408672.309	4726678.26
EXT2	408671.105	4726680.797
EXT2	408669.724	4726683.243
EXT2	408668.174	4726685.584
EXT2	408666.463	4726687.811
EXT2	408664.598	4726689.911
EXT2	408662.591	4726691.875
EXT2	408660.449	4726693.692
EXT2	408658.185	4726695.353
EXT2	408655.809	4726696.85
EXT2	408653.333	4726698.176
EXT2	408650.77	4726699.323
EXT2	408648.132	4726700.287
EXT2	408645.433	4726701.062
EXT2	408642.686	4726701.645
EXT2	408642.686	4726701.645
EXT2	408630.659	4726700.274

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EXT2	408618.566	4726699.749
EXT2	408606.466	4726700.074
EXT2	408594.419	4726701.247
EXT2	408582.483	4726703.262
EXT2	408570.719	4726706.109
EXT2	408559.183	4726709.775
EXT2	408547.932	4726714.241
EXT2	408537.023	4726719.485
EXT2	408526.508	4726725.482
EXT2	408516.44	4726732.201
EXT2	408506.868	4726739.61
EXT2	408497.839	4726747.672
EXT2	408489.398	4726756.347
EXT2	408481.586	4726765.594
EXT2	408474.443	4726775.365
EXT2	408468.002	4726785.614
EXT2	408462.296	4726796.289
EXT2	408462.296	4726796.289
EXT2	408461.692	4726797.421
EXT2	408461.01	4726798.507
EXT2	408460.254	4726799.544
EXT2	408459.428	4726800.525
EXT2	408458.536	4726801.447
EXT2	408457.582	4726802.304
EXT2	408456.57	4726803.093
EXT2	408455.506	4726803.81
EXT2	408454.395	4726804.451
EXT2	408453.242	4726805.013
EXT2	408452.052	4726805.493
EXT2	408450.832	4726805.889
EXT2	408449.587	4726806.2
EXT2	408448.324	4726806.423
EXT2	408447.048	4726806.557
EXT2	408447.048	4726806.557
EXT2	408446.053	4726823.971
EXT2	408446.053	4726823.971
EXT2	408675.644	4726843.402
EXT2	408675.644	4726843.402
EXT2	408758.758	4726909.076
EXT2	408758.758	4726909.076
EXT2	408749.302	4726887.433
EXT2	408749.302	4726887.433
EXT2	408747.229	4726882.186
EXT2	408745.533	4726876.804
EXT2	408744.225	4726871.316
EXT2	408743.311	4726865.748
EXT2	408742.795	4726860.129
EXT2	408742.679	4726854.488
EXT2	408742.965	4726848.853
EXT2	408743.652	4726843.253
EXT2	408744.734	4726837.715
EXT2	408746.208	4726832.269
EXT2	408748.066	4726826.941
EXT2	408750.297	4726821.759
EXT2	408750.297	4726821.759
EXT2	408751.802	4726818.281
EXT2	408753.067	4726814.709
EXT2	408754.087	4726811.06
EXT2	408754.858	4726807.35
EXT2	408755.374	4726803.596
EXT2	408755.635	4726799.815
EXT2	408755.64	4726796.026
EXT2	408755.387	4726792.245
EXT2	408754.878	4726788.49
EXT2	408754.116	4726784.778
EXT2	408753.104	4726781.127
EXT2	408751.846	4726777.552
EXT2	408750.349	4726774.071
EXT2	408748.619	4726770.7
EXT2	408746.665	4726767.453
EXT2	408746.665	4726767.453
EXT2	408744.864	4726764.453
EXT2	408743.276	4726761.334
EXT2	408741.911	4726758.112
EXT2	408740.774	4726754.802
EXT2	408739.872	4726751.421
EXT2	408739.208	4726747.985
EXT2	408738.787	4726744.511
EXT2	408738.609	4726741.016
EXT2	408738.677	4726737.517

EXT2	408738.988	4726734.031
EXT2	408739.543	4726730.576
EXT2	408740.339	4726727.168
EXT2	408740.339	4726727.168
EXT2	408742.028	4726721.683
EXT2	408744.092	4726716.328
EXT2	408746.521	4726711.128
EXT2	408749.303	4726706.108
EXT2	408752.424	4726701.292
EXT2	408755.871	4726696.703
EXT2	408759.626	4726692.363
EXT2	408763.672	4726688.292
EXT2	408767.989	4726684.511
EXT2	408772.557	4726681.036
EXT2	408777.353	4726677.885
EXT2	408782.356	4726675.072
EXT2	408787.541	4726672.612
EXT2	408792.884	4726670.515
EXT2	408798.358	4726668.792
EXT2	408803.938	4726667.451
EXT2	408809.598	4726666.498
EXT2	408815.31	4726665.938
EXT2	408821.047	4726665.774
EXT2	408826.781	4726666.006
EXT2	408832.486	4726666.634
EXT2	408838.134	4726667.653
EXT2	408838.134	4726667.653
EXT2	409007.284	4726719.13
EXT2	409007.284	4726719.13
EXT2	409010.401	4726719.965
EXT2	409013.568	4726720.588
EXT2	409016.769	4726720.997
EXT2	409019.991	4726721.189
EXT2	409023.218	4726721.163
EXT2	409026.437	4726720.92
EXT2	409029.631	4726720.461
EXT2	409032.787	4726719.787
EXT2	409035.891	4726718.903
EXT2	409035.891	4726718.903
P1	409288.423	4726680.547
P1	409305.187	4726656.825
P1	409309.443	4726650.835
P1	409352.533	4726589.926
P1	409392.093	4726548.739
P1	409398.327	4726542.248
P1	409425.428	4726514.033
P1	409396.873	4726511.317
P1	409399.997	4726478.466
P1	409341.275	4726472.882
P1	409338.16	4726505.64
P1	409314.242	4726501.299
P1	409266.749	4726477.009
P1	409254.06	4726487.697
P1	409248.741	4726489.416
P1	409245.552	4726489.51
P1	409240.786	4726494.267
P1	409237.404	4726496.486
P1	409221.5	4726500.492
P1	409212.127	4726510.241
P1	409206.383	4726516.963
P1	409202.328	4726519.128
P1	409196.245	4726519.882
P1	409190.204	4726527
P1	409171.212	4726546.865
P1	409168.837	4726548.696
P1	409159.883	4726551.02
P1	409288.423	4726680.547
P2	409097.889	4726868.606
P2	409066.21	4726816.118
P2	409072.18	4726812.529
P2	409079.361	4726805.046
P2	409071.812	4726790.453
P2	409063.578	4726778.521
P2	409094.194	4726729.301
P2	409056.669	4726691.081
P2	409057.613	4726623.607
P2	409113.493	4726568.154
P2	409116.522	4726566.672
P2	409119.551	4726565.19
P2	409123.558	4726563.367

P2	409127.947	4726561.504
P2	409130.969	4726560.247
P2	409136.666	4726558.08
P2	409159.884	4726551.019
P2	409288.423	4726680.547
P2	409270.833	4726705.411
P2	409259.652	4726709.166
P2	409213.454	4726753.926
P2	409097.889	4726868.606
P3	409553.456	4726468.243
P3	409560.945	4726487.198
P3	409565.144	4726505.534
P3	409550.588	4726510.153
P3	409535.611	4726515.471
P3	409523.574	4726524.569
P3	409458.337	4726601.786
P3	409450.435	4726608.175
P3	409438.498	4726618.346
P3	409426.729	4726629.275
P3	409417.314	4726638.942
P3	409407.562	4726650.795
P3	409396.55	4726662.06
P3	409385.706	4726673.408
P3	409376.021	4726686.154
P3	409365.667	4726697.447
P3	409355.565	4726709.177
P3	409347.471	4726722.763
P3	409320.83	4726759.233
P3	409312.808	4726772.358
P3	409298.304	4726801.955
P3	409359.509	4726836.6
P3	409455.492	4726665.528
P3	409565.229	4726550.967
P3	409566.924	4726538.894
P3	409593.178	4726508.801
P3	409621.428	4726480.542
P3	409625.563	4726451.926
P3	409553.456	4726468.243
P4	409298.304	4726801.955
P4	409312.808	4726772.358
P4	409320.83	4726759.233
P4	409347.471	4726722.763
P4	409355.565	4726709.177
P4	409365.667	4726697.447
P4	409376.021	4726686.154
P4	409385.706	4726673.408
P4	409396.55	4726662.06
P4	409407.562	4726650.795
P4	409417.314	4726638.942
P4	409426.729	4726629.275
P4	409438.498	4726618.346
P4	409450.435	4726608.175
P4	409458.337	4726601.786
P4	409523.574	4726524.569
P4	409535.611	4726515.471
P4	409550.588	4726510.153
P4	409565.144	4726505.534
P4	409560.945	4726487.198
P4	409553.456	4726468.243
P4	409545.736	4726434.059
P4	409545.144	4726415.959
P4	409574.327	4726304.953
P4	409574.094	4726301.157
P4	409575.331	4726289.257
P4	409581.441	4726265.908
P4	409526.869	4726260.582
P4	409517.51	4726259.653
P4	409493.174	4726258.347
P4	409478.904	4726257.357
P4	409454.993	4726255.564
P4	409418.13	4726250.624
P4	409379.037	4726250.161
P4	409364.759	4726249.243
P4	409350.489	4726248.254
P4	409336.254	4726247.267
P4	409317.182	4726244.996
P4	409285.689	4726240.868
P4	409276.97	4726242.655
P4	409271.455	4726240.312
P4	409270.157	4726251.08

P4	409279.283	4726274.733
P4	409273.839	4726292.203
P4	409267.349	4726323.112
P4	409257.796	4726368.848
P4	409267.967	4726382.318
P4	409274.559	4726386.397
P4	409278.244	4726390.044
P4	409279.645	4726395.877
P4	409279.748	4726416.918
P4	409271.726	4726447.192
P4	409270.482	4726454.646
P4	409266.749	4726477.009
P4	409314.242	4726501.299
P4	409338.16	4726505.64
P4	409341.275	4726472.882
P4	409399.997	4726478.466
P4	409396.873	4726511.317
P4	409425.428	4726514.033
P4	409398.327	4726542.248
P4	409392.093	4726548.739
P4	409360.157	4726581.989
P4	409352.533	4726589.926
P4	409309.443	4726650.835
P4	409305.187	4726656.825
P4	409288.435	4726680.559
P4	409270.833	4726705.411
P4	409259.652	4726709.166
P4	409213.454	4726753.926
P4	409298.304	4726801.955
P5	409066.21	4726816.118
P5	409056.914	4726800.678
P5	409038.309	4726776.43
P5	409020.686	4726357.078
P5	409041.232	4726345.667
P5	409055.725	4726350.146
P5	409071.799	4726356.985
P5	409085.75	4726360.416
P5	409096.195	4726357.669
P5	409113.322	4726344.994
P5	409127.484	4726331.988
P5	409138.35	4726325.403
P5	409152.181	4726326.385
P5	409161.406	4726329.021
P5	409173.416	4726322.766
P5	409178.624	4726314.956
P5	409180.114	4726305.734
P5	409175.659	4726291.912
P5	409176.487	4726279.237
P5	409182.913	4726266.562
P5	409192.289	4726256.028
P5	409205.142	4726251.913
P5	409217.648	4726251.417
P5	409236.656	4726257.671
P5	409270.157	4726251.08
P5	409279.283	4726274.733
P5	409274.103	4726291.344
P5	409257.796	4726368.848
P5	409267.967	4726382.318
P5	409274.588	4726386.462
P5	409278.244	4726390.044
P5	409279.645	4726395.877
P5	409279.748	4726416.918
P5	409271.726	4726447.192
P5	409269.238	4726462.1
P5	409266.749	4726477.009
P5	409254.06	4726487.697
P5	409248.741	4726489.416
P5	409245.552	4726489.51
P5	409240.786	4726494.267
P5	409237.404	4726496.486
P5	409229.334	4726498.29
P5	409221.5	4726500.492
P5	409212.127	4726510.241
P5	409206.383	4726516.963
P5	409202.328	4726519.128
P5	409196.245	4726519.882
P5	409190.204	4726527
P5	409171.212	4726546.865
P5	409168.837	4726548.696
P5	409159.886	4726551.019

DEL22-025 – Kettle Creek Subdivision
Post-Development – Ultimate Conditions - PCSWMM Input

P5	409136.666	4726558.08
P5	409130.969	4726560.247
P5	409124.925	4726562.761
P5	409122.191	4726563.973
P5	409119.551	4726565.19
P5	409113.493	4726568.154
P5	409057.613	4726623.607
P5	409056.668	4726691.17
P5	409094.194	4726729.301
P5	409063.578	4726778.521
P5	409071.812	4726790.453
P5	409079.361	4726805.046
P5	409072.18	4726812.529
P5	409066.21	4726816.118
P6	409504.503	4726918.672
P6	409359.509	4726836.6
P6	409312.905	4726810.22
P6	409213.454	4726753.926
P6	409097.888	4726868.608
P6	409061.068	4726807.596
P6	409056.914	4726800.678
P6	409048.959	4726790.311
P6	409050.74	4726833.178
P6	409019.734	4726855.43
P6	408998.576	4726881.216
P6	408979.886	4726916.247
P6	408952.004	4726967.783
P6	408932.487	4727004.183
P6	408923.735	4727017.815
P6	408912.976	4727035.45
P6	408947.049	4727070.809
P6	408993.165	4727106.037
P6	409022.632	4727128.518
P6	409073.036	4727155.766
P6	409127.725	4727169.205
P6	409185.902	4727177.081
P6	409214.925	4727176.164
P6	409241.884	4727168.594
P6	409278.702	4727154.217
P6	409340.88	4727126.7
P6	409351.945	4727117.363
P6	409371.226	4727097.739
P6	409396.275	4727072.084
P6	409411.697	4727050.411
P6	409427.286	4727028.977
P6	409441.624	4727008.879
P6	409457.517	4726986.986
P6	409467.485	4726974.582
P6	409478.903	4726959.268
P6	409488.612	4726945.874
P6	409494.973	4726940.153
P6	409489.492	4726939.316
P6	409504.503	4726918.672
P6	409504.503	4726918.672
P7	409670.238	4726337.583
P7	409668.885	4726346.23
P7	409668.209	4726350.554
P7	409667.871	4726352.716
P7	409667.702	4726353.797
P7	409667.475	4726354.878
P7	409659.469	4726389.456
P7	409651.463	4726424.034
P7	409647.461	4726441.323
P7	409646.804	4726444.16
P7	409646.773	4726444.171
P7	409646.71	4726444.186
P7	409646.46	4726444.246
P7	409645.459	4726444.485
P7	409643.458	4726444.964
P7	409627.446	4726448.793
P7	409625.952	4726449.15
P7	409625.845	4726449.909
P7	409625.562	4726451.926
P7	409553.456	4726468.243
P7	409545.736	4726434.059
P7	409545.091	4726416.343
P7	409574.327	4726304.953
P7	409574.094	4726301.157
P7	409575.331	4726289.257
P7	409581.441	4726265.908

```
P7              409526.869       4726260.582
P7              409517.51        4726259.653
P7              409493.174       4726258.347
P7              409478.904       4726257.357
P7              409454.993       4726255.564
P7              409418.13        4726250.624
P7              409371.898       4726249.702
P7              409364.759       4726249.243
P7              409350.489       4726248.254
P7              409336.254       4726247.267
P7              409317.182       4726244.996
P7              409285.689       4726240.868
P7              409276.97        4726242.655
P7              409271.455       4726240.312
P7              409270.157       4726251.08
P7              409236.656       4726257.671
P7              409217.648       4726251.417
P7              409205.142       4726251.913
P7              409192.289       4726256.028
P7              409182.913       4726266.562
P7              409176.487       4726279.237
P7              409175.659       4726291.912
P7              409180.114       4726305.734
P7              409178.624       4726314.956
P7              409173.416       4726322.766
P7              409161.406       4726329.021
P7              409152.181       4726326.385
P7              409138.35        4726325.403
P7              409127.484       4726331.988
P7              409113.322       4726344.994
P7              409096.195       4726357.669
P7              409085.75        4726360.416
P7              409071.799       4726356.985
P7              409055.725       4726350.146
P7              409041.232       4726345.667
P7              409020.685       4726357.079
P7              409019.659       4726332.658
P7              409018.829       4726312.915
P7              409018.414       4726303.043
P7              409018.207       4726298.107
P7              409018.155       4726296.873
P7              409018.148       4726296.719
P7              409018.145       4726296.641
P7              409018.14        4726296.515
P7              409018.129       4726296.261
P7              409018.086       4726295.248
P7              409015.36        4726230.396
P7              409014.678       4726214.183
P7              409014.636       4726213.169
P7              409014.599       4726212.283
P7              409014.6         4726212.243
P7              409014.607       4726212.243
P7              409014.85        4726212.262
P7              409015.334       4726212.3
P7              409016.304       4726212.375
P7              409020.183       4726212.677
P7              409024.061       4726212.978
P7              409024.546       4726213.016
P7              409024.667       4726213.025
P7              409024.697       4726213.028
P7              409024.871       4726213.041
P7              409025.101       4726213.059
P7              409025.56        4726213.095
P7              409026.479       4726213.166
P7              409030.154       4726213.451
P7              409044.854       4726214.592
P7              409103.654       4726219.155
P7              409221.254       4726228.281
P7              409456.455       4726246.533
P7              409574.055       4726255.659
P7              409632.855       4726260.222
P7              409636.53        4726260.508
P7              409636.989       4726260.543
P7              409637.482       4726260.582
P7              409638.016       4726260.623
P7              409639.083       4726260.706
P7              409641.217       4726260.871
P7              409675.369       4726263.522
P7              409679.638       4726263.853
P7              409680.705       4726263.936
```

DEL22-025 – Kettle Creek Subdivision
Post-Development – Ultimate Conditions - PCSWMM Input

```
P7              409681.739       4726264.016
P7              409681.733       4726264.078
P7              409681.056       4726268.401
P7              409678.352       4726285.697
P7              409672.942       4726320.287
P7              409670.238       4726337.583
P7              409670.238       4726337.583

[SYMBOLS]
;;Gage          X-Coord          Y-Coord
;;-------------- ---------------- ----------------
a
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

DEL22-025 - Post-Development - Ultimate


*************
Element Count
*************
Number of rain gages ...... 2
Number of subcatchments ... 9
Number of nodes ........... 6
Number of links ........... 5
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                      Data       Recording
Name                 Data Source                      Type       Interval
--------------------------------------------------------------------------
SBM-Development      SubcatchmentOff                  CUMULATIVE   1 min.
St.Thomas            St.Thomas-2yr                    INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                        Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
EXT1                        7.61    253.53      2.00    5.0000 St.Thomas            SU1
EXT2                       11.47    229.44      2.00    5.0000 St.Thomas            SU1
P1                          2.75    275.30     14.00    1.0000 St.Thomas            SU1
P2                          4.07    169.71     71.00    1.0000 St.Thomas            SU1
P3                          2.05    683.00     16.00    4.0000 St.Thomas            Marr_Drain
P4                          9.94    397.68     36.00    1.0000 St.Thomas            SU1
P5                          6.57    243.30      2.00   15.0000 St.Thomas            SU1
P6                         15.86    396.60     45.00    2.0000 SBM-Development      SU1
P7                          4.57    457.30      0.00    2.0000 St.Thomas            Lake_Road_Drain


************
Node Summary
************
                                           Invert      Max.    Ponded    External
Name                 Type                   Elev.     Depth      Area    Inflow
-------------------------------------------------------------------------------
J1                   JUNCTION              176.00      2.60       0.0
J2                   JUNCTION              175.50      2.00       0.0
Lake_Road_Drain      OUTFALL               175.00      0.00       0.0
Marr_Drain           OUTFALL               175.00      2.26       0.0
Overflow             OUTFALL               175.50      0.00       0.0
SU1                  STORAGE               174.50      4.07       0.0    Yes


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
1                J1               J2               CONDUIT          123.2    0.2192    0.0130
2                J2               Marr_Drain       CONDUIT            9.2    0.2174    0.0130
HIGHFLOW         SU1              J1               CONDUIT           15.0    0.3333    0.0130
LOWFLOW          SU1              J1               CONDUIT           18.6   -3.9816    0.0130
OVERFLOW         SU1              Overflow         WEIR


*********************
Cross Section Summary
*********************
                                        Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape                 Depth     Area     Rad.    Width  Barrels     Flow
---------------------------------------------------------------------------------------
1                CIRCULAR               1.35     1.43     0.34     1.35        1  2498.81
2                CIRCULAR               1.35     1.43     0.34     1.35        1  2488.73
HIGHFLOW         CIRCULAR               1.20     1.13     0.30     1.20        1  2251.07
LOWFLOW          CIRCULAR               0.45     0.16     0.11     0.45        1   568.94
```

DEL22-025 Kettle Creek Subdivision
2-Year Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

```
*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 04/10/2015 00:00:00
Ending Date .............. 04/13/2015 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         1.607        24.766
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         1.297        19.990
Surface Runoff ...........         0.247         3.802
Final Storage ............         0.064         0.979
Continuity Error (%) .....        -0.018


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.247         2.468
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.114         1.140
External Outflow .........         0.357         3.571
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.904         9.037
Final Stored Volume ......         0.907         9.073
Continuity Error (%) .....         0.000


***************************
Time-Step Critical Elements
***************************
None


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
```

```
Average Time Step          :     1.00 sec
Maximum Time Step          :     1.00 sec
Percent in Steady State    :     0.00
Average Iterations per Step :    2.00
Percent Not Converging     :     0.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
EXT1	32.78	0.00	0.00	30.78	0.73	0.06	56.60	0.022
EXT2	32.78	0.00	0.00	30.82	0.69	0.08	85.37	0.021
P1	32.78	0.00	0.00	26.98	4.52	0.12	142.97	0.138
P2	32.78	0.00	0.00	9.09	22.27	0.91	677.25	0.680
P3	32.78	0.00	0.00	25.99	5.52	0.11	121.98	0.168
P4	32.78	0.00	0.00	20.13	11.33	1.13	1065.35	0.346
P5	32.78	0.00	0.00	30.71	0.81	0.05	48.88	0.025
P6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
P7	32.78	0.00	0.00	31.34	0.18	0.01	3.72	0.006

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.29	0.48	176.48	0 02:43	0.48
J2	JUNCTION	0.47	0.65	176.15	0 02:44	0.65
Lake_Road_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Marr_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Overflow	OUTFALL	0.00	0.00	175.50	0 00:00	0.00
SU1	STORAGE	1.84	2.13	176.63	0 02:43	2.13

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.00	166.51	0 02:42	0	3.45	0.012
J2	JUNCTION	0.00	166.51	0 02:44	0	3.45	0.015
Lake_Road_Drain	OUTFALL	3.72	3.72	0 03:00	0.00831	0.00831	0.000
Marr_Drain	OUTFALL	121.98	173.63	0 02:50	0.113	3.56	0.000
Overflow	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
SU1	STORAGE	2197.09	2197.09	0 01:05	3.49	12.5	0.001

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

DEL22-025 Kettle Creek Subdivision
2-Year Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	9.317	31	0	0	11.324	38	0 02:43	166.51

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Lake_Road_Drain	2.01	1.60	3.72	0.008
Marr_Drain	100.00	13.75	173.63	3.563
Overflow	0.00	0.00	0.00	0.000
System	34.00	15.34	177.19	3.571

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	166.51	0 02:44	1.07	0.07	0.17
2	CONDUIT	166.51	0 02:44	1.15	0.07	0.16
HIGHFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
LOWFLOW	CONDUIT	166.51	0 02:42	1.40	0.29	0.70
OVERFLOW	WEIR	0.00	0 00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
HIGHFLOW	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LOWFLOW	1.00	0.00	0.00	0.00	0.05	0.00	0.95	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
LOWFLOW	0.01	0.01	72.00	0.01	0.01

```
Analysis begun on:  Thu Aug 01 15:35:47 2024
Analysis ended on:  Thu Aug 01 15:35:50 2024
Total elapsed time: 00:00:03
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

DEL22-025 - Post-Development - Ultimate

Element Count

Number of rain gages 2
Number of subcatchments ... 9
Number of nodes 6
Number of links 5
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
SBM-Development	SubcatchmentOff	CUMULATIVE	1 min.
St.Thomas	St.Thomas-5yr	INTENSITY	5 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
EXT1	7.61	253.53	2.00	5.0000	St.Thomas	SU1
EXT2	11.47	229.44	2.00	5.0000	St.Thomas	SU1
P1	2.75	275.30	14.00	1.0000	St.Thomas	SU1
P2	4.07	169.71	71.00	1.0000	St.Thomas	SU1
P3	2.05	683.00	16.00	4.0000	St.Thomas	Marr_Drain
P4	9.94	397.68	36.00	1.0000	St.Thomas	SU1
P5	6.57	243.30	2.00	15.0000	St.Thomas	SU1
P6	15.86	396.60	45.00	2.0000	SBM-Development	SU1
P7	4.57	457.30	0.00	2.0000	St.Thomas	Lake_Road_Drain

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	176.00	2.60	0.0	
J2	JUNCTION	175.50	2.00	0.0	
Lake_Road_Drain	OUTFALL	175.00	0.00	0.0	
Marr_Drain	OUTFALL	175.00	2.26	0.0	
Overflow	OUTFALL	175.50	0.00	0.0	
SU1	STORAGE	174.50	4.07	0.0	Yes

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
1	J1	J2	CONDUIT	123.2	0.2192	0.0130
2	J2	Marr_Drain	CONDUIT	9.2	0.2174	0.0130
HIGHFLOW	SU1	J1	CONDUIT	15.0	0.3333	0.0130
LOWFLOW	SU1	J1	CONDUIT	18.6	-3.9816	0.0130
OVERFLOW	SU1	Overflow	WEIR			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1	CIRCULAR	1.35	1.43	0.34	1.35	1	2498.81
2	CIRCULAR	1.35	1.43	0.34	1.35	1	2488.73
HIGHFLOW	CIRCULAR	1.20	1.13	0.30	1.20	1	2251.07
LOWFLOW	CIRCULAR	0.45	0.16	0.11	0.45	1	568.94

DEL22-025 Kettle Creek Subdivision
5-Year Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units .... LPS
Process Models:
  Rainfall/Runoff .... YES
  RDII .... NO
  Snowmelt .... NO
  Groundwater .... NO
  Flow Routing .... YES
  Ponding Allowed .... YES
  Water Quality .... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date 04/10/2015 00:00:00
Ending Date 04/13/2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step .... 1.00 sec
Variable Time Step .... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance .... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	2.119	32.648
Evaporation Loss	0.000	0.000
Infiltration Loss	1.652	25.458
Surface Runoff	0.404	6.225
Final Storage	0.063	0.970
Continuity Error (%)	-0.019	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.404	4.040
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.198	1.984
External Outflow	0.599	5.987
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.904	9.037
Final Stored Volume	0.907	9.074
Continuity Error (%)	-0.000	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 0.50 sec

Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
EXT1	43.21	0.00	0.00	39.35	2.62	0.20	74.26	0.061
EXT2	43.21	0.00	0.00	39.84	2.11	0.24	112.02	0.049
P1	43.21	0.00	0.00	34.09	7.84	0.22	187.89	0.182
P2	43.21	0.00	0.00	11.42	30.38	1.24	964.30	0.703
P3	43.21	0.00	0.00	31.67	10.27	0.21	160.04	0.238
P4	43.21	0.00	0.00	25.83	16.06	1.60	1470.12	0.372
P5	43.21	0.00	0.00	38.60	3.37	0.22	64.14	0.078
P6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
P7	43.21	0.00	0.00	39.43	2.54	0.12	21.26	0.059

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.29	0.56	176.56	0 03:05	0.56
J2	JUNCTION	0.47	0.72	176.22	0 03:05	0.72
Lake_Road_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Marr_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Overflow	OUTFALL	0.00	0.00	175.50	0 00:00	0.00
SU1	STORAGE	1.85	2.28	176.78	0 03:04	2.28

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.00	297.93	0 03:04	0	5.66	0.003
J2	JUNCTION	0.00	297.92	0 03:05	0	5.66	0.009
Lake_Road_Drain	OUTFALL	21.26	21.26	0 03:00	0.116	0.116	0.000
Marr_Drain	OUTFALL	160.04	311.14	0 03:00	0.211	5.87	0.000
Overflow	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
SU1	STORAGE	3040.11	3040.11	0 01:05	5.7	14.7	0.002

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

DEL22-025 Kettle Creek Subdivision
5-Year Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	9.403	32	0	0	12.465	42	0 03:04	297.93

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Lake_Road_Drain	3.97	11.31	21.26	0.116
Marr_Drain	100.00	22.65	311.14	5.871
Overflow	0.00	0.00	0.00	0.000
System	34.65	33.96	332.41	5.987

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	297.92	0 03:05	1.27	0.12	0.22
2	CONDUIT	297.92	0 03:05	1.36	0.12	0.21
HIGHFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
LOWFLOW	CONDUIT	297.93	0 03:04	2.23	0.52	0.78
OVERFLOW	WEIR	0.00	0 00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
HIGHFLOW	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LOWFLOW	1.00	0.00	0.00	0.00	0.02	0.04	0.93	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
LOWFLOW	0.01	0.01	72.00	0.01	0.01

Analysis begun on: Thu Aug 01 15:39:36 2024
Analysis ended on: Thu Aug 01 15:39:40 2024
Total elapsed time: 00:00:04

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

DEL22-025 - Post-Development - Ultimate

Element Count

Number of rain gages 2
Number of subcatchments ... 9
Number of nodes 6
Number of links 5
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
SBM-Development	SubcatchmentOff	CUMULATIVE	1 min.
St.Thomas	St.Thomas-10yr	INTENSITY	5 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
EXT1	7.61	253.53	2.00	5.0000	St.Thomas	SU1
EXT2	11.47	229.44	2.00	5.0000	St.Thomas	SU1
P1	2.75	275.30	14.00	1.0000	St.Thomas	SU1
P2	4.07	169.71	71.00	1.0000	St.Thomas	SU1
P3	2.05	683.00	16.00	4.0000	St.Thomas	Marr_Drain
P4	9.94	397.68	36.00	1.0000	St.Thomas	SU1
P5	6.57	243.30	2.00	15.0000	St.Thomas	SU1
P6	15.86	396.60	45.00	2.0000	SBM-Development	SU1
P7	4.57	457.30	0.00	2.0000	St.Thomas	Lake_Road_Drain

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	176.00	2.60	0.0	
J2	JUNCTION	175.50	2.00	0.0	
Lake_Road_Drain	OUTFALL	175.00	0.00	0.0	
Marr_Drain	OUTFALL	175.00	2.26	0.0	
Overflow	OUTFALL	175.50	0.00	0.0	
SU1	STORAGE	174.50	4.07	0.0	Yes

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
1	J1	J2	CONDUIT	123.2	0.2192	0.0130
2	J2	Marr_Drain	CONDUIT	9.2	0.2174	0.0130
HIGHFLOW	SU1	J1	CONDUIT	15.0	0.3333	0.0130
LOWFLOW	SU1	J1	CONDUIT	18.6	-3.9816	0.0130
OVERFLOW	SU1	Overflow	WEIR			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1	CIRCULAR	1.35	1.43	0.34	1.35	1	2498.81
2	CIRCULAR	1.35	1.43	0.34	1.35	1	2488.73
HIGHFLOW	CIRCULAR	1.20	1.13	0.30	1.20	1	2251.07
LOWFLOW	CIRCULAR	0.45	0.16	0.11	0.45	1	568.94

DEL22-025 Kettle Creek Subdivision
10-Year Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units .... LPS
Process Models:
Rainfall/Runoff .... YES
RDII .... NO
Snowmelt .... NO
Groundwater .... NO
Flow Routing .... YES
Ponding Allowed .... YES
Water Quality .... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date 04/10/2015 00:00:00
Ending Date 04/13/2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step .... 1.00 sec
Variable Time Step .... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance .... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	2.451	37.771
Evaporation Loss	0.000	0.000
Infiltration Loss	1.848	28.475
Surface Runoff	0.540	8.324
Final Storage	0.064	0.979
Continuity Error (%)	-0.020	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.540	5.403
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.246	2.459
External Outflow	0.782	7.823
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.904	9.037
Final Stored Volume	0.907	9.075
Continuity Error (%)	-0.000	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 0.50 sec

Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
EXT1	49.99	0.00	0.00	44.02	4.70	0.36	85.96	0.094
EXT2	49.99	0.00	0.00	44.91	3.81	0.44	129.67	0.076
P1	49.99	0.00	0.00	37.97	10.75	0.30	217.60	0.215
P2	49.99	0.00	0.00	12.70	35.89	1.46	1160.24	0.718
P3	49.99	0.00	0.00	34.95	13.78	0.28	185.26	0.276
P4	49.99	0.00	0.00	28.98	19.68	1.96	1741.90	0.394
P5	49.99	0.00	0.00	42.87	5.86	0.39	74.25	0.117
P6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
P7	49.99	0.00	0.00	43.83	4.93	0.23	33.84	0.099

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.30	0.59	176.59	0 03:07	0.59
J2	JUNCTION	0.48	0.75	176.25	0 03:07	0.75
Lake_Road_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Marr_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Overflow	OUTFALL	0.00	0.00	175.50	0 00:00	0.00
SU1	STORAGE	1.86	2.41	176.91	0 03:06	2.41

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.00	373.68	0 03:06	0	7.32	0.002
J2	JUNCTION	0.00	373.67	0 03:07	0	7.32	0.007
Lake_Road_Drain	OUTFALL	33.84	33.84	0 02:35	0.225	0.225	0.000
Marr_Drain	OUTFALL	185.26	389.11	0 03:00	0.282	7.6	0.000
Overflow	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
SU1	STORAGE	3605.28	3605.28	0 01:05	7.35	16.4	0.002

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

DEL22-025 Kettle Creek Subdivision
10-Year Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	9.479	32	0	0	13.496	45	0 03:06	373.68

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Lake_Road_Drain	4.35	19.99	33.84	0.225
Marr_Drain	100.00	29.31	389.11	7.598
Overflow	0.00	0.00	0.00	0.000
System	34.78	49.30	422.13	7.823

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	373.67	0 03:07	1.36	0.15	0.25
2	CONDUIT	373.67	0 03:07	1.45	0.15	0.24
HIGHFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
LOWFLOW	CONDUIT	373.68	0 03:06	2.66	0.66	0.82
OVERFLOW	WEIR	0.00	0 00:00			0.00

****
Flow Classification Summary
****

		---------- Fraction of Time in Flow Class ----------								
Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
HIGHFLOW	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LOWFLOW	1.00	0.00	0.00	0.00	0.02	0.06	0.92	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

	--------- Hours Full --------				
Conduit	Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
LOWFLOW	0.01	0.01	72.00	0.01	0.01

Analysis begun on: Thu Aug 01 15:40:25 2024
Analysis ended on: Thu Aug 01 15:40:28 2024
Total elapsed time: 00:00:03

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

DEL22-025 - Post-Development - Ultimate


*************
Element Count
*************
Number of rain gages ...... 2
Number of subcatchments ... 9
Number of nodes ........... 6
Number of links ........... 5
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
------------------------------------------------------------------------
SBM-Development      SubcatchmentOff              CUMULATIVE   1 min.
St.Thomas            St.Thomas-25yr               INTENSITY    5 min.


********************
Subcatchment Summary
********************
Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
-----------------------------------------------------------------------------------------------------------
EXT1                       7.61    253.53      2.00    5.0000 St.Thomas            SU1
EXT2                      11.47    229.44      2.00    5.0000 St.Thomas            SU1
P1                         2.75    275.30     14.00    1.0000 St.Thomas            SU1
P2                         4.07    169.71     71.00    1.0000 St.Thomas            SU1
P3                         2.05    683.00     16.00    4.0000 St.Thomas            Marr_Drain
P4                         9.94    397.68     36.00    1.0000 St.Thomas            SU1
P5                         6.57    243.30      2.00   15.0000 St.Thomas            SU1
P6                        15.86    396.60     45.00    2.0000 SBM-Development      SU1
P7                         4.57    457.30      0.00    2.0000 St.Thomas            Lake_Road_Drain


************
Node Summary
************
                                         Invert      Max.    Ponded    External
Name                 Type                 Elev.     Depth      Area    Inflow
-----------------------------------------------------------------------------------
J1                   JUNCTION            176.00      2.60       0.0
J2                   JUNCTION            175.50      2.00       0.0
Lake_Road_Drain      OUTFALL             175.00      0.00       0.0
Marr_Drain           OUTFALL             175.00      2.26       0.0
Overflow             OUTFALL             175.50      0.00       0.0
SU1                  STORAGE             174.50      4.07       0.0    Yes


************
Link Summary
************
Name             From Node        To Node          Type            Length    %Slope Roughness
---------------------------------------------------------------------------------------------
1                J1               J2               CONDUIT          123.2    0.2192    0.0130
2                J2               Marr_Drain       CONDUIT            9.2    0.2174    0.0130
HIGHFLOW         SU1              J1               CONDUIT           15.0    0.3333    0.0130
LOWFLOW          SU1              J1               CONDUIT           18.6   -3.9816    0.0130
OVERFLOW         SU1              Overflow         WEIR


*********************
Cross Section Summary
*********************
                                        Full     Full     Hyd.     Max.   No. of     Full
Conduit          Shape                 Depth     Area     Rad.    Width  Barrels     Flow
---------------------------------------------------------------------------------------
1                CIRCULAR               1.35     1.43     0.34     1.35        1  2498.81
2                CIRCULAR               1.35     1.43     0.34     1.35        1  2488.73
HIGHFLOW         CIRCULAR               1.20     1.13     0.30     1.20        1  2251.07
LOWFLOW          CIRCULAR               0.45     0.16     0.11     0.45        1   568.94
```

DEL22-025 Kettle Creek Subdivision
25-Year Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

```
*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ 04/10/2015 00:00:00
Ending Date .............. 04/13/2015 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 8
Number of Threads ........ 1
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         2.874        44.290
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         2.071        31.918
Surface Runoff ...........         0.741        11.414
Final Storage ............         0.063         0.968
Continuity Error (%) .....        -0.022


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.741         7.408
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.336         3.356
External Outflow .........         1.072        10.725
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.904         9.037
Final Stored Volume ......         0.908         9.076
Continuity Error (%) .....        -0.000


***************************
Time-Step Critical Elements
***************************
None


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
```

Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
EXT1	58.62	0.00	0.00	49.34	8.03	0.61	104.08	0.137
EXT2	58.62	0.00	0.00	50.72	6.68	0.77	155.20	0.114
P1	58.62	0.00	0.00	42.38	14.99	0.41	257.48	0.256
P2	58.62	0.00	0.00	14.15	43.08	1.75	1420.43	0.735
P3	58.62	0.00	0.00	38.79	18.58	0.38	224.99	0.317
P4	58.62	0.00	0.00	32.56	24.75	2.46	2098.91	0.422
P5	58.62	0.00	0.00	47.77	9.61	0.63	92.26	0.164
P6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
P7	58.62	0.00	0.00	48.79	8.56	0.39	54.91	0.146

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.31	0.67	176.67	0 03:04	0.67
J2	JUNCTION	0.49	0.83	176.33	0 03:05	0.83
Lake_Road_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Marr_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Overflow	OUTFALL	0.00	0.00	175.50	0 00:00	0.00
SU1	STORAGE	1.88	2.59	177.09	0 03:04	2.59

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
J1	JUNCTION	0.00	567.68	0 03:04	0	9.95	0.002	
J2	JUNCTION	0.00	567.66	0 03:05	0	9.95	0.005	
Lake_Road_Drain	OUTFALL	54.91	54.91	0 02:05	0.392	0.392	0.000	
Marr_Drain	OUTFALL	224.99	586.16	0 03:00	0.381	10.3	0.000	
Overflow	OUTFALL	0.00	0.00	0 00:00	0	0	0.000	ltr
SU1	STORAGE	4364.60	4364.60	0 01:05	9.99	19	0.002	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

DEL22-025 Kettle Creek Subdivision
25-Year Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	9.588	32	0	0	14.970	50	0 03:04	567.68

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Lake_Road_Drain	4.58	33.01	54.91	0.392
Marr_Drain	100.00	39.87	586.16	10.333
Overflow	0.00	0.00	0.00	0.000
System	34.86	72.87	633.75	10.725

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	567.66	0 03:05	1.54	0.23	0.30
2	CONDUIT	567.67	0 03:05	1.63	0.23	0.29
HIGHFLOW	CONDUIT	111.36	0 03:04	1.08	0.05	0.15
LOWFLOW	CONDUIT	456.32	0 03:03	2.99	0.80	0.92
OVERFLOW	WEIR	0.00	0 00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	---------- Fraction of Time in Flow Class ---------- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
HIGHFLOW	1.00	0.96	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00
LOWFLOW	1.00	0.00	0.00	0.00	0.02	0.07	0.90	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
LOWFLOW	0.01	0.01	72.00	0.01	0.01

Analysis begun on: Thu Aug 01 15:41:18 2024
Analysis ended on: Thu Aug 01 15:41:21 2024
Total elapsed time: 00:00:03

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

DEL22-025 - Post-Development - Ultimate

****
Element Count
****

Number of rain gages 2
Number of subcatchments ... 9
Number of nodes 6
Number of links 5
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
SBM-Development	SubcatchmentOff	CUMULATIVE	1 min.
St.Thomas	St.Thomas-50yr	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
EXT1	7.61	253.53	2.00	5.0000	St.Thomas	SU1
EXT2	11.47	229.44	2.00	5.0000	St.Thomas	SU1
P1	2.75	275.30	14.00	1.0000	St.Thomas	SU1
P2	4.07	169.71	71.00	1.0000	St.Thomas	SU1
P3	2.05	683.00	16.00	4.0000	St.Thomas	Marr_Drain
P4	9.94	397.68	36.00	1.0000	St.Thomas	SU1
P5	6.57	243.30	2.00	15.0000	St.Thomas	SU1
P6	15.86	396.60	45.00	2.0000	SBM-Development	SU1
P7	4.57	457.30	0.00	2.0000	St.Thomas	Lake_Road_Drain

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	176.00	2.60	0.0	
J2	JUNCTION	175.50	2.00	0.0	
Lake_Road_Drain	OUTFALL	175.00	0.00	0.0	
Marr_Drain	OUTFALL	175.00	2.26	0.0	
Overflow	OUTFALL	175.50	0.00	0.0	
SU1	STORAGE	174.50	4.07	0.0	Yes

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
1	J1	J2	CONDUIT	123.2	0.2192	0.0130
2	J2	Marr_Drain	CONDUIT	9.2	0.2174	0.0130
HIGHFLOW	SU1	J1	CONDUIT	15.0	0.3333	0.0130
LOWFLOW	SU1	J1	CONDUIT	18.6	-3.9816	0.0130
OVERFLOW	SU1	Overflow	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1	CIRCULAR	1.35	1.43	0.34	1.35	1	2498.81
2	CIRCULAR	1.35	1.43	0.34	1.35	1	2488.73
HIGHFLOW	CIRCULAR	1.20	1.13	0.30	1.20	1	2251.07
LOWFLOW	CIRCULAR	0.45	0.16	0.11	0.45	1	568.94

DEL22-025 Kettle Creek Subdivision
50-Year Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****

Flow Units .... LPS
Process Models:
  Rainfall/Runoff .... YES
  RDII .... NO
  Snowmelt .... NO
  Groundwater .... NO
  Flow Routing .... YES
  Ponding Allowed .... YES
  Water Quality .... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date 04/10/2015 00:00:00
Ending Date 04/13/2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step .... 1.00 sec
Variable Time Step .... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance .... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	3.197	49.258
Evaporation Loss	0.000	0.000
Infiltration Loss	2.226	34.293
Surface Runoff	0.909	14.012
Final Storage	0.063	0.964
Continuity Error (%)	-0.023	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.909	9.094
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.392	3.916
External Outflow	1.297	12.971
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.904	9.037
Final Stored Volume	0.908	9.076
Continuity Error (%)	-0.000	

****
Time-Step Critical Elements
****

None

****
Highest Flow Instability Indexes
****

All links are stable.

****
Routing Time Step Summary
****

Minimum Time Step : 0.50 sec

```
Average Time Step          :     1.00 sec
Maximum Time Step          :     1.00 sec
Percent in Steady State    :     0.00
Average Iterations per Step :    2.00
Percent Not Converging     :     0.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
EXT1	65.19	0.00	0.00	52.99	10.95	0.83	122.47	0.168
EXT2	65.19	0.00	0.00	54.68	9.29	1.07	178.49	0.142
P1	65.19	0.00	0.00	45.42	18.52	0.51	288.97	0.284
P2	65.19	0.00	0.00	15.15	48.66	1.98	1615.61	0.746
P3	65.19	0.00	0.00	41.47	22.46	0.46	265.81	0.344
P4	65.19	0.00	0.00	35.03	28.87	2.87	2364.25	0.443
P5	65.19	0.00	0.00	51.16	12.79	0.84	114.00	0.196
P6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
P7	65.19	0.00	0.00	52.30	11.67	0.53	75.21	0.179

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.31	0.74	176.74	0 03:02	0.74
J2	JUNCTION	0.49	0.89	176.39	0 03:02	0.89
Lake_Road_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Marr_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Overflow	OUTFALL	0.00	0.00	175.50	0 00:00	0.00
SU1	STORAGE	1.89	2.69	177.19	0 03:01	2.69

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.00	741.07	0 03:01	0	12	0.001
J2	JUNCTION	0.00	741.07	0 03:02	0	12	0.004
Lake_Road_Drain	OUTFALL	75.21	75.21	0 01:50	0.534	0.534	0.000
Marr_Drain	OUTFALL	265.81	765.21	0 03:00	0.46	12.4	0.000
Overflow	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
SU1	STORAGE	4949.30	4949.30	0 01:05	12	21.1	0.002

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	9.648	32	0	0	15.848	53	0 03:01	741.07

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Lake_Road_Drain	4.68	43.97	75.21	0.534
Marr_Drain	100.00	47.98	765.21	12.437
Overflow	0.00	0.00	0.00	0.000
System	34.89	91.95	823.81	12.971

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	741.07	0 03:02	1.66	0.30	0.35
2	CONDUIT	741.07	0 03:02	1.76	0.30	0.33
HIGHFLOW	CONDUIT	278.72	0 03:01	1.39	0.12	0.23
LOWFLOW	CONDUIT	469.92	0 02:23	3.01	0.83	0.99
OVERFLOW	WEIR	0.00	0 00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
HIGHFLOW	1.00	0.95	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
LOWFLOW	1.00	0.00	0.00	0.00	0.04	0.06	0.90	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

Conduit	Hours Full Both Ends	Hours Full Upstream	Hours Full Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
LOWFLOW	0.01	0.01	72.00	0.01	0.01

```
Analysis begun on:  Thu Aug 01 15:42:08 2024
Analysis ended on:  Thu Aug 01 15:42:11 2024
Total elapsed time: 00:00:03
```

DEL22-025 Kettle Creek Subdivision
50-Year Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

```
  EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
  --------------------------------------------------------------

  DEL22-025 - Post-Development - Ultimate


  *************
  Element Count
  *************
  Number of rain gages ...... 2
  Number of subcatchments ... 9
  Number of nodes ........... 6
  Number of links ........... 5
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                    Data       Recording
  Name                 Data Source                  Type       Interval
  ------------------------------------------------------------------------
  SBM-Development      SubcatchmentOff              CUMULATIVE   1 min.
  St.Thomas            St.Thomas-100yr              INTENSITY    5 min.


  ********************
  Subcatchment Summary
  ********************
  Name                       Area     Width   %Imperv    %Slope Rain Gage            Outlet
  -----------------------------------------------------------------------------------------------------------
  EXT1                       7.61    253.53      2.00    5.0000 St.Thomas            SU1
  EXT2                      11.47    229.44      2.00    5.0000 St.Thomas            SU1
  P1                         2.75    275.30     14.00    1.0000 St.Thomas            SU1
  P2                         4.07    169.71     71.00    1.0000 St.Thomas            SU1
  P3                         2.05    683.00     16.00    4.0000 St.Thomas            Marr_Drain
  P4                         9.94    397.68     36.00    1.0000 St.Thomas            SU1
  P5                         6.57    243.30      2.00   15.0000 St.Thomas            SU1
  P6                        15.86    396.60     45.00    2.0000 SBM-Development      SU1
  P7                         4.57    457.30      0.00    2.0000 St.Thomas            Lake_Road_Drain


  ************
  Node Summary
  ************
                                           Invert      Max.    Ponded    External
  Name                 Type                 Elev.     Depth      Area    Inflow
  -------------------------------------------------------------------------------
  J1                   JUNCTION            176.00      2.60       0.0
  J2                   JUNCTION            175.50      2.00       0.0
  Lake_Road_Drain      OUTFALL             175.00      0.00       0.0
  Marr_Drain           OUTFALL             175.00      2.26       0.0
  Overflow             OUTFALL             175.50      0.00       0.0
  SU1                  STORAGE             174.50      4.07       0.0    Yes


  ************
  Link Summary
  ************
  Name             From Node        To Node          Type            Length    %Slope Roughness
  ---------------------------------------------------------------------------------------------
  1                J1               J2               CONDUIT          123.2    0.2192    0.0130
  2                J2               Marr_Drain       CONDUIT            9.2    0.2174    0.0130
  HIGHFLOW         SU1              J1               CONDUIT           15.0    0.3333    0.0130
  LOWFLOW          SU1              J1               CONDUIT           18.6   -3.9816    0.0130
  OVERFLOW         SU1              Overflow         WEIR


  *********************
  Cross Section Summary
  *********************
                                        Full     Full     Hyd.     Max.   No. of     Full
  Conduit          Shape               Depth     Area     Rad.    Width  Barrels     Flow
  ---------------------------------------------------------------------------------------
  1                CIRCULAR             1.35     1.43     0.34     1.35        1  2498.81
  2                CIRCULAR             1.35     1.43     0.34     1.35        1  2488.73
  HIGHFLOW         CIRCULAR             1.20     1.13     0.30     1.20        1  2251.07
  LOWFLOW          CIRCULAR             0.45     0.16     0.11     0.45        1   568.94
```



```
  *********************************************************
  NOTE: The summary statistics displayed in this report are
  based on results found at every computational time step,
  not just on results from each reporting time step.
  *********************************************************

  ****************
  Analysis Options
  ****************
  Flow Units ............... LPS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ YES
    Water Quality .......... NO
  Infiltration Method ...... CURVE_NUMBER
  Flow Routing Method ...... DYNWAVE
  Starting Date ............ 04/10/2015 00:00:00
  Ending Date .............. 04/13/2015 00:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:01:00
  Wet Time Step ............ 00:01:00
  Dry Time Step ............ 00:01:00
  Routing Time Step ........ 1.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 1
  Head Tolerance ........... 0.001500 m


  **************************        Volume         Depth
  Runoff Quantity Continuity     hectare-m            mm
  **************************     ---------       -------
  Total Precipitation ......         3.513        54.127
  Evaporation Loss .........         0.000         0.000
  Infiltration Loss ........         2.364        36.428
  Surface Runoff ...........         1.086        16.740
  Final Storage ............         0.063         0.972
  Continuity Error (%) .....        -0.023


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......         1.086        10.864
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.452         4.525
  External Outflow .........         1.535        15.350
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.904         9.037
  Final Stored Volume ......         0.908         9.076
  Continuity Error (%) .....         0.000


  ***************************
  Time-Step Critical Elements
  ***************************
  None


  ********************************
  Highest Flow Instability Indexes
  ********************************
  All links are stable.


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     0.49 sec
```

Average Time Step	:	1.00 sec
Maximum Time Step	:	1.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
EXT1	71.64	0.00	0.00	56.32	14.09	1.07	144.78	0.197
EXT2	71.64	0.00	0.00	58.21	12.17	1.40	205.36	0.170
P1	71.64	0.00	0.00	48.16	22.21	0.61	322.36	0.310
P2	71.64	0.00	0.00	16.06	54.19	2.21	1814.29	0.756
P3	71.64	0.00	0.00	43.97	26.42	0.54	314.69	0.369
P4	71.64	0.00	0.00	37.25	33.10	3.29	2633.47	0.462
P5	71.64	0.00	0.00	54.22	16.16	1.06	147.73	0.226
P6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
P7	71.64	0.00	0.00	55.43	14.96	0.68	98.93	0.209

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.32	0.80	176.80	0 02:56	0.80
J2	JUNCTION	0.49	0.95	176.45	0 02:56	0.95
Lake_Road_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Marr_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Overflow	OUTFALL	0.00	0.00	175.50	0 00:00	0.00
SU1	STORAGE	1.89	2.78	177.28	0 02:56	2.78

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.00	944.28	0 02:56	0	14.1	0.001
J2	JUNCTION	0.00	944.29	0 02:57	0	14.1	0.004
Lake_Road_Drain	OUTFALL	98.93	98.93	0 01:45	0.684	0.684	0.000
Marr_Drain	OUTFALL	314.69	973.47	0 02:55	0.541	14.7	0.000
Overflow	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
SU1	STORAGE	5556.25	5556.25	0 01:05	14.2	23.2	0.002

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	9.703	33	0	0	16.651	56	0 02:56	944.28

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Lake_Road_Drain	4.79	55.34	98.93	0.684
Marr_Drain	100.00	56.71	973.47	14.666
Overflow	0.00	0.00	0.00	0.000
System	34.93	112.05	1045.52	15.350

Link Flow Summary

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	944.29	0 02:57	1.79	0.38	0.40
2	CONDUIT	944.29	0 02:57	1.90	0.38	0.38
HIGHFLOW	CONDUIT	485.94	0 02:56	1.62	0.22	0.31
LOWFLOW	CONDUIT	470.83	0 01:50	3.01	0.83	1.00
OVERFLOW	WEIR	0.00	0 00:00			0.00

Flow Classification Summary

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								
1	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
2	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
HIGHFLOW	1.00	0.95	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
LOWFLOW	1.00	0.00	0.00	0.00	0.05	0.05	0.89	0.00	0.00	0.00

Conduit Surcharge Summary

Conduit	--------- Hours Full -------- Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
LOWFLOW	1.44	1.44	72.00	0.01	0.01

Analysis begun on: Thu Aug 01 15:43:21 2024
Analysis ended on: Thu Aug 01 15:43:24 2024
Total elapsed time: 00:00:03

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

DEL22-025 - Post-Development - Ultimate

Element Count

Number of rain gages 2
Number of subcatchments ... 9
Number of nodes 6
Number of links 5
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
SBM-Development	SubcatchmentOff	CUMULATIVE	1 min.
St.Thomas	Hazel_48hr_2024	VOLUME	60 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
EXT1	7.61	253.53	2.00	5.0000	St.Thomas	SU1
EXT2	11.47	229.44	2.00	5.0000	St.Thomas	SU1
P1	2.75	275.30	14.00	1.0000	St.Thomas	SU1
P2	4.07	169.71	71.00	1.0000	St.Thomas	SU1
P3	2.05	683.00	16.00	4.0000	St.Thomas	Marr_Drain
P4	9.94	397.68	36.00	1.0000	St.Thomas	SU1
P5	6.57	243.30	2.00	15.0000	St.Thomas	SU1
P6	15.86	396.60	45.00	2.0000	SBM-Development	SU1
P7	4.57	457.30	0.00	2.0000	St.Thomas	Lake_Road_Drain

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	176.00	2.60	0.0	
J2	JUNCTION	175.50	2.00	0.0	
Lake_Road_Drain	OUTFALL	175.00	0.00	0.0	
Marr_Drain	OUTFALL	175.00	2.26	0.0	
Overflow	OUTFALL	175.50	0.00	0.0	
SU1	STORAGE	174.50	4.07	0.0	Yes

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
1	J1	J2	CONDUIT	123.2	0.2192	0.0130
2	J2	Marr_Drain	CONDUIT	9.2	0.2174	0.0130
HIGHFLOW	SU1	J1	CONDUIT	15.0	0.3333	0.0130
LOWFLOW	SU1	J1	CONDUIT	18.6	-3.9816	0.0130
OVERFLOW	SU1	Overflow	WEIR			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1	CIRCULAR	1.35	1.43	0.34	1.35	1	2498.81
2	CIRCULAR	1.35	1.43	0.34	1.35	1	2488.73
HIGHFLOW	CIRCULAR	1.20	1.13	0.30	1.20	1	2251.07
LOWFLOW	CIRCULAR	0.45	0.16	0.11	0.45	1	568.94

DEL22-025 Kettle Creek Subdivision
Hurricane Hazel Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units .... LPS
Process Models:
  Rainfall/Runoff .... YES
  RDII .... NO
  Snowmelt .... NO
  Groundwater .... NO
  Flow Routing .... YES
  Ponding Allowed .... YES
  Water Quality .... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date 04/10/2015 00:00:00
Ending Date 04/13/2015 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step .... 1.00 sec
Variable Time Step .... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance .... 0.001500 m

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	13.976	215.337
Evaporation Loss	0.000	0.000
Infiltration Loss	4.234	65.231
Surface Runoff	9.679	149.129
Final Storage	0.063	0.978
Continuity Error (%)	-0.001	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	9.679	96.787
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	3.488	34.881
External Outflow	13.150	131.503
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.904	9.037
Final Stored Volume	0.920	9.201
Continuity Error (%)	0.000	

Time-Step Critical Elements

Link 2 (3.10%)

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 0.04 sec

```
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :    -0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
EXT1	285.00	0.00	0.00	100.49	183.26	13.94	822.17	0.643
EXT2	285.00	0.00	0.00	102.86	180.88	20.75	1110.31	0.635
P1	285.00	0.00	0.00	86.89	196.83	5.42	329.45	0.691
P2	285.00	0.00	0.00	29.12	254.45	10.36	565.45	0.893
P3	285.00	0.00	0.00	82.02	201.69	4.13	265.90	0.708
P4	285.00	0.00	0.00	66.17	217.50	21.62	1182.63	0.763
P5	285.00	0.00	0.00	98.37	185.38	12.18	782.36	0.650
P6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
P7	285.00	0.00	0.00	100.47	183.28	8.38	539.94	0.643

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.55	2.31	178.31	1 23:02	2.31
J2	JUNCTION	0.68	1.68	177.18	1 23:02	1.68
Lake_Road_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Marr_Drain	OUTFALL	0.00	0.00	175.00	0 00:00	0.00
Overflow	OUTFALL	0.00	0.00	175.50	0 00:00	0.00
SU1	STORAGE	2.20	4.05	178.55	1 23:02	4.05

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.00	5184.23	1 23:02	0	119	0.001
J2	JUNCTION	0.00	5184.24	1 23:02	0	119	0.000
Lake_Road_Drain	OUTFALL	539.94	539.94	1 22:00	8.38	8.38	0.000
Marr_Drain	OUTFALL	265.90	5373.29	1 23:00	4.13	123	0.000
Overflow	OUTFALL	0.00	0.00	0 00:00	0	0	0.000 ltr
SU1	STORAGE	6805.46	6805.46	1 22:00	119	128	0.000

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	1.72	0.253	0.287

****
Node Flooding Summary
****

No nodes were flooded.

DEL22-025 Kettle Creek Subdivision
Hurricane Hazel Design Storm Event - Post-Development – Ultimate Conditions - PCSWMM Output

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SU1	12.144	41	0	0	29.482	99	1 23:02	5184.23

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
Lake_Road_Drain	51.30	65.40	539.94	8.381
Marr_Drain	99.99	490.94	5373.29	123.121
Overflow	0.00	0.00	0.00	0.000
System	50.43	556.34	5805.91	131.502

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	5184.24	1 23:02	3.69	2.07	0.95
2	CONDUIT	5184.25	1 23:03	3.80	2.08	0.91
HIGHFLOW	CONDUIT	4864.76	1 23:02	4.30	2.16	1.00
LOWFLOW	CONDUIT	470.66	1 16:01	3.01	0.83	1.00
OVERFLOW	WEIR	0.00	0 00:00			0.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
1	1.00	0.02	0.00	0.00	0.03	0.00	0.00	0.95	0.00	0.00
2	1.00	0.02	0.00	0.00	0.00	0.00	0.00	0.98	0.00	0.00
HIGHFLOW	1.00	0.82	0.00	0.00	0.03	0.00	0.00	0.14	0.00	0.00
LOWFLOW	1.00	0.00	0.00	0.00	0.37	0.14	0.49	0.00	0.00	0.00

****
Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
1	0.01	2.64	0.01	3.26	0.01
2	0.01	0.01	0.01	3.27	0.01
HIGHFLOW	1.72	2.13	1.72	3.13	1.72
LOWFLOW	9.68	9.68	72.00	0.01	0.01

```
Analysis begun on:  Thu Aug 01 15:44:14 2024
Analysis ended on:  Thu Aug 01 15:44:16 2024
Total elapsed time: 00:00:02
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