Robinson
Land Development

4101 Limebank Road, Ottawa, ON
Light Industrial Development
Servicing and Stormwater Management Report

Prepared For:

Group Montoni

Prepared By:

Robinson Land Development

Project No. 23074
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LEGAL NOTIFICATION

This report was prepared by Robinson Land Development for the account of **Group Montoni**.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. **Robinson Land Development** accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project

1.0 INTRODUCTION

Robinson Land Development has been retained by Group Montoni to prepare a site servicing and stormwater management design for proposed light industrial and warehousing facilities located at 4101 Limebank Road, in the City of Ottawa. The site is part of the Riverside South development area.

The client proposes to develop two categories of buildings: two buildings with multiple smaller industrial condo units (total approximate footprint 5,900 m^2 and 3,800 m^2); and three buildings with large warehousing units (total approximate footprint 10,700 m^2, 17,100 m^2 and 16,100 m^2). The buildings and site will be complete with parking and loading docks, driving aisles, sidewalks, landscaping, and stormwater management ponds. Refer to architectural site plan provided in **Appendix A** for reference.

The undeveloped 15.1 ha site is currently zoned Development Reserve (DR) and will be rezoned too General Industrial (IG). The property has open farm fields to the north and east, urbanized Limebank Road to the west, and stormwater Pond #3 which services Limebank Road ROW to the south. The Leitrim Road realignment, when completed, will require the developer to give a portion of their property located between Pond 3 and the proposed site to the City of Ottawa as a condition of Site Plan Approval.

This report will detail the proposed means of servicing the site with water and sanitary service and provide details on how to meet the stormwater management requirements. The validation of the offsite servicing criteria is detailed in a separate report by Robinson Land Development titled **Scoped Master Servicing Study**, upon which this report will reference.

2.0 EXISTING CONDITIONS

The following infrastructure exists adjacent to the site:

- 300 mm dia. PVC watermain on Limebank Road.
    - An existing valved 300 mm water service located approximately 80m north of the realigned Leitrim Road will be one of two connections to services the site.
- 375 mm dia. concrete sanitary sewer along Limebank Road, flowing south to Spratt Road.
- 600 mm dia. concrete storm sewer along Limebank Road, discharging to the stormwater Pond #3 immediately south of the site.
    - The pond is explicitly for Limebank Road ROW, but is anticipated for expansion for realigned Leitrim Road ROW and other lands within the Riverside South development area.
- A ditch is being constructed along the realigned Leitrim Road ROW west of Limebank Road as part of the Phase 1A development of 3700 Twin Falls that discharges to Tributary 4 of Mosquito Creek.
    - This ditch will be connected to, as well as being lowered to accommodate the site, for the site's stormwater discharge. Details of the ditch are provided in the Scoped Master Servicing Study.
- Drainage ditches currently exist along the south, middle and north edge of the site draining from east to west to the Limebank Road ditch.
- There is an 18m Trans Northern Pipelines easement that runs diagonally through the southwestern corner of the site. It is understood that there are two gas lines that run through the easement. Attempts to contact Trans Northern Pipelines have been made by Robinson and the City of Ottawa to identify the pipe locations, sizes and depths; and at the time of issuance of this report no responses have been received from Trans Northern Pipelines. Once the pipes have been confirmed the impacts to the infrastructure crossing the easement can be reviewed.

Refer to as-built information received of the existing watermain, sanitary, and storm infrastructure, and the relevant Phase 1A of 3700 Twin Falls plans provided in **Appendix A** for more details.

3.0 DEVELOPMENT PROPOSAL

The Owner is developing two categories of buildings: two buildings with multiple smaller industrial condo units (total approximate footprint 5,900 m^2 and 3,800 m^2); and three buildings with large warehousing units (total approximate footprint 10,700 m^2, 17,100 m^2 and 16,100 m^2). The buildings and site will be complete with parking and loading docks, driving aisles, sidewalks, landscaping, and stormwater management ponds.

Access to the site includes one connection from Limebank Road and two locations from the realigned Leitrim Road. The Limebank Road connection is a right in/right out entrance in the northwest corner of the property approximately 220 m north of the realigned Leitrim Road. The first realigned Leitrim Road access location will be located approximately 230 m east of Limebank Road. The realigned Leitrim Road cross section for this section of new road will be constructed as a semi-rural cross-section with a 7 m wide asphalt roadway surface, with curb and sidewalk for pedestrian access and a ditch along the north side, and a gravel shoulder to the existing ditch along the south. The third access location to the site is provided at the southeast corner of the site, however it will onlybe constructed and opened when warranted. Refer to architectural site plan provided in **Appendix A** for reference.

The proposed development will include a looped water service, sanitary service, and storm infrastructure per City requirements. The proposed civil design drawings are provided in **Appendix B** including:

- Servicing Plans
- Grading Plans
- Notes & Details Plans
- Erosion & Sediment Control Plan
- Existing Conditions & Removals Plan
- Storm Drainage Area Plan
- Sanitary Drainage Area Plan

4.0 WATER SERVICING

The subject site will receive water supply via a 250 mm dia. looped internal system by connecting to the existing 300 mm service off Limebank Road and a new 250 mm service on the realigned Leitrim Road. As part of the offsite realigned Leitrim Road works a 300 mm dia. watermain will be constructed east from Limebank Road approximately 240 m to the site access location. A twinned 300 mm dia. watermain is proposed from Spratt Road to the 3700 Twin Falls site as an interim measure for service redundancy and reliability within the Riverside South employment lands (including 3700 Twin Falls and the subject site). The Phase 1 development of 3700 Twin Falls, currently under construction, was approved within the need of the twinning. However, the twinning is a requirement of the 3700 Twin Falls full buildout and this development at 4101 Limebank Road. The status of the design for the twinning is currently unknown.

The watermain system has been designed according to the following standards and guidelines:

- Ottawa Design Guidelines – Water Distribution (2010) periodically amended as part of Technical Bulletins
- Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection (2020)

- MOECC Design Guidelines for Drinking-Water Systems (2008)
- Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area by IBI Group (August 2023)

Accordingly, the following watermain design criteria have been utilized for the subject site:

- Employee Demand: 137 L/cap/d (per ISSU)
- Commercial Peaking Factor: 1.5 Max Day; 1.8 Peak Hour
- Minimum Pressure During Peak Hour 276 kPa (40 psi)
- Minimum Pressure During Maximum Day Plus Fire 140 kPa (20 psi)
- Maximum Pressure in Unoccupied Areas 689 kPa (100 psi)
- Maximum Pressure in Occupied Areas 552 kPa (80 psi)

4.1 Boundary Conditions & Demands

The boundary conditions are taken from the modeling results of the Scoped Master Servicing Study for the watermain along Limebank Road up to the two connection points of the site. The model was run for the current pressure zone configuration and future SUC pressure zone reconfiguration (earliest anticipation for reconfiguration is 2026). Refer to **Appendix C** for proposed domestic and fire demand calculations. The demands and boundary conditions have been summarized in the table below:

Table 1 – Water Demands & Boundary Conditions

Current Demand Scenario	Demand (L/s)	Limebank Connection (m)	Leitrim Connection (m)
Average Day	1.23 L/s	131.74	131.74
Peak Hour	3.32 L/s	124.94	124.93
Max Day + Fire (worst case)	201.84 L/s	119.20	118.22
Future PZ Reconfiguration Demand Scenario	**Demand (L/s)**	**Limebank Connection (m)**	**Leitrim Connection (m)**
Average Day	1.23 L/s	148.34	148.34
Peak Hour	3.32 L/s	145.39	145.38
Max Day + Fire (worst case)	201.84 L/s	138.15	137.17

It should be noted that the domestic demands used in the Scoped Master Servicing Study were based on gross area which were greater than the per capita demand estimates. Also, the boundary conditions used for the Max Day + Fire scenario was based on a fire demand of 13,000 L/min. However, the maximum fire demand determined for the site is 12,000 L/min (Building C3). Therefore, the results of the internal site water model are conservative.

4.2 Fire Protection

The nearest existing hydrant is along the east side of Limebank Road, beside the property, approximately 90 m south of the Limebank Road entrance. Therefore, private hydrants are proposed within the site to provide coverage. Each building will be sprinklered therefore the proposed hydrants will be located within 45m of each buildings' fire department connection.

The required fire flow for the subject site was calculated using the Fire Underwriter's Survey (FUS) long form (refer to **Appendix C**). Based on the anticipated building construction,

occupancy and ground floor area, the minimum fire demand is 8,000 L/min (133 L/s) at Building A2 and the maximum fire demand is 12,000 L/min (200 L/s) at Building C3.

4.3 Hydraulic Model Results

The hydraulic model results for Average Day, Peak Hour and Max Day + Fire have been calculated and summarized in **Table 2** below. The fire demand scenario was rendered for the hydrants nearest a sprinklered building and its associated fire demand split between the hydrants (maximum 5,700 L/min assigned to each hydrant per ISTB-2018-02). The resultant pressures are measured at ground elevation.

Table 2 – Hydraulic Model Results

Current Pressure Zone Scenario	Fire Demand (L/min)	Min. System Pressure	Max. System Pressure	Allowable Pressure Range
Avg Day	-	373 kPa (54.1 psi)	414 kPa (60.1 psi)	276-552 kPa 40 – 80 psi
Peak Hour	-	306 kPa (44.4 psi)	347 kPa (50.4 psi)	276-552 kPa 40 – 80 psi
Max Day + Fire (Hyd 2 & 3 - Bldg A1 or B1)	10,000	206 kPa (29.9 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 1 & 2 - Bldg A2)	8,000	223 kPa (32.4 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 1 & 2 - Bldg B2)	10,000	208 kPa (30.1 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 5 & 6 - Bldg C1 or C2)	10,000	186 kPa (27.0 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 5, 6 & 7 - Bldg C3)	12,000	165 kPa (23.9 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 8 & 9 – Bldg D1 or D2)	10,000	151 kPa (21.9 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 7 & 8 - Bldg D3)	11,000	142 kPa (20.6 psi)	-	>140 kPa >20 psi
Future SUC Pressure Zone Scenario	**Fire Demand (L/min)**	**Min. Pressure**	**Max. Pressure**	**Allowable Pressure Range**
Avg Day	-	536 kPa (77.7 psi)	577 kPa (83.7 psi)	276-552 kPa 40 – 80 psi
Peak Hour	-	507 kPa (73.5 psi)	548 kPa (79.5 psi)	276-552 kPa 40 – 80 psi
Max Day + Fire (Hyd 2 & 3 - Bldg A1 or B1)	10,000	392 kPa (56.8 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 1 & 2 - Bldg A2)	8,000	409 kPa (59.4 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 1 & 2 - Bldg B2)	10,000	394 kPa (57.1 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 5 & 6 - Bldg C1 or C2)	10,000	372 kPa (53.9 psi)	-	>140 kPa >20 psi

Max Day + Fire (Hyd 5, 6 & 7 - Bldg C3)	12,000	350 kPa (50.8 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 8 & 9 – Bldg D1 or D2)	10,000	337 kPa (48.8 psi)	-	>140 kPa >20 psi
Max Day + Fire (Hyd 7 & 8 - Bldg D3)	11,000	328 kPa (47.6 psi)	-	>140 kPa >20 psi

As indicated in **Table 2** above, the subject site can be adequately serviced for both domestic and fire demands. Under the future pressure zone scenario the average day demand is noted as slightly exceeding the maximum pressure within the private system, however at the building services themselves the pressure is anticipated to be below the maximum pressure. The need for a pressure reducing valve in the buildings will be validated with the Mechanical Engineer during detailed design. Refer to the hydraulic model outputs provided in **Appendix C** for details.

5.0 SANITARY SERVICING

5.1 Design Criteria

Sanitary flows from the site will discharge to the 375 mm sanitary sewer on Limebank at the sanitary maintenance hole being installed as part of the 3700 Twin Falls Phase 1A works. A 375 mm sewer will be extended along the realigned Leitrim Road ROW to service the site and any future upstream flows.

The sanitary sewer system has been designed according to the following standards and guidelines:

- Ottawa Sewer Design Guidelines (2012) periodically amended as part of Technical Bulletins
- MOECC Design Guidelines for Sewage Works (2008)
- Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area by IBI Group (August 2023)

Accordingly, the following design parameters have been implemented for the subject site:

- Employee Demand: 137 L/cap/d
- Peaking Factor: 1.0
- Infiltration Allowance: 0.33 L/s/ha
- Velocity: 0.60-3.0 m/s

5.2 Proposed Design

A network of 250 mm dia. sewers will collect sanitary discharge from each building, with a monitoring maintenance hole near the property line at the southwestern site entrance prior to discharging to the proposed 375 mm dia. sewer on realigned Leitrim Road. All proposed sanitary sewers have been designed to have capacities to convey the peak design flows and meet minimum full flow velocities. Refer to the sanitary sewer design sheet in **Appendix D** for more details.

6.0 STORM SERVICING

6.1 Design Criteria

Stormwater runoff collected on the subject site will be discharged to a ditch along the north side of realigned Leitrim Road, cross Limebank Road via a 900 mm storm sewer, and connect

to the ditch on the south side realigned Leitrim Road ("Mosquito Drive"), west of Limebank Road, part of the 3700 Twin Falls site. The ditch ultimately discharges to Tributary 4 of Mosquito Creek. The Mosquito Drive ditch is currently under construction as part of the 3700 Twin Falls Phase 1A works. As detailed in the Scoped Master Servicing Study, the ditch will need to be lowered 0.76 m to accommodate the subject site.

The existing ditch along the east side of Limebank Road ROW will be maintained with the existing connections from the south and north ditch lines of the property. The ditches will be regraded to even out the slopes between existing upstream and downstream elevations. A 600 mm culvert currently services a gravel driveway to the property which will be removed. The Limebank Road ditch will be provided with 600 mm culverts at realigned Leitrim Road and the Limebank entrance to maintain connectivity.

The storm sewer system has been designed according to the following standards and guidelines:

- Ottawa Sewer Design Guidelines (2012) periodically amended as part of Technical Bulletins
- MOECC Stormwater Management Planning and Design Manual (2003)
- Riverside South Community Master Drainage Plan Update, Mosquito Creek Study Area by IBI Group (April 2021)
- Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area by IBI Group (August 2023)

Accordingly, the following design parameters have been implemented for the subject site:

- Quantity Control: 159.72 L/s peak discharge
- Quality Control: Enhanced (80% TSS reduction)
- Infiltration: N/A
- Ponding: No ponding during 2-yr, max. 300mm ponding
- Max. Ponding Time: 48 hrs
- Velocity: 0.80-3.0 m/s

Based on a forthcoming Technical Bulletin, the City will no longer accept infiltration-based LID measures in areas of clay soils, which includes the subject site. Following correspondence with the City, it was agreed that the site will be treated as a conventional stormwater system requiring controlling to the peak discharge rate and no infiltration is assumed (included in **Appendix E** for reference).

6.2 Minor System

The site stormwater is split into two systems defined by their discharge location. The west portion of the site is collected and drains to Pond 1 located at the southwest corner of the site. Pond 1 area includes the roof drainage from Buildings A1, A2, B1 and B2. The east portion of the site is collected and drains to Pond 2 located in the middle of the south edge of the site. Pond 2 area includes the roof drainage from Buildings C1, C2, C3, D1, D2, and D3. Each pond is outfitted with an orifice plate on the discharge pipe to control the peak discharge rate. The combined flow rate from each pond (maximum 56.25 L/s at Pond 1, 90.19 L/s at Pond 2; total 146.44 L/s during the 100yr storm) will be below the maximum allowable flow rate of 159.72 L/s. The ponds will discharge to a ditch along the north side of the realigned Leitrim Rd. ROW that will cross Limebank Rd. to the 3700 Twin Falls ditch. Culverts will cross the Trans National Pipeline easement to Pond 1 sized for the 100yr flow. Culverts will also cross the Trans National Pipeline easement and south entrance sized for the controlled flows from the site, upstream lands, and the 100yr runoff from realigned Leitrim Road. Once information is available regarding the location, size and depth of the existing gas mains these crossings can be further assessed. Refer to **Appendix E** for culvert sizing.

Each building will be outfitted with controlled roof drains and roof storage. A typical maximum 40 L/s/ha total roof drain discharge rate has been utilized for design purposes (refer to the roof drain cutsheet in **Appendix E** for reference; however the Building Mechanical Engineer will finalize the selection during detailed design). The roof storage is assumed at maximum 150 mm in depth, and maximum available roof storage will be verified with the Building Architect during detailed design. Maximum drawdown time of the roof storage is less than 3 hrs during the 100yr storm.

The storm sewers have been sized to allow free flow (no ponding) during 2-yr storm based on the controlled flow rates from the building roofs. Refer to the 2-yr storm sewer design sheet in **Appendix E** for details of the calculations and the Storm Area Drainage Plan in **Appendix B** for reference.

The realigned Leitrim Road will be a semi-rural cross-section with the south half draining overland to the existing south ditch. The south ditch will be regraded to even out the slope and will provide minimum 500mm from bottom of ditch to property line. The north half of realigned Leitrim Road will be provided with curb inlet catch basins that will capture the runoff and direct it to the northside ditch.

6.3 Major System

The major system flows of the site involve ponding in the respective drainage areas. The individual drainage areas will cascade overland to their respective drainage ponds. The individual drainage areas are limited to a maximum 300mm ponding, and the local overflow elevations are minimum 300mm below the nearby building entrances. Quantity storage is provided by the building roofs and Ponds 1 and 2. While additional storage is provided within each individual drainage area from surface ponding, those volumes have conservatively been disregarded in calculating the total storage required. Emergency spillover is provided in each pond, minimum 300mm above the 100yr ponding elevation, to the discharge ditch on the northside of realigned Leitrim Road. Emergency spillover is provided from the northside ditch at a low-point in realigned Leitrim Road to the south ditch line and towards the Limebank Road ditch and Pond 3. The maximum drawdown time was calculated for the open ponding storage areas (roofs and ponds) and were all below the 48 hr maximum. The maximum drawdown time for the roofs was 2.9 hrs during the 100yr storm. The maximum drawdown time was 27.9 hrs for Pond 1 and 29.8 hrs for Pond 2 during the 100yr storm.

The 100yr HGL of the realigned Leitrim Road northside ditch was estimated based on the ditch and culvert capacities. For the 100yr design storm the pond storage calculations and ICD head elevation was based on the ditch HGL. A summary of the ditch HGL is presented in Table 3 below.

Table 3 – 100-Year Ditch Hydraulic Grade Line

Location	Ditch Invert (m)	Approx. 100-yr HGL (m)	Approx. Min. Roadway Elevation (m)	Capacity Notes
Pond 1 Outlet	89.90	90.58	90.40	Per ditch capacity
Pond 2 Outlet	90.23	90.81	91.05	Per ditch capacity

Refer to the 100-year storm sewer design sheet, ICD, ditch, and storage calculations in **Appendix E** for details of the calculations and the Storm Drainage Area Plan in **Appendix B** for reference.

A summary of the calculations is presented in the tables below:

Table 4 – 100-Year Post-Development Discharge Rates

Area	Max Discharge Rate (L/s)
Pond 1	56.25
Pond 2	90.19
Total	**146.44**
Allowable Flow	**159.72**

Table 5 – 100-Year Post-Development Storage Volumes

Area	Required Storage (m^3)	Available Storage (m^3)
Bldg A1	247	298
Bldg A2	161	194
Bldg B1	224	270
Bldg B2	225	271
Bldg C1	224	270
Bldg C2	224	271
Bldg C3	270	325
Bldg D1	224	270
Bldg D2	224	270
Bldg D3	232	280
Pond 1 (Areas 1-13)	2830	2848
Pond 2 (Areas 14-28)	4841	4877

6.5 Culvert Sizing

Culverts are utilized in the site for crossing the Trans National Pipeline easement, crossing the site driveways, and pond outlets. Sizing of the site culverts was based on the MTO design charts for outlet and inlet control. The pond inlet culverts and realigned Leitrim Road ditch culverts are sized for the 100yr storm. The pond outlet culverts are sized for the 2yr storm to demonstrate free-flowing capacity, however they will be restricted well below their capacity from the orifice plates on the inlet headwalls. Two culverts along the entrances to Limebank Road will be 600mm, to match the 600mm culvert at the existing site's entrance that will be removed. Refer to the MTO design charts in **Appendix E** for more details.

6.6 Quality Control

Quality control will be provided by oil-grit separators prior to discharge to the respective ponds sized for approximately 60% TSS reduction at ETV particle size distribution. This is the approximate maximum reduction rate an OGS unit can achieve using ETV particle size distribution, equivalent to approximately 90% TSS reduction using the typical "Fine" particle size distribution. In order to achieve the 80% TSS reduction, additional settlement will be provided within the ponds. MECP's Stormwater Management Planning and Design Guideline recommends a maximum 0.15 m/s velocity below which settlement will occur within channels

and ponds. The ponds, based on the maximum pond depths, will provide average velocities of 0.003 – 0.001 m/s during the 2yr to 100yr storm, respectively. It is acknowledged that further settlement is anticipated within the downstream ditches prior to discharge to Mosquito Creek Tributary 4 as noted in the Scoped Master Servicing Study, though this will not be directly credited to the site. Refer to pond calculations and OGS sizing cutsheet in **Appendix E** for more details.

7.0 EROSION AND SEDIMENT CONTROL

Prior to construction and until vegetation has been re-established in disturbed areas, erosion and sediment control measures must be implemented to mitigate the impact on receiving watercourses and existing infrastructure. The following erosion and sediment control (ESC) measures have been proposed for the subject site:

- Limiting the extent of exposed soils at any given time.
- Erosion and sediment control measures shall be maintained until vegetation has been re-established in all disturbed areas. Re-vegetate disturbed areas in accordance with approved Landscape Plan as soon as possible.
- Stockpile soil away (15 metres or greater) from watercourses, drainage features and top of steep slopes.
- Installation of silt sacks between frame and cover on all proposed and existing catch basins and open cover storm manholes until construction is completed.
- Silt fence to be installed and maintained along the property boundaries.
- Install straw bale check dams in ditches.
- Install mud mats at all construction entrances.
- During active construction periods, visual inspections shall be undertaken on a weekly basis and after major storm events (>25mm of rain in 24 hour period) on ESC and any damage repaired immediately.
- ESC shall also be assessed (and repaired as required) following significant snowmelt events.
- Visual inspections shall also be undertaken in anticipation of large storm events (or a series of rainfall and/or snowmelt days) that could potentially yield significant runoff volumes.
- Care shall be taken to prevent damage to ESC during construction operations.
- In some cases, barriers may be removed temporarily to accommodate construction operations. The affected barriers shall be reinstated immediately after construction operations are completed.
- ESC should be adjusted during construction to adapt to site features as the site becomes developed.
- ESC shall be cleaned of accumulated sedimentation as required and replaced as necessary.
- During the course of construction, if the Engineer believes that additional prevention methods are required to control erosion and sedimentation, the Contractor shall implement additional measures, as required, to the satisfaction of the Engineer.
- Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification (OPSS) 805.

Refer to the Erosion and Sediment Control Plan provided in **Appendix B** for more details.

8.0 APPROVALS

The proposed development is subject to the City of Ottawa's Site Plan Approval process with criteria from the Rideau Valley Conservation Authority. Notable stakeholders during the Site

Plan Approval process include Rideau Valley Conservation Authority for the stormwater criteria and Trans National Pipeline for the easement being crossed by utilities. Since stormwater quantity and quality are being provided for an industrial-use site an Environmental Compliance Approval (ECA) from the Ontario Ministry of Environment, Conservation and Parks will also be required.

9.0 CONCLUSIONS

This servicing and stormwater management report has been prepared to support the Site Plan Application for the development of the property located at 4101 Limebank Road. The report has detailed the proposed means of servicing the site for potable water and sanitary sewer and provided details on how to meet the stormwater management requirements in accordance with City of Ottawa standards and requirements. The proposed servicing and stormwater management designs will be achieved by implementing the following key features:

- Domestic water supply will be provided by the existing 300 mm dia. service stubbed at the property and a 300 mm dia. extension along realigned Leitrim Rd.
- The site will be internally looped with a 250 mm dia. watermain for redundancy.
- Fire protection will be provided by private hydrants within the site and the buildings will all be sprinklered.
- Sanitary flows will be conveyed to the existing 375 mm dia. sanitary sewer on Limebank Rd. via a 375 mm dia. sewer extension on realigned Leitrim Rd. and 250 mm dia. sewers within the site.
- Stormwater runoff (minor system) will be conveyed by the proposed storm sewer system to Pond 1 and Pond 2 within the site.
- Stormwater runoff for all storm events up to and including the 100-year design storm will be controlled on-site to the required discharge rate via orifice plates on the pond discharge pipes.
- On-site storage will be provided for all storm events up to and including the 100-year design storm event via roof storage and the dry ponds.
- Emergency overland flows will be conveyed to the southside ditch on realigned Leitrim Rd.
- Quality control will be provided by oil-grit separators immediately prior to discharging to the respective ponds, with further settlement within the ponds.
- Erosion and sediment control measures will be implemented prior to construction and maintained until vegetation has been re-established in disturbed areas.

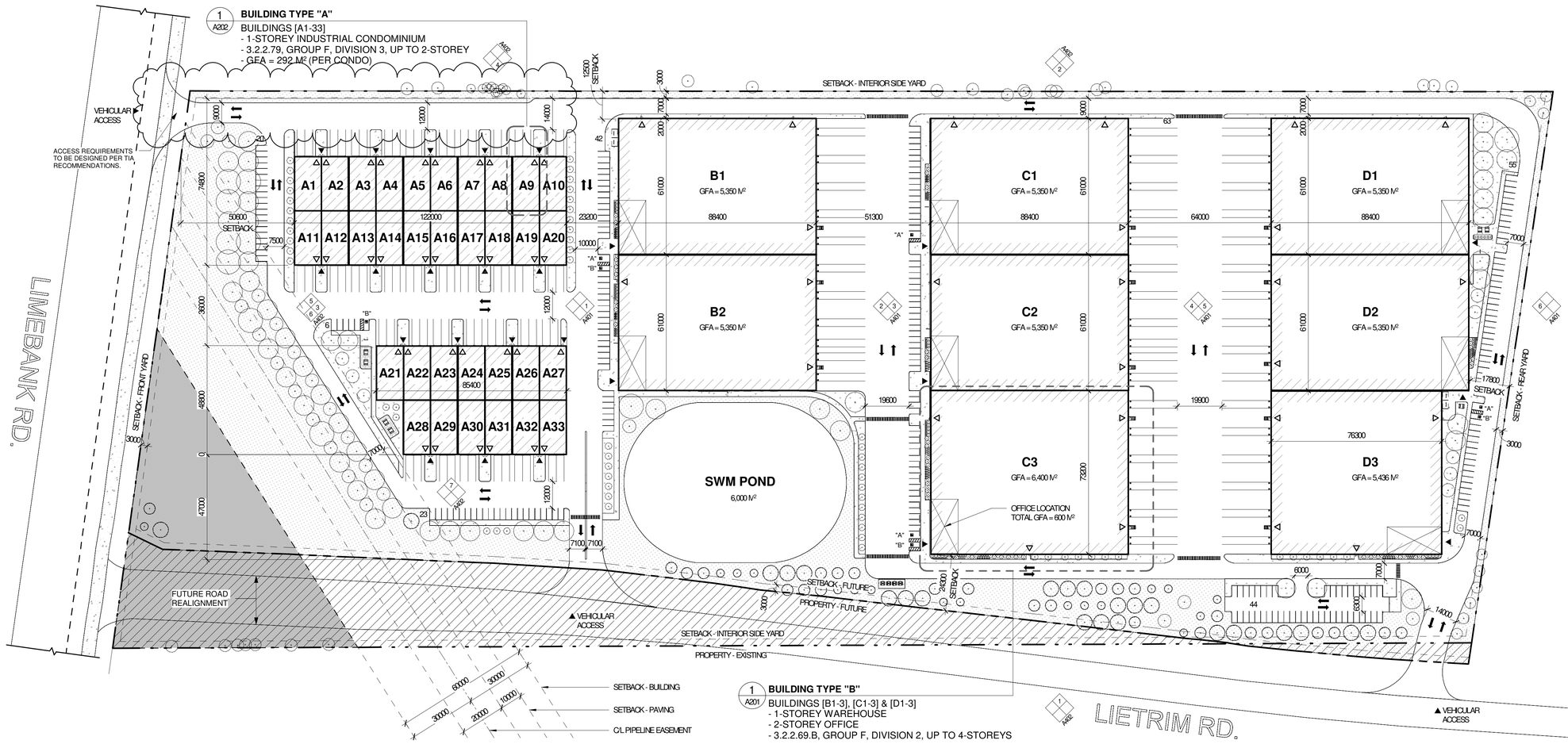
Report Prepared By:

Stephen McCaughey, P.Eng.
Project Engineer

Report Reviewed By:

Chris Collins
Manager, Land Development

Appendix A



1 A101 SITE PLAN
1 : 1000

SITE PLAN SYMBOLS LEGEND

- ▼ = ENTRANCE
- ▽ = EXIT
- = MANHOLE, CATCH BASIN, ETC, REFER TO CIVIL
- = LS, LIGHT STANDARD, REFER TO ELECTRICAL AND STRUCTURAL
- = DENOTES SLOPED GRADE, REFER TO CIVIL
- = DENOTES FIRE TRUCK ACCESS ROUTE, REFER TO CIVIL DRAWINGS
- = PROPERTY LINE
- = PEDESTRIAN WALKWAY
- —S— = SWALE. REFER TO CIVIL DRAWINGS
- = SETBACK LINE
- ● = BOLLARD
- ■ = SURVEY BAR
- = GRASS
- = LANDSCAPING
- = PAINTED LINES
- = RIGHT-OF-WAY WIDENING PROTECTION
- = OFFICE SPACE
- = STORMWATER MANAGEMENT DESIGNATION AS PER CDP
- = SIDEWALK/ CONCRETE SURFACE

GENERAL NOTES

1. CONTRACTOR TO CONFIRM ALL DIMESIONS AND REPORT ANY DISCREPANCIES TO CONTRACTOR ADMINISTRATOR PRIOR TO CONSTRUCTION.
2. LAYOUT TO APPROVED BY CONTRACT ADMINISTRATOR PRIOR TO ANY CONSTRUCTION OR REMOVALS.
3. ALL DIMENSIONS ARE IN METRIC UNLESS OTHERWISE NOTED.
4. CONTRACTOR IS RESPONSIBLE FOR ALL EXCAVATIONS, REMOVALS, DISPOSALS AND ROUGH GRADING AS REQUIRED AS SHOWN ON ALL PLANS, DETAILS AND SPECIFICATIONS.
5. LOCATION OF ALL UTILITITES SHOWN FOR ILLUSTRATION ONLY. CONTRACTOR MUST CONTACT ALL UTILITIES REGARDING RULES FOR WORKING IN THE AREA OF THE UTILITIES PRIOR TO COMMECEMENT OF ANY WORK. CONTRACTOR MUST CONFIRM LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.
6. ALL EXISTING EXISTING ROADS, SIDEWALKS, CURBS, FENCING, PAVING, SODDED AREAS, AND APPROACHES, ETC. TO REMAIN TO BE PROTECTED DURING CONSTRUCTION TO CONTRACT ADMINISTRATOR'S APPROVAL AT THE CONTRACTORS OWN COSTS.
7. FOR LANDSCAPE, REFER TO LANDSCAPE DRAWINGS.
8. FOR UTILITIES, GRADING, ETC. REFER TO CIVIL DRAWINGS.
9. LEGAL SURVEY BOUNDARIES AND TOPOGRAPHICAL INFORMATION TAKEN FROM TOPOGRAPHICAL PLAN OF SURVEY OF PART OF LOTS 16 & 17 CONCESSION 2 (RIDEAU FRONT) GEOGRAPHIC TOWNSHIP OF GLOUCESTER, DATED DECEMBER 6, 2023, FROM THE OFFICE OF ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

Site Information

Legal Description:	Part of lots 16 & 17, Concession 2 (Rideau Front), Geographic Township of Gloucester, City of Ottawa
P.I.N:	04331 - 0320
Easements:	Inst. GL54354, Part 16, Plan 4R-8983 Inst. GL50325. Part 2. Plan 5R-9196 Inst. OC2191832, Part 1, Plan 4R-32295
Municipal Address:	4101 Limebank Road, Ottawa, Ontario

Parking (4101 Limebank Road)

Requirement

Light Industrial: 0.8 / 100m² for first 5,000m²;
0.4 / 100m² of remaining gross floor area.

Proposed Buildings	227 Spaces
Accessible Parking	3 - Type A (5200 mm x 3400 mm (MIN.)) 4 - Type B (5200 mm x 2400 mm (MIN.))
Total Site Required	227 Spaces (Including Accessible Parking)

Provided

Total Site Provided	253 Spaces (Including 4 Type-A and 4 Type-B Accessible Parking)

	Requirement	Provided
Bicycle Parking		
Light Industrial: 1 / 1000m² of gross floor area	63 Spaces	63 Spaces
Loading Spaces		116 Spaces

Zoning Statistics

Zoning: General Industrial (IG) - Currently Development Reserve Zone (DR)

Proposed Use:
Building Type "A" [Industrial Condo]: Group F, Division 3 Occupancy, Up to 2-Storeys
Building Type "B" [Warehouse]: Group F, Division 2 Occupancy, Up to 4-Storeys

Standard		Requirement	Provided
Lot Area (min.)		1,000 m²	151,250 m²
Lot Coverage (max.)		65%	36%
Gross Floor Area	Condo	N/A	9,636 m²
	Office	N/A	4,800 m²
	Warehouse	N/A	41,536 m²
	Total	N/A	55,972 m²
Front Yard and Corner Side Yard (min.)		3.0 m	50.6 m
Side Yard (min.)			
Adjoining Residential or Institutional		15.0 m	N/A
All other cases		3 m	24.3 m [South] 12.5 m [North]
Rear Yard (min.)			
Adjoining Residential or Institutional		15.0 m	N/A
All other cases		3 m	17.8 m
Maximum Floor Space Index		2.0	0.4
Maximum Building Height			
Within 20M of Adjoining Residential Zone		11.0 m	N/A
All other cases		22.0 m	≤ 22.0 m
Minimum Width of Landscape Area		3.0 m	3 m
Landscaped Area within Parking Lot		N/A	5-10%
Total Vegetation and Landscaped Area		N/A	18%

ARCHITECTURE 49
ARCHITECTURE49
1345 ROSEMOUNT AVENUE | CORNWALL, ON, CANADA K6J 3E5
Phone: 613-933-5604 | cornwall@architecture49.com | architecture49.com

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SEAL:

THIS BAR IS 25mm LONG WHEN PLOTTED AT CORRECT SCALE. DO NOT SCALE DRAWINGS. 25mm

NORTH ARROW: TRUE NORTH

DIGITAL REFERNECE:

PROJECT NO.: CA0014797.3416 CONTRACT NO.
DRAWN BY: TS CHECKED BY: APPROVED BY:
KEYPLAN:

NO.	DATE	ISSUED
1	2024-03-15	ISSUED FOR SITE PLAN APPLICATION

PROJECT

4101 Limebank Road Site Plan Application

DRAWING TITLE

GENERAL SITE PLAN

DRAWING NO. **A101**

PRINT DATE: 2024-07-24 12:17:03 PM

ARCH D (24" x 36" | 610mm x 914mm)

TOPOGRAPHICAL PLAN OF SURVEY OF

PART OF LOTS 16 & 17
CONCESSION 2 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF GLOUCESTER
CITY OF OTTAWA
Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

Scale 1 : 750

50 22.5 15 7.5 0 15 30 Metres

Metric
DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

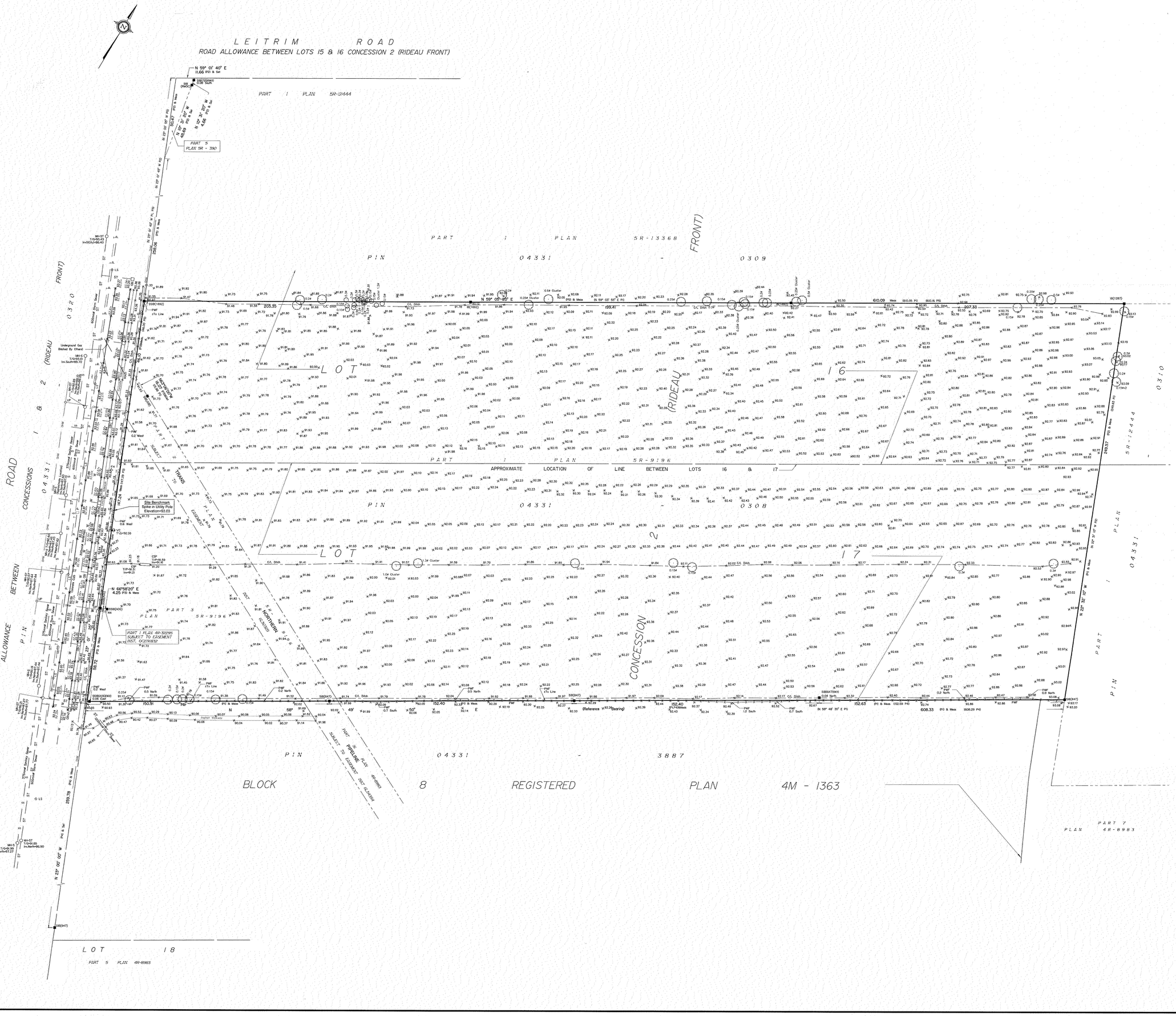
Surveyor's Certificate

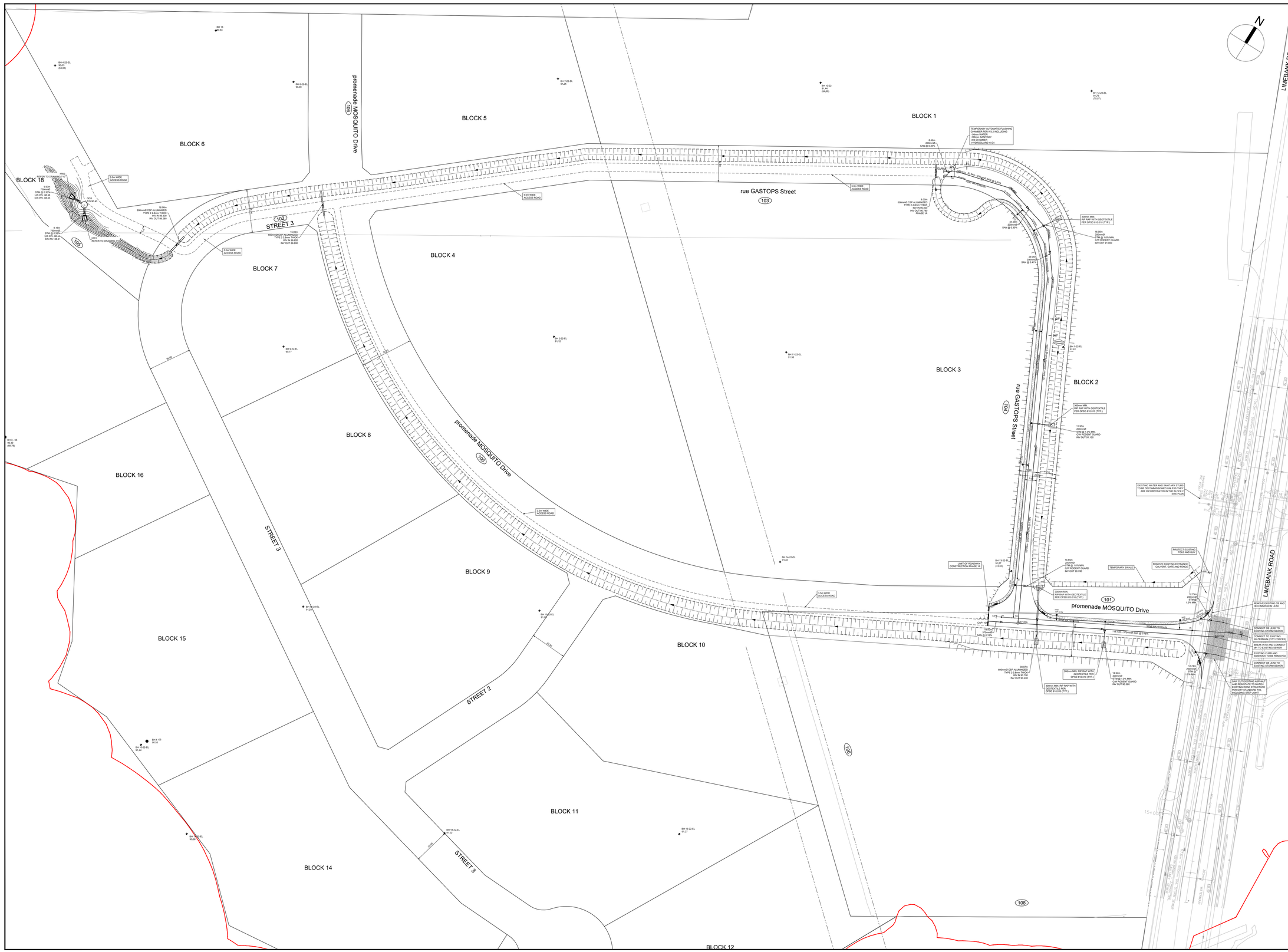
I CERTIFY THAT :

1. This survey and plan are correct and in accordance with the Surveys Act and the Surveyors Act and the regulations made under them.
2. The survey was completed on the 5th day of December, 2023.

December 6, 2023
Date

A. J. Beckham
Andrew J. Beckham
Ontario Land Surveyor


LEITRIM ROAD
ROAD ALLOWANCE BETWEEN LOTS 15 & 16 CONCESSION 2 (RIDEAU FRONT)
PART 1 PLAN 5R-12444
PART 1 PLAN 5R-13368
PART 1 PLAN 5R-9196
PART 1 PLAN 4R-32295
PART 1 PLAN 4R-8983
PART 5 PLAN 4R-8983
PART 3 PLAN 5R-9196
PART 2 PLAN 4R-32295
PART 7 PLAN 4R-8983
PART 5 PLAN 5R-12444
PART 1 PLAN 4M-32295
PART 2 PLAN 4M-32295
PART 1 PLAN 4M-1363
PART 1 PLAN 4M-8983
PART 1 PLAN 5R-9196
PART 1 PLAN 5R-13368
PART 1 PLAN 5R-12444
PART 5 PLAN 5R - 3961
PART 5 PLAN 4R-8983
PART 1 PLAN 4M-32295
PART 2 PLAN 4M-32295
PART 1 PLAN 4M-1363
PART 1 PLAN 4M-8983
PART 1 PLAN 5R-9196
PART 1 PLAN 5R-13368
PART 1 PLAN 5R-12444
PIN 04331 - 0309
PIN 04331 - 0308
PIN 04331 - 3887
PIN 04331 - 0310
LOT 16
LOT 17
LOT 18
BLOCK 8 REGISTERED PLAN 4M - 1363
CONCESSION 2 (RIDEAU FRONT)
CONCESSIONS 1 & 2 (RIDEAU FRONT)
ROAD ALLOWANCE BETWEEN LIMEBANK ROAD
APPROXIMATE LOCATION OF LINE BETWEEN LOTS 16 & 17
N 59° 01' 40" E
11.656 PP2 & Set
N 59° 03' 55" E P3
N 59° 00' 20" E
N 59° 01' 40" W PP2
N 59° 03' 55" W P3
N 59° 00' 20" W Pr. P3
N 59° 01' 40" W PP1
N 59° 03' 55" W P1
N 59° 00' 20" W P1
N 30° 30' 20" W
30.47
PP2 & Meas
N 30° 30' 20" W
60.69
PP3 & Meas
N 30° 30' 20" W
4.06
PP3 & Set
PART 5
PLAN 5R - 3961
N 23° 00' 00" W
255.79
PP2 & Meas
N 23° 00' 00" W
255.79
P1 & Meas
N 23° 00' 00" W
255.79
PP3 & Meas
N 23° 00' 00" W
255.79
P1 & Meas
N 23° 00' 00" W
255.79
PP2



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4	SUBMISSION 3 FOR CITY REVIEW	2024-04-02
5	ISSUED FOR CONSTRUCTION	2024-04-25

KEY PLAN



CONSULTANTS

1:1000 0 10 30 50m

SEAL



PRIME CONSULTANT

ARCADIS

333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT

RIVERSIDE SOUTH
3700 TWIN FALLS PLACE
PHASE 1A

PROJECT NO: 136974	
DRAWN BY: **C.C.**	CHECKED BY: **L.E.**
PROJECT MGR: **L.E.**	APPROVED BY: **L.E.**

SHEET TITLE

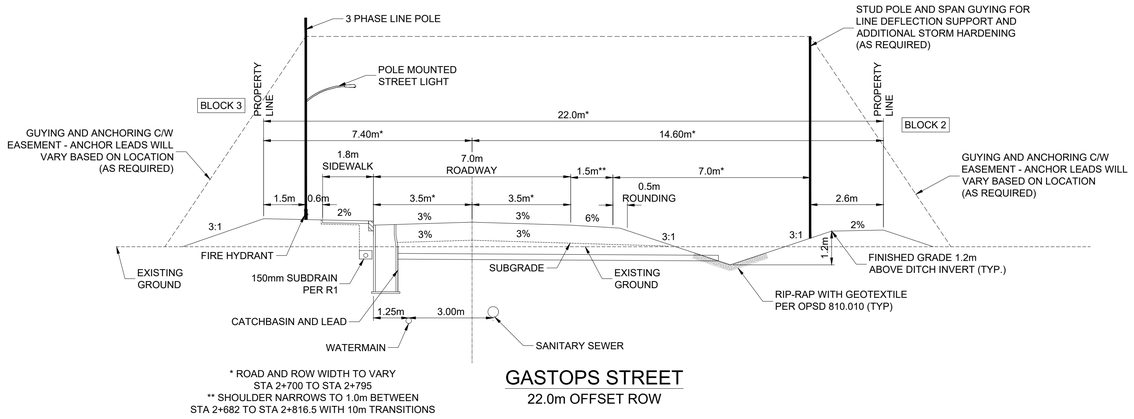
GENERAL PLAN OF SERVICES 1A

SHEET NUMBER	ISSUE
002	5

SCALE CHECK
1 in 25mm
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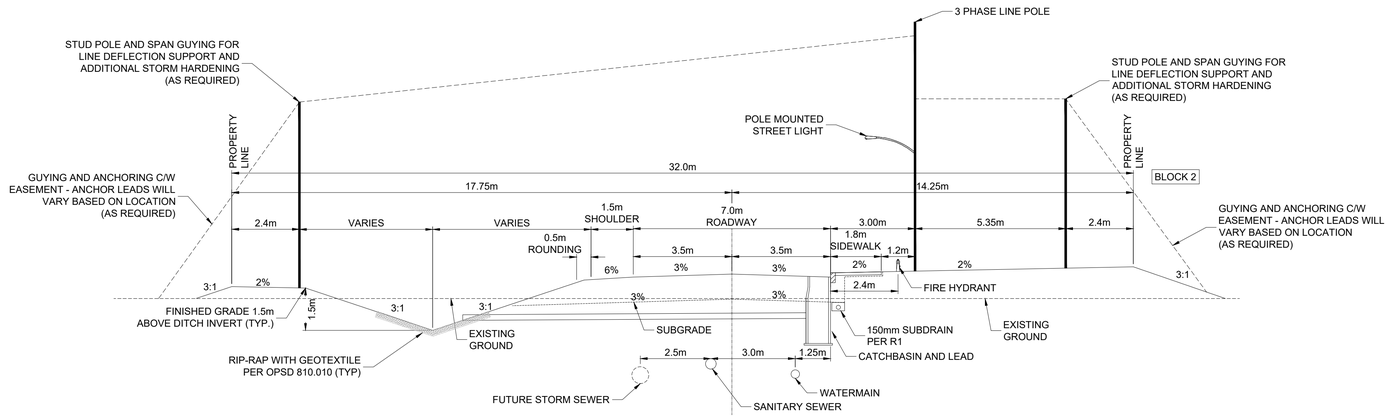
D07-16-22-0014

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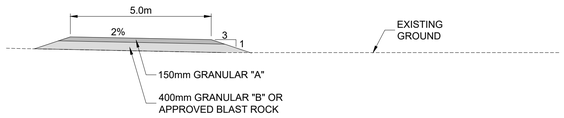


* ROAD AND ROW WIDTH TO VARY STA 2+700 TO STA 2+795
** SHOULDER NARROWS TO 1.0m BETWEEN STA 2+682 TO STA 2+816.5 WITH 10m TRANSITIONS

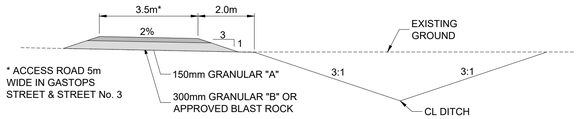
GASTOPS STREET
22.0m OFFSET ROW



MOSQUITO DRIVE
32.0m OFFSET ROW



PERMANENT GRAVEL ACCESS ROAD
(BLOCK 18)



TEMPORARY GRAVEL ACCESS ROAD
(GASTOPS STREET, STREET NO.3, MOSQUITO DRIVE)

GRAVEL ACCESS ROAD - GEOTECHNICAL NOTES

1. ROAD STRUCTURE PER PATERSON MEMO PG4958-MEMO.17

   TEMPORARY ACCESS ROAD (GASTOPS, STREET NO. 3, MOSQUITO DRIVE)
   150MM - BASE OPSS GRANULAR A OR OPSS GRANULAR B TYPE CRUSHED STONE
   300MM - SUBBASE OPSS OPSS GRANULAR B TYPE II OR APPROVED BLAST ROCK

   PERMANENT ACCESS ROAD (BLOCK 18)
   150MM - BASE OPSS GRANULAR A OR OPSS GRANULAR B TYPE CRUSHED STONE
   400MM - SUBBASE OPSS OPSS GRANULAR B TYPE II OR APPROVED BLAST ROCK

2. WHERE BLAST ROCK IS USED GEOTEXTILE TO BE PLACED BETWEEN THE SUBBASE AND BASE LAYER. WOVEN GEOTEXTILE - TERRAFIX 200W OR APPROVED EQUIVALENT
3. GRANULAR BASE AND SUBBASE TO BE PLACED IN MAXIMUM 300MM THICK LIFTS AND COMPACTED TO A MINIMUM OF 100% OF THE MATERIALS SPMDD
4. FILL USED TO RAISE THE SUBGRADE LEVEL SHALL BE COMPACTED TO A MINIMUM OF 95% OF ITS SPMDD. SITE GENERATED CLAY FILL SHALL BE COMPACTED WITH A SHEEPSFOOT ROLLER AND REVIEWED BY THE GEOTECHNICAL ENGINEER

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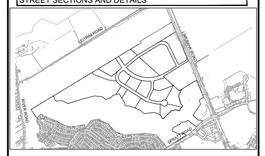
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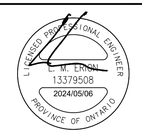
ISSUES

No.	DESCRIPTION	DATE
1	SUBMISSION 1 FOR CITY REVIEW	2023-11-24
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3	ISSUED FOR TENDER	2024-02-23
4	SUBMISSION 3 FOR CITY REVIEW	2024-04-02
5	ISSUED FOR CONSTRUCTION	2024-04-25
6	REVISED PER GEOTECHNICAL MEMO	2024-04-30
7	REVISED PER CITY COMMENTS	2024-05-02
8	REISSUED FOR CONSTRUCTION	2024-05-06

SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS



SEAL



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PROJECT
RIVERSIDE SOUTH
3700 TWIN FALLS PLACE
PHASE 1

PROJECT NO: 136974	
DRAWN BY: **C.C.**	CHECKED BY: **L.E.**
PROJECT MGR: **L.E.**	APPROVED BY: **L.E.**

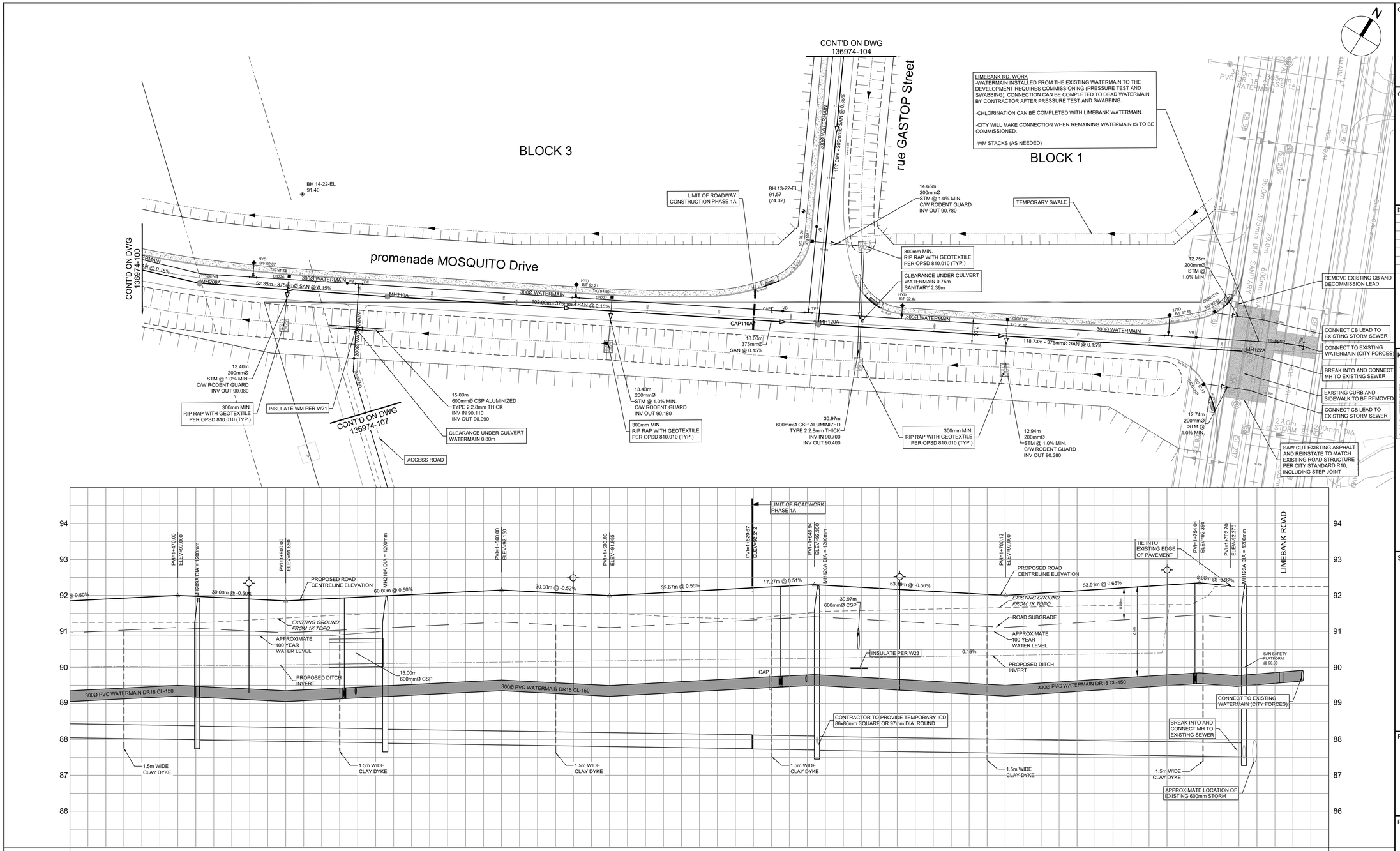
SHEET TITLE
STREET SECTIONS

SHEET NUMBER	ISSUE
011	8

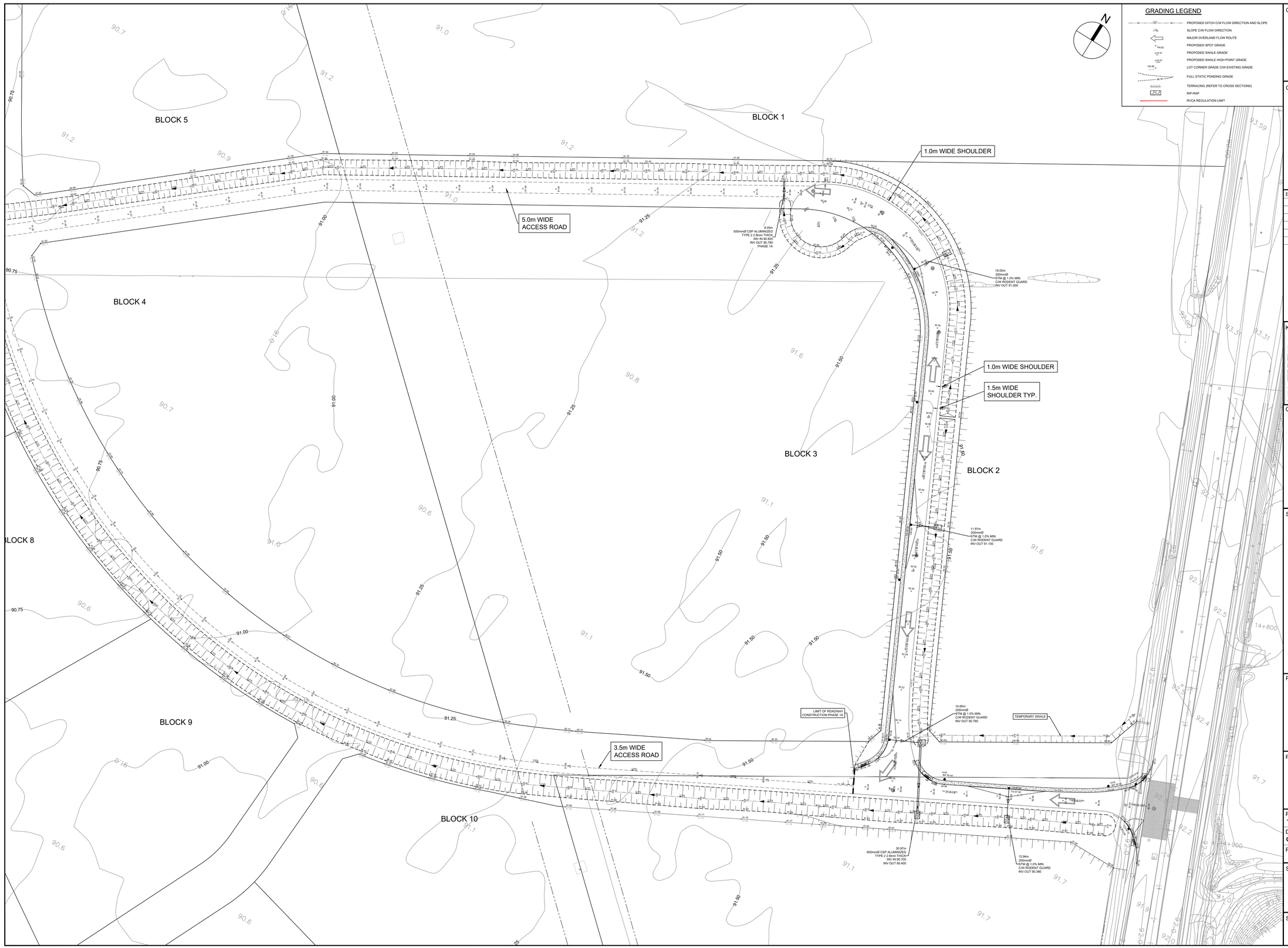
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D07-16-22-0014


CONT'D ON DWG 136974-104
CONT'D ON DWG 136974-100
CONT'D ON DWG 136974-107
BLOCK 3
BLOCK 1
rue GASTOP Street
promenade MOSQUITO Drive
LIMEBANK RD. WORK
-WATERMAIN INSTALLED FROM THE EXISTING WATERMAIN TO THE DEVELOPMENT REQUIRES COMMISSIONING (PRESSURE TEST AND SWABBING). CONNECTION CAN BE COMPLETED TO DEAD WATERMAIN BY CONTRACTOR AFTER PRESSURE TEST AND SWABBING.
-CHLORINATION CAN BE COMPLETED WITH LIMEBANK WATERMAIN.
-CITY WILL MAKE CONNECTION WHEN REMAINING WATERMAIN IS TO BE COMMISSIONED.
-WM STACKS (AS NEEDED)
LIMIT OF ROADWAY CONSTRUCTION PHASE 1A
TEMPORARY SWALE
BH 14-22-EL 91,40
BH 13-22-EL 91,57 (74.32)
14.65m 200mmØ STM @ 1.0% MIN. C/W RODENT GUARD INV OUT 90.780
300mm MIN. RIP RAP WITH GEOTEXTILE PER OPSD 810.010 (TYP.)
CLEARANCE UNDER CULVERT WATERMAIN 0.75m SANITARY 2.39m
12.75m 200mmØ STM @ 1.0% MIN.
REMOVE EXISTING CB AND DECOMMISSION LEAD
CONNECT CB LEAD TO EXISTING STORM SEWER
CONNECT TO EXISTING WATERMAIN (CITY FORCES)
BREAK INTO AND CONNECT MH TO EXISTING SEWER
EXISTING CURB AND SIDEWALK TO BE REMOVED
CONNECT CB LEAD TO EXISTING STORM SEWER
SAW CUT EXISTING ASPHALT AND REINSTATE TO MATCH EXISTING ROAD STRUCTURE PER CITY STANDARD R10, INCLUDING STEP JOINT
52.35m - 375mmØ SAN @ 0.15%
102.00m - 375mmØ SAN @ 0.15%
118.73m - 375mmØ SAN @ 0.15%
107.09m - 200mmØ SAN @ 0.35%
300Ø WATERMAIN
MH210A
MH120A
MH122A
CAP110A
CAP120
CB226
CB227
CICB126
CICB127
CICB128
CICB129
CICB130
CICB131
CICB132
CICB133
CICB134
CICB135
CICB136
CICB137
13.40m 200mmØ STM @ 1.0% MIN. C/W RODENT GUARD INV OUT 90.080
300mm MIN. RIP RAP WITH GEOTEXTILE PER OPSD 810.010 (TYP.)
INSULATE WM PER W21
15.00m 600mmØ CSP ALUMINIZED TYPE 2 2.8mm THICK INV IN 90.110 INV OUT 90.090
CLEARANCE UNDER CULVERT WATERMAIN 0.80m
ACCESS ROAD
13.43m 200mmØ STM @ 1.0% MIN. C/W RODENT GUARD INV OUT 90.180
300mm MIN. RIP RAP WITH GEOTEXTILE PER OPSD 810.010 (TYP.)
18.00m 375mmØ SAN @ 0.15%
30.97m 600mmØ CSP ALUMINIZED TYPE 2 2.8mm THICK INV IN 90.700 INV OUT 90.400
300mm MIN. RIP RAP WITH GEOTEXTILE PER OPSD 810.010 (TYP.)
12.94m 200mmØ STM @ 1.0% MIN. C/W RODENT GUARD INV OUT 90.380
12.74m 200mmØ STM @ 1.0% MIN.
23.0m STORM SEWER
200mm DIA
38.0m PVC DR 18 - 375mm WATERMAIN
96.0m - 375mm DIA SANITARY
76.2m - 600mm STORM
LIMIT OF ROADWORK PHASE 1A
TIE INTO EXISTING EDGE OF PAVEMENT
PROPOSED ROAD CENTRELINE ELEVATION
EXISTING GROUND FROM 1K TOPO
ROAD SUBGRADE
APPROXIMATE 100 YEAR WATER LEVEL
PROPOSED DITCH INVERT
APPROXIMATE 100 YEAR WA ER LEVEL
PROPOSED DITCH INVERT
INSULATE PER W23
CONTRACTOR TO PROVIDE TEMPORARY ICD 86x86mm SQUARE OR 97mm DIA. ROUND
SAN SAFETY PLATFORM @ 90.00
CONNECT TO EXISTING WATERMAIN (CITY FORCES)
BREAK INTO AND CONNECT MH TO EXISTING SEWER
APPROXIMATE LOCATION OF EXISTING 600m/m STORM
LIMEBANK ROAD
PVI=1+470.00 ELEV=92.000
PVI=1+500.00 ELEV=91.850
PVI=1+560.00 ELEV=92.150
PVI=1+590.00 ELEV=91.995
PVI=1+629.67 ELEV=92.212
PVI=1+646.94 ELEV=92.300
PVI=1+700.13 ELEV=92.000
PVI=1+754.04 ELEV=92.360
PVI=1+762.70 ELEV=92.210
MH209A DIA = 1200mm
MH210A DIA = 1200mm
MH120A DIA = 1200mm
MH122A DIA = 1200mm
30.00m @ -0.50%
60.00m @ 0.50%
30.00m @ -0.52%
39.67m @ 0.55%
17.27m @ 0.51%
53.79m @ -0.56%
53.91m @ 0.65%
8.00m @ -0.92%
@ 0.50%
15.00m 600mmØ CSP
30.97m 600mmØ CSP
0.15%
0.80m
2.0m
300Ø PVC WATERMAIN DR18 CL-150
1.5m WIDE CLAY DYKE
94
93
92
91
90
89
88
87
86

| | | |



GRADING LEGEND

- PROPOSED DITCH C/W FLOW DIRECTION AND SLOPE
- SLOPE C/W FLOW DIRECTION
- MAJOR OVERLAND FLOW ROUTE
- PROPOSED SPOT GRADE
- PROPOSED SWALE GRADE
- PROPOSED SWALE HIGH POINT GRADE
- LOT CORNER GRADE C/W EXISTING GRADE
- FULL STATIC PONDING GRADE
- TERRACING (REFER TO CROSS SECTIONS)
- RIP-RAP
- RVCA REGULATION LIMIT

CLIENT

Riverside South

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5	ISSUED FOR CONSTRUCTION	2024-04-25

SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS

KEY PLAN



CONSULTANTS

1:750 0 7.5 22.5 37.5m

SEAL

LICENSED PROFESSIONAL ENGINEER
L. M. ERION
13379508
2024/04/25
PROVINCE OF ONTARIO

PRIME CONSULTANT

ARCADIS

333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
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PROJECT

RIVERSIDE SOUTH
3700 TWIN FALLS PLACE
PHASE 1A

PROJECT NO: 136974	
DRAWN BY: **C.C.**	CHECKED BY: **L.E.**
PROJECT MGR: **L.E.**	APPROVED BY: **L.E.**

SHEET TITLE

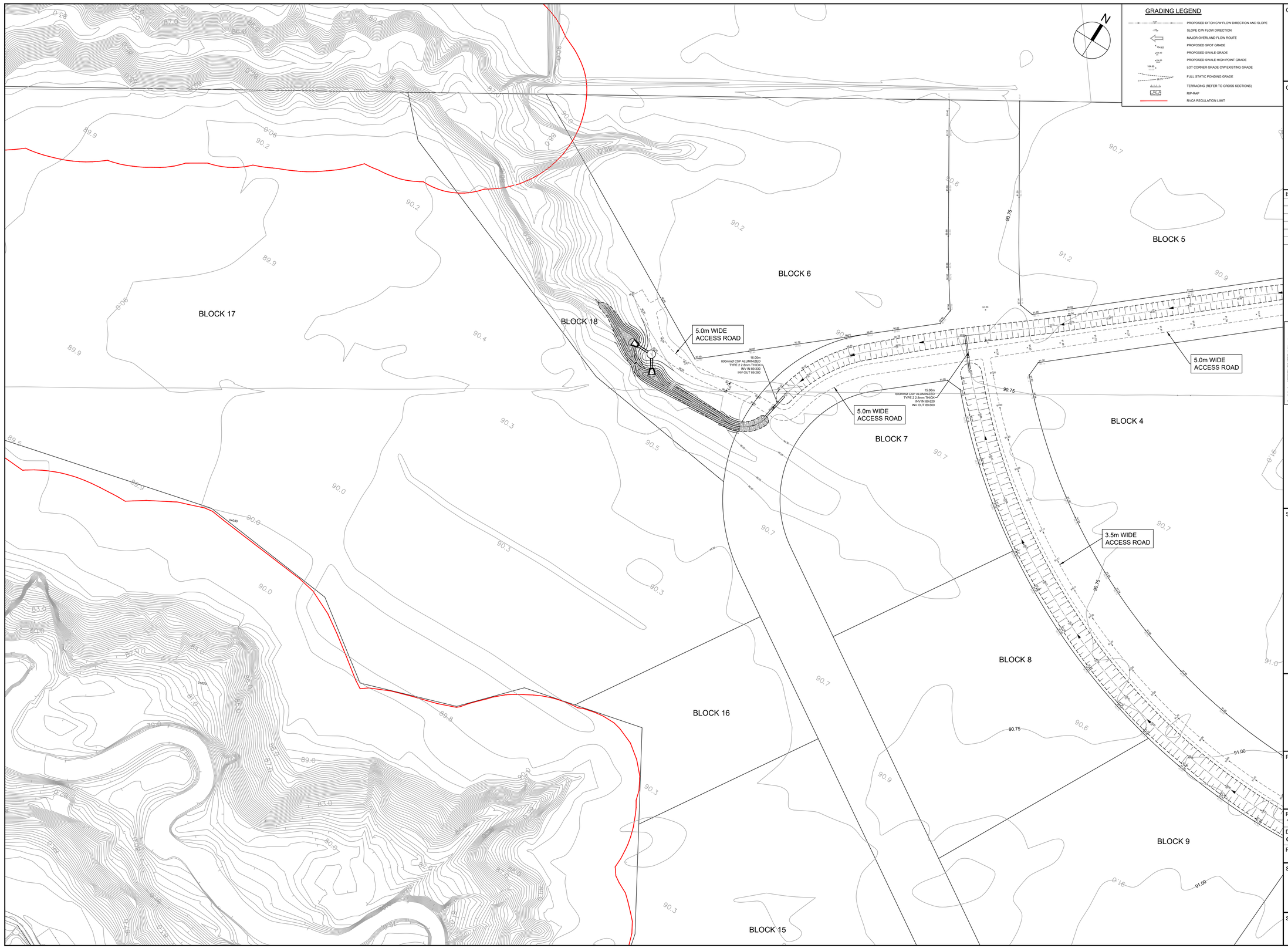
1A GRADING

SHEET NUMBER	ISSUE
200	5

SCALE CHECK 1 in 19072 50mm

D07-16-22-0014

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GRADING LEGEND

- PROPOSED DITCH C/W FLOW DIRECTION AND SLOPE
- SLOPE C/W FLOW DIRECTION
- MAJOR OVERLAND FLOW ROUTE
- PROPOSED SPOT GRADE
- PROPOSED SWALE GRADE
- PROPOSED SWALE HIGH POINT GRADE
- LOT CORNER GRADE C/W EXISTING GRADE
- FULL STATIC PONDING GRADE
- TERRACING (REFER TO CROSS SECTIONS)
- RIP-RAP
- RVCA REGULATION LIMIT

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Riverside South

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ISSUES

No.	DESCRIPTION	DATE
1	SUBMISSION 1 FOR CITY REVIEW	2023-11-24
2	SUBMISSION 2 FOR CITY REVIEW	2024-02-21
3	ISSUED FOR TENDER	2024-02-23
4	SUBMISSION 3 FOR CITY REVIEW	2024-04-02
5	ISSUED FOR CONSTRUCTION	2024-04-25

SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS



1:750 0 7.5 22.5 37.5m
0 7.5 22.5 37.5m

SEAL

LICENSED PROFESSIONAL ENGINEER
L. M. ERION
13379508
2024/04/25
PROVINCE OF ONTARIO

ARCADIS
333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT
RIVERSIDE SOUTH
3700 TWIN FALLS PLACE
PHASE 1A

PROJECT NO: 136974	
DRAWN BY: C.C.	CHECKED BY: L.E.
PROJECT MGR: L.E.	APPROVED BY: ####

SHEET TITLE
1A GRADING

SHEET NUMBER	ISSUE
201	5

SCALE CHECK 1 in 19072 50mm

D07-16-22-0014

File Location: J:\136974_RSS_Employme\7.0_Production\7.03_Design\04_Civil\Sheets\201 1A GRADING.dwg Last Saved: April 29, 2024, by Chris.Cormier Plotted: Monday, April 29, 2024 5:15:22 PM by Chris Cormier

File No.: PC2023-0184

August 30, 2023

Tyler Yakichuk
Fotenn Planning and Design
Via email: yakicuk@fotenn.com

Subject: **Phase 1 Pre-Application Consultation Meeting Feedback**
Zoning By-law Amendment & Site Plan Control – 4101 Limebank Road

Please find below information regarding next steps as well as consolidated comments from the above-noted pre-application consultation meeting held on August 23, 2023.

Pre-Application Consultation Preliminary Assessment

1 ☐	**2** ☐	**3** ☐	**4** ☐	**5** ☒

One (1) indicates that considerable major revisions are required while five (5) suggests that the proposal appears to meet the City's key land use policies and guidelines. This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.

Next Steps

1. As discussed during the Phase 1 pre-application consultation meeting, staff strongly recommend waiting for the **completion of the Mosquito Creek Master Servicing Study** prior to proceeding with the Phase 3 pre-application consultation application.

   When you are prepared to submit the Phase 3 pre-application consultation application, please send the completed form and studies/plans to planningcirculations@ottawa.ca.

2. In the next pre-application consultation submission, please include a detailed cover letter outlining how each of the comments were addressed. Please coordinate the numbering of the responses in your cover letter with the comment numbers herein.

Please note that if the proposal changes significantly in scope, design, or density, you may need to complete a Phase 2 pre-application consultation.

Supporting Information and Material Requirements

The attached **Study and Plan Identification List** outlines the information and material required (R) or advised (A) as for the Zoning By-law Amendment and Site Plan Control applications.

The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, are available on Ottawa.ca.

Please note that the new ToR and Guidelines outline specific requirements to deem a plan and/or study adequate at the Phase 3 pre-application consultation.

Consultation with External Agencies

Staff encourage applicants to consult with external technical agencies early in the development of the project concept and application process. External agencies include:

- Ottawa Airport Authority – Delroy Brown at Delroy.Brown@yow.ca
- Trans Northern Pipeline Inc. – W. Watt at wwatt@tnpi.com
- Riverside South Landowners Cost Sharing Agreement - Ursula Melinz, Soloway Wright

Planning Comments – Siobhan Kelly, Planner I

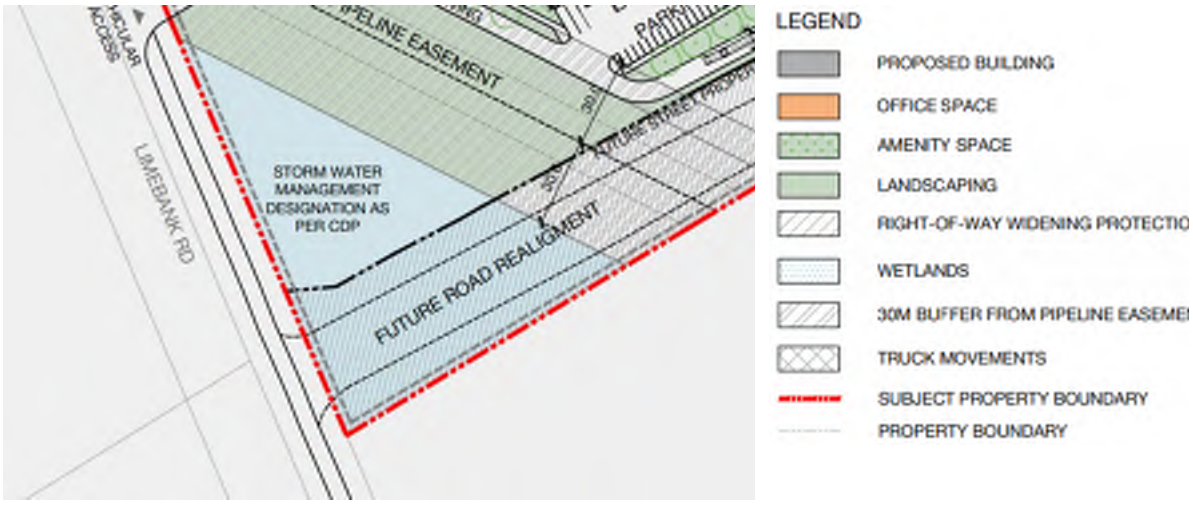
1. The Official Plan designates the property Industrial & Logistics in the Suburban Transect. The property is also within the Riverside South Secondary Plan area (to be drafted and approved by Council).

2. The property is subject to the Riverside South Community Design Plan. Please ensure that the Planning Rationale submitted in support of the application considers the policy and built form directions, including Section 6.3 Employment Areas Built Form.

3. Provide a copy of the registered easement agreement for the transmission pipeline with the application submission.

4. The Concept Plan submitted with the Phase 1 pre-application consultation shows a stormwater management (SWM) pond in the south-west corner of the site. Please note that the completed Mosquito Creek Master Servicing Study may reveal that a SWM pond is not required in this location.

5. The Concept Plan identifies the SWM pond as a wetland based on the notation in legend. Please confirm if the pond (if required) will be constructed as a wetland or dry pond.



6. For the Phase 3 application consultation please confirm if any site-specific amendments are needed to facilitate the proposed development. Provisions from the General Industrial (IG) zone to make note of include:

- Accessory display and sale areas are capped at 25% of the GFA of the warehouse use.

- Parking rates – if the office uses are accessory to the warehouse (i.e., service the warehouses on-site), you can rely on the warehouse parking rate.

7. Preliminary site plan comments:

    - Snow storage area(s) should be strategically located given the size of the site and amount of surface parking and loading spaces. If parking any spaces are used for snow storage, be aware that those spaces cannot contribute to the required parking space count.

    - Aisle width dimensions for loading spaces will depend on the angle of the loading space.

8. Section 37 requirements / Community Benefits Charge

    a. The former Section 37 regime has been replaced with a "Community Benefits Charge", By-law No. 2022-307, of 4% of the land value. This charge will be required for ALL buildings that are 5 or more storeys and 10 or more units and will be required at the time of building permit unless the development is subject to an existing registered Section 37 agreement. Questions regarding this change can be directed to Ranbir.Singh@ottawa.ca.

If you have any questions or require further information, please contact Siobhan Kelly, Planner I, at siobhan.kelly@ottawa.ca

Engineering Comments – Reed Adams, Infrastructure Project Manager

9. Phase 2 of the Mosquito Creek Master Servicing Study (IBI is the consultant completing the study) must be completed before the submission of this application.

    a. For updates on Phase 2 of the master servicing study, please refer to the following contacts:

        i. Terry Brule, P.Eng. Associate Director – Practice Lead, Land Engineering at Arcadis (formerly IBI), terry.brule@arcadis.com, Cell: 819-664-7322

        ii. Marcel Denomme, Vice President of Land Development at Urbandale Corporation, mdenomme@urbandale.com Office Number: 613-731-6712 ext: 1230, Cell 613-889-6204

10. Existing Public Services (Storm, Sanitary & Water Supply)

    a. 305mm watermain along Limebank Rd. (see water section below).

    b. 375mm sanitary sewer along Limebank Rd. (see sanitary section below).

    c. 600mm storm sewer along Limebank Rd. (see stormwater section below).

d. Monitoring manholes are required. They must be located in an accessible location on private property near the property line (ie. Not in a parking area).

11. Water Boundary condition requests must include the location of the service (map or plan with connection location(s) indicated) and the expected loads required by the proposed development, including calculations. Please provide the following information:

    a. Location of service

    b. Type of development and the amount of fire flow required (as per FUS).

    c. Average daily demand: ___ l/s.

    d. Maximum daily demand: ___l/s.

    e. Maximum hourly daily demand: ___ l/s.

12. An MECP Environmental Compliance Approval for **Industrial/Municipal/Private Sewage Works** will be required for the proposed development. Please contact the Ministry of the Environment, Conservation and Parks, Ottawa District Office to arrange a pre-submission consultation (pre-submission consultation only required for direct submission applications):

    a. Emily Diamond at (613) 521-3450, ext. 238 or Emily.Diamond@ontario.ca

13. Water

    a. The watermain currently under Limebank Rd is inactive and would need to be commissioned when approaching the service connection date. The commissioning would be done by City forces. An automatic private flushing chamber may also be required for water quality purposes.

    b. A second watermain will be required to provide looping to the proposed development if the anticipated flows are greater than 50 cum/day. Urbandale Corporation is currently in the process obtaining draft plan approval for a subdivision at 3700 Twin Falls. Contact Urbandale Corp to discuss opportunities to extend another watermain along Leitrim Rd to provide looping.

14. Sanitary

    a. The sanitary outlet for this site would be to the future sanitary sewer in the future Leitrim road realignment.

15. Stormwater

    a. There are no storm sewers or end of pipe facilities planned for the business park.

    b. The storm outlet for this site would be going through Urbandale's realigned Leitrim Rd as part of their proposed subdivision.

    c. On-site stormwater quality and quantity control is required via LIDs (i.e. infiltration measures). Based on the current site plan, there does not appear to be any open space

for such LID features. This needs to be explored further to comply with the approved Mosquito Creek Master Drainage Plan.

d. A ditch type outlet would need to be accommodated along the future Leitrim Rd realignment and outlet to proposed (as part of Urbandale's future subdivision) 975mm diameter culvert under Limebank Road.

e. The existing drainage feature to the north of the site must be maintained.

f. Maximum release rate:

    a. 159.72 L/s (based on draft MSS Storm Drainage Plan Drawing 500)

g. The site is tributary to Tributary 4 (watercourse located at the corner of Leitrim and River Rd. that outlets to the Rideau River, to refer to Mosquito Creek Master Drainage Plan).

h. Quality control is required for the site, with enhanced TSS removal being required (80% TSS removal).

16. Background studies

    a. Riverside South Community Master Drainage Plan Update Mosquito Creek Study Area, 2021

If you have any questions or require further information, please contact Reed Adams, Infrastructure Project Manager, at reed.adams@ottawa.ca

Urban Design Comments – Molly Smith, Planner II

17. A Design Brief is required. Please refer to the **attached terms of reference**. The Design Brief is to be a standalone document and should follow the structure of Section 3.

18. Please review the guidelines in the Riverside South Community Design Plan. There is a section on 'Employment Areas Built Form', which applies to the site. The CDP seeks large landscape buffers (ideally 6m) and pedestrian connections within the site, and articulated elevations. A response to the CDP policies will be required to be included in the Design Brief.

19. The parking bays adjacent to the future road alignment are not supported by the CDP and should be internal to the site, not adjacent to the street edge.

20. Please ensure that pedestrian connections are direct to entrances from parking lots or are marked clearly. Where there are opportunities, please include trees in parking islands.

21. An outdoor refuge area would be beneficial for employees. Staff recommend locating this refuge area in proximity to a landscaped area, LIDs or include shade structures.

22. Please find locations for large tree plantings. The pipeline easement seems to be a great opportunity to provide plantings but please check with the pipeline that trees can be planted.

If you have any questions or require further information, please contact Molly Smith, Planner II, at molly.smith@ottawa.ca

Noise & Transportation – Neeti Paudel, Transportation Project Manager

23. A stationary noise study is **only required** if there will be any exposed mechanical equipment in proximity to neighbouring noise sensitive land uses. Please provide confirmation as part of the next submission.

24. A Transportation Impact Assessment (TIA) is required and should be prepared in accordance with the City's TIA Guidelines.

    a. The applicant will need to submit Step 2 of the TIA with the Phase 2 pre-application consultation. If a Phase 2 pre-application consultation is not warranted, it is the applicant's responsibility to submit Step 2 of the TIA to the Transportation Project Manager. Please submit this as soon as possible or at the latest, 14 days prior to the Phase 3 pre-application consultation submission. Failure to do so will result in deeming the application for a Phase 3 pre-application consultation incomplete.

    b. There is currently no timeline for the Leitrim Road realignment. The TIA should include an assessment of the Limebank Road access without future access on the realigned Leitrim Road. .

    c. Collaboration and communication between the applicant and City staff is required at the end of each step of the TIA process.

25. Corner triangle on Limebank Road and future Leitrim Road should be protected in accordance with the functional design of the EA. Please refer to the **attached drawing for realigned Leitrim Road**.

26. Ensure that the development proposal complies with the Right-of-Way protection requirements of the Official Plan's Schedule C16. Design for Leitrim is attached. Please note right of way requirements are reviewed and approved by Transportation Planning.

27. Clear throat requirements as per the Transportation Association of Canada (TAC) Guidelines should be met.

28. Site Plan comments:

    a. Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.

    b. Turning templates will be required for all accesses showing the largest vehicle to access the site; required for internal movements and at all access (entering and exiting and going in both directions).

    c. Show all curb radii measurements; ensure that all curb radii are reduced as much as possible.

    d. Show lane/aisle widths.

    e. Sidewalk is to be continuous across access as per City Specification 7.1.

29. As the proposed site is industrial and for public use, the Accessibility for Ontarians with Disabilities Act (AODA) applies.

    a. Clearly define accessible parking stalls and ensure they meet AODA standards (include an access aisle next to the parking stall and a pedestrian curb ramp at the end of the access aisle, as required).

    b. Please consider using the City's Accessibility Design Standards, which provide a summary of AODA requirements. https://ottawa.ca/en/city-hall/creating-equal-inclusive-and-diverse-city/accessibility-services/accessibility-design-standards-features#accessibility-design-standards

If you have any questions or require further information, please contact Neeti Paudel, Transportation Project Manager, at Neeti.paudel@ottawa.ca

Environmental Planning Comments – Mark Elliott, Planner II

30. Environmental Planning staff have concerns with the lack of soft landscaping on site from the perspective of meeting the urban tree canopy, climate resilience, and urban heat island effect goals. More plantings (as preferred in the Bird Hazard Zone guide), are recommended.

31. A Tree Conservation Report is required to ensure the protection of species-at-risk butternut trees, should they exist in the hedgerows along the perimeter. An Environmental Impact Statement (EIS) is not required provided that the TCR fully addresses the butternut trees.

32. Based on the materials provided, it does not appear that the proposed development will encroach on the watercourse located in the southwestern corner of the property. The proposal should adhere to the Riverside South Master Drainage Plan.

33. The property is within the Airport Primary and Secondary Bird Hazard Zones, which impacts the types of trees that should be planted. Staff will follow up with a copy of the suggested planting guide.

If you have any questions or require further information, please contact Mark Elliott, Planner II, mark.elliott@ottawa.ca

Parks and Facilities Planning Comments – Burl Walker, Planner III

34. The parkland dedication requirement has been estimated for the proposed development based on the Site Information shown on Concept Plan – Option 1B revised June 16, 2023, and the rates established in the Parkland Dedication By-law No. 2022-280 for a parkland dedication requirement of 0.303 ha as follows:

    Table 1: Parkland Dedication Requirement.

Proposed Use	Gross Land Area (ha)	Parkland Dedication Rate	Parkland Dedication Requirement (ha)
Industrial	15.125 ha	2% of Gross Land Area	0.303

The Riverside South CDP Land Use Plan and the draft Land Use Plan for the Riverside South Secondary Plan do not identify any parks within the subdivision.

The Riverside South Landowners Cost Sharing Agreement is intended to address the sharing of park land and development costs in the Riverside South CDP area. Pursuant to Policy 11.6.11 of the Official Plan, the owner would be required to contribute to the cost sharing of the park land and development costs and to provide a letter from the Agreement Administrator stating that the owner is in good standing prior to the registration of the site plan agreement.

The subject lands correspond with the property described as 845471 Ontario Inc. in the schedules to the Riverside South Landowners Cost Sharing Agreement. 845471 Ontario Inc. is identified in the Agreement as a participating landowner. The Shared Park Land schedule to the agreement identifies a contribution from the site towards the overall parkland dedication in Riverside South. If the Parkland Dedication By-law requires a greater parkland dedication requirement compared to the owner's share of parkland dedication in the Cost Sharing Agreement, the remaining parkland dedication requirement may be taken in the form of cash-in-lieu of parkland dedication.

For further information on the Riverside South Landowners Cost Sharing Agreement, the applicant or owner should contact the Agreement Administrator, **Ursula Melinz at Soloway Wright**.

If you have any questions or require further information, please contact Burl Walker at burl.walker@ottawa.ca

Planning Forestry Comments – Hayley Murray, Forester

35. Confirm if there are any trees 10 cm or greater in size on the property and if there are any adjacently owned trees with critical root zones that extend into the property. If the answer is yes, a Tree Conservation Report (TCR) is required for the Site Plan Control application.

36. A landscape plan is required for the Site Plan Control application. Staff recommend submitting a high-level conceptual landscape plan with the Zoning By-law Application to demonstrate that there is adequate space and soil volume for tree planting.

37. Maximize tree planting opportunities on the property to mitigate the urban heat island effect and contribute to the City's 40% urban canopy cover target (as per Official Plan Sections 2.2.3 and 4.8.2).

38. Incorporate tree planting around the perimeter of the property and throughout the site where feasible.

39. Ensure that the landscape plan complies with the City's new terms of reference for landscape plans: https://documents.ottawa.ca/sites/documents/files/landscape_tor_en.pdf

40. Tree Conservation Report (TCR) requirements:

    a. The TCR must list all trees on site, as well as off-site trees if the CRZ extends into the developed area, by species, diameter, and health condition.

    b. Please identify trees by ownership – private onsite, private on adjoining site, city owned, boundary (trees on a property line).

    c. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained.

    d. All retained trees must be shown, and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca

    e. The location of tree protection fencing must be shown on the plan.

    f. The City encourages the retention of healthy trees; if possible, please seek opportunities for tree retention that will contribute to the design/function of the site.

    g. For more information on the process or help with tree retention options, contact Hayley Murray hayley.murray@ottawa.ca or on City of Ottawa

    41. Landscape Plan Tree Planting Requirements:

        a. Minimum Setbacks

            - Maintain 1.5m from sidewalk or MUP/cycle track or water service laterals.
            - Maintain 2.5m from curb.
            - Coniferous species require a minimum 4.5m setback from curb, sidewalk, or MUP/cycle track/pathway.
            - Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing, except where otherwise approved in naturalization / afforestation areas. Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when **planting around overhead primary conductors.**

        b. Tree specifications

            - Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
            - Maximize the use of large deciduous species wherever possible to maximize future canopy coverage.

- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
- Plant native trees whenever possible
- No root barriers, dead man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

c. Hard surface planting

- Curb style planter is highly recommended.
- No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
- Trees are to be planted at grade.

d. Soil Volume

- Please document on the LP that adequate soil volumes can be met:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

** Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay **

- Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines for trees in the Right of Way

e. Tree Canopy

- The landscape plan shall show how the proposed tree planting will replace and increase canopy cover on the site over time, to support the City's 40% urban forest canopy cover target.

- At a site level, efforts shall be made to provide as much canopy cover as possible, through tree planting and tree retention, with an aim of 40% canopy cover at 40 years, as appropriate. Indicate on the plan the projected future canopy cover at 40 years for the site.

If you have any questions or require further information, please contact Hayley Murray, Forester at Hayley.murray@ottawa.ca

Rideau Valley Conservation Authority – Eric Lalonde, Senior Planner

42. There are no natural hazards or regulated features on the property. The RVCA has no comments.

If you have any questions or require further information, please contact Eric Lalonde, Senior Planner at eric.lalande@rvca.ca

Other Notes

High-Performance Development Standards (HPDS)

- The High-Performance Development Standard (HPDS) is a collection of voluntary and required standards that raise the performance of new building projects to achieve sustainable and resilient design. Council passed the HPDS on April 13, 2022.

- The HPDS is not currently in effect and Council referred the 2023 HPDS Update Report back to staff with direction to bring forward an updated report to Committee with recommendations for revised phasing timelines, resource requirements and associated amendments to the Site Plan Control By-law by no later than Q1 2024.

- Please refer to the HPDS information attached and ottawa.ca/HPDS for more information.

If you have any questions or require further information, please feel free to to contact myself or the contacts identified for the above disciplines.

Regards,

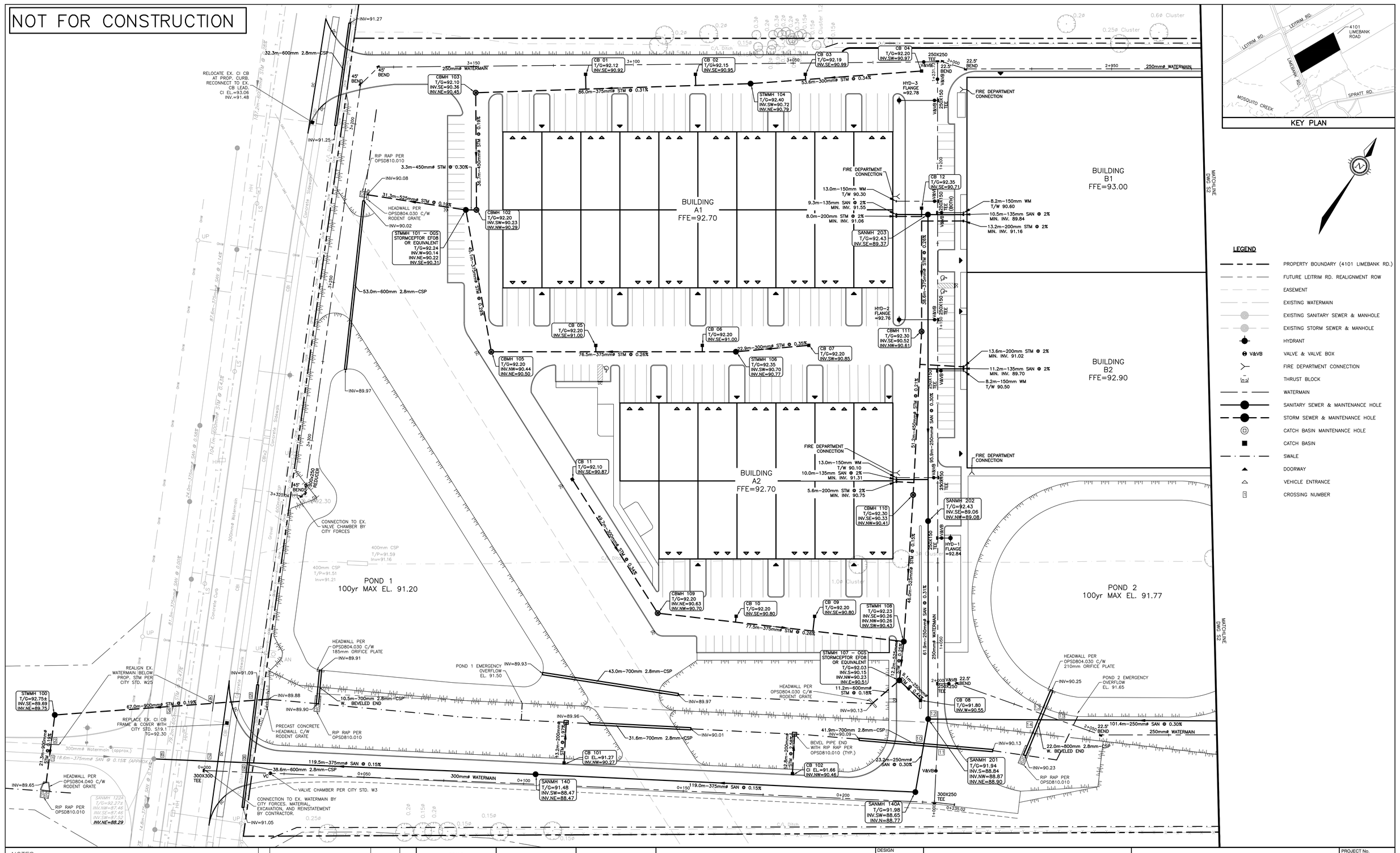
Siobhan Kelly
Planner I
Development Review – South
Planning, Real Estate and Economic Development Department

cc.

Stream Shen, Planner III
Molly Smith, Planner II, Urban Design
Reed Adams, PM
John Sevigny, Senior PM
Neeti Paudel, TPM
Mark Elliott, Planner II, Environmental Planning
Hayley Murray, Forester
Burl Walker, Planner III, Parks & Facilities
Planning Circulations - planningcirculations@ottawa.ca

Appendix B

NOT FOR CONSTRUCTION



NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

PROPERTY BOUNDARIES ARE DERIVED FROM TOPOGRAPHICAL PLAN OF SURVEY OF PART OF LOTS 16 & 17 CONCESSION 2 (RIDEAU FRONT), GEOGRAPHIC TOWNSHIP OF GLOUCESTER, CITY OF OTTAWA. PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ONTARIO LAND SURVEYORS, REF: 24256–23. ELEVATIONS ARE REFERRED TO GEODETIC DATUM (CGVD28).

NO.	REVISION DESCRIPTION	DATE	BY

SCALE
0 5m 10m 20m
HORIZONTAL 1:500

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

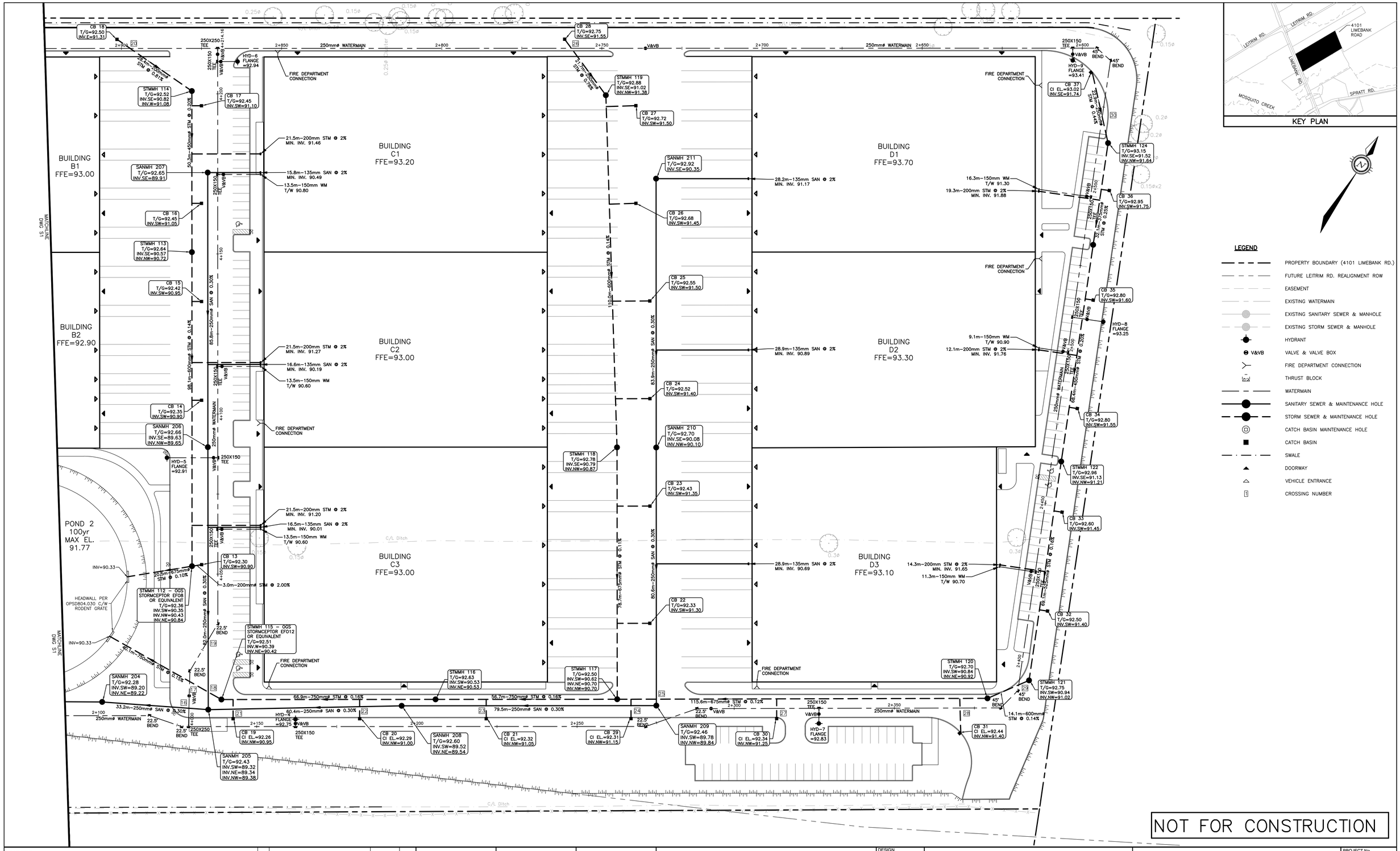
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DRAWN	SM
CHECKED	CC
APPROVED	CC

GROUPE MONTONI

4101 LIMEBANK RD.
CITY OF OTTAWA

SERVICING PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	SEPT 2024
DWG. No:	23074-S1



LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- FUTURE LEITRIM RD. REALIGNMENT ROW
- EASEMENT
- EXISTING WATERMAIN
- EXISTING SANITARY SEWER & MANHOLE
- EXISTING STORM SEWER & MANHOLE
- HYDRANT
- V&VB — VALVE & VALVE BOX
- FIRE DEPARTMENT CONNECTION
- THRUST BLOCK
- WATERMAIN
- SANITARY SEWER & MAINTENANCE HOLE
- STORM SEWER & MAINTENANCE HOLE
- CATCH BASIN MAINTENANCE HOLE
- CATCH BASIN
- SWALE
- DOORWAY
- VEHICLE ENTRANCE
- CROSSING NUMBER

NOT FOR CONSTRUCTION

NOTES

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NO.	REVISION DESCRIPTION	DATE	BY

SCALE

0 5m 10m 20m

HORIZONTAL 1:500

Robinson Land Development

350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

DESIGN	SM
CHECKED	CC
DRAWN	SM
CHECKED	CC
APPROVED	CC

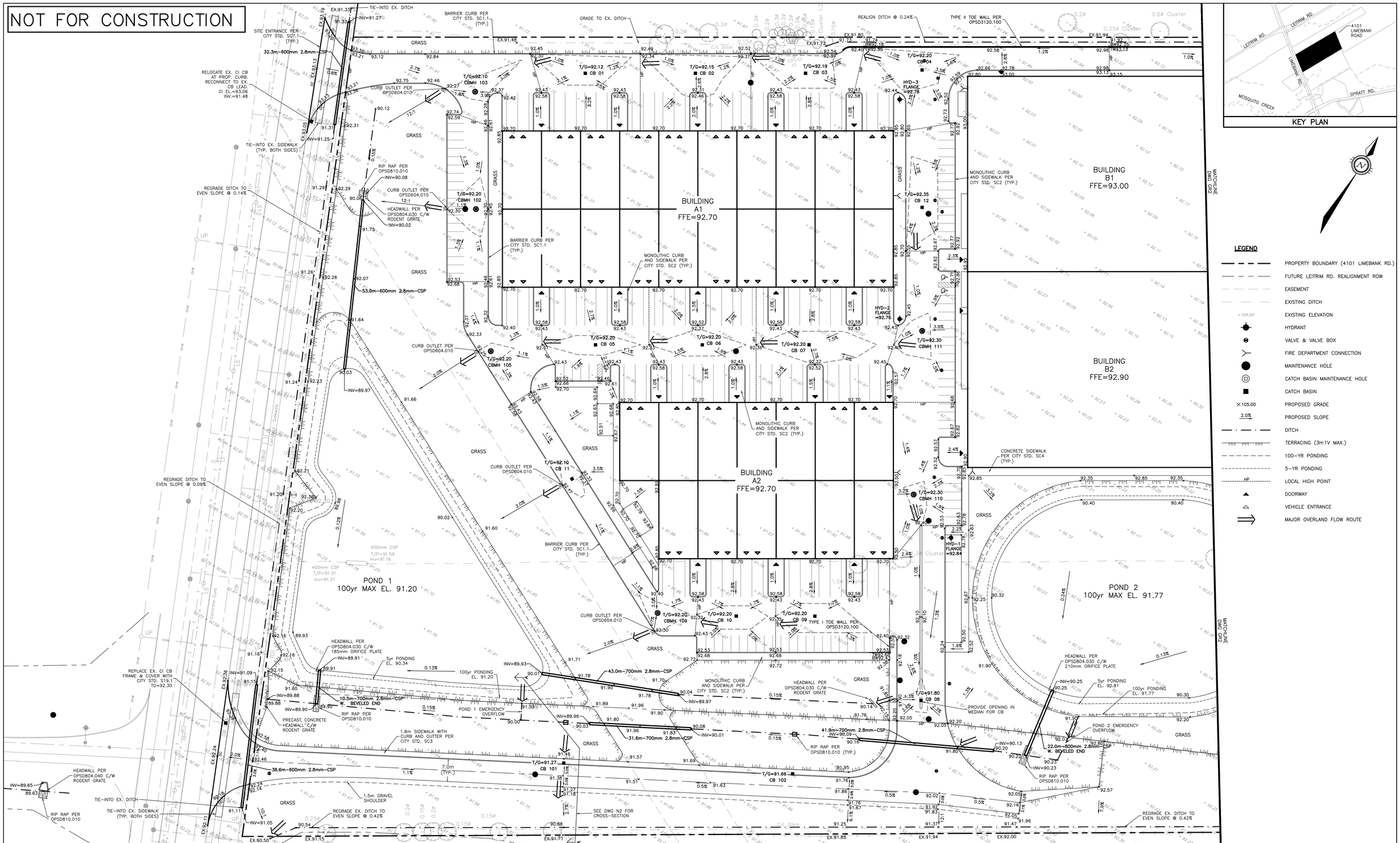
GROUPE MONTONI

4101 LIMEBANK RD.
CITY OF OTTAWA

SERVICING PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	SEPT 2024
DWG. No:	23074-S2

NOT FOR CONSTRUCTION



LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- FUTURE LEITRIM RD. REALIGNMENT ROW
- EASEMENT
- EXISTING DITCH
- ×104.00 EXISTING ELEVATION
- HYDRANT
- VALVE & VALVE BOX
- FIRE DEPARTMENT CONNECTION
- MAINTENANCE HOLE
- CATCH BASIN MAINTENANCE HOLE
- CATCH BASIN
- ×105.00 PROPOSED GRADE
- 2.0% PROPOSED SLOPE
- DITCH
- TERRACING (3H:1V MAX.)
- 100-YR PONDING
- 5-YR PONDING
- HP LOCAL HIGH POINT
- DOORWAY
- VEHICLE ENTRANCE
- MAJOR OVERLAND FLOW ROUTE

NOTES

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PROPERTY BOUNDARIES ARE DERIVED FROM TOPOGRAPHICAL PLAN OF SURVEY OF PART OF LOTS 16 & 17 CONCESSION 2 (RIDEAU FRONT), GEOGRAPHIC TOWNSHIP OF GLOUCESTER, CITY OF OTTAWA. PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ONTARIO LAND SURVEYORS, REF: 24256-23. ELEVATIONS ARE REFERRED TO GEODETIC DATUM (CGVD28).

NO.	REVISION DESCRIPTION	DATE	BY

SCALE
0 5m 10m 20m
HORIZONTAL 1:500

Robinson Land Development
350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

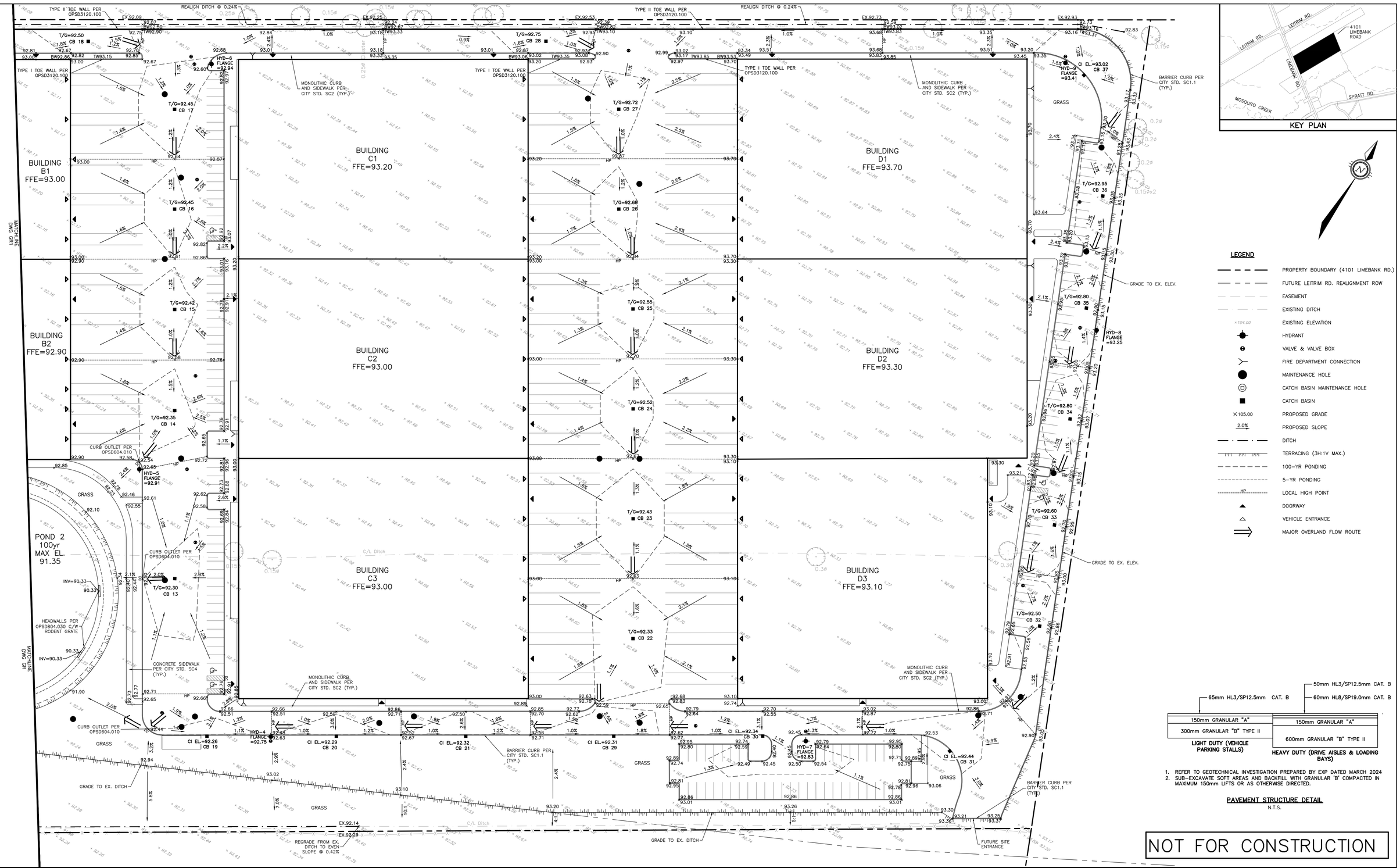
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APPROVED	CC

GROUPE MONTONI

4101 LIMEBANK RD.
CITY OF OTTAWA

GRADING PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	SEPT 2024
DWG. No:	23074-GR1



KEY PLAN

LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- FUTURE LEITRIM RD. REALIGNMENT ROW
- EASEMENT
- EXISTING DITCH
- ×104.00 EXISTING ELEVATION
- HYDRANT
- VALVE & VALVE BOX
- FIRE DEPARTMENT CONNECTION
- MAINTENANCE HOLE
- CATCH BASIN MAINTENANCE HOLE
- CATCH BASIN
- ×105.00 PROPOSED GRADE
- 2.0% PROPOSED SLOPE
- DITCH
- TERRACING (3H:1V MAX.)
- 100-YR PONDING
- 5-YR PONDING
- HP LOCAL HIGH POINT
- DOORWAY
- VEHICLE ENTRANCE
- MAJOR OVERLAND FLOW ROUTE

1. REFER TO GEOTECHNICAL INVESTIGATION PREPARED BY EXP DATED MARCH 2024
2. SUB-EXCAVATE SOFT AREAS AND BACKFILL WITH GRANULAR 'B' COMPACTED IN MAXIMUM 150mm LIFTS OR AS OTHERWISE DIRECTED.

PAVEMENT STRUCTURE DETAIL
N.T.S.

NOT FOR CONSTRUCTION

NOTES

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

PROPERTY BOUNDARIES ARE DERIVED FROM TOPOGRAPHICAL PLAN OF SURVEY OF PART OF LOTS 16 & 17 CONCESSION 2 (RIDEAU FRONT), GEOGRAPHIC TOWNSHIP OF GLOUCESTER, CITY OF OTTAWA. PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. ONTARIO LAND SURVEYORS, REF: 24256-23. ELEVATIONS ARE REFERRED TO GEODETIC DATUM (CGVD28).

NO.	REVISION DESCRIPTION	DATE	BY

SCALE
0 5m 10m 20m
HORIZONTAL 1:500

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350 Palladium Drive
Ottawa, ON K2V 1A8
(613) 592-6060 rcii.com

DESIGN	SM
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DRAWN	SM
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APPROVED	CC

GROUPE MONTONI

4101 LIMEBANK RD.
CITY OF OTTAWA

GRADING PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	AUG 2024
DWG. No:	23074-GR2

GENERAL NOTES:

1. ALL WORKS AND MATERIALS SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF THE CITY OF OTTAWA AND ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS), AS AMENDED BY THE CITY OF OTTAWA.
2. THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION, TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
3. ALL DIMENSIONS AND ELEVATIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.
4. DESIGN ELEVATIONS GIVEN ARE TO BE ADHERED TO WITH NO CHANGES WITHOUT PRIOR WRITTEN APPROVAL BY ROBINSON LAND DEVELOPMENT.
5. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS TO PROPOSED GRADES WHERE NOTED, AND EXISTING GRADES OTHERWISE.
6. CONTRACTOR SHALL ADJUST FINAL GRADE OF EXISTING MAINTENANCE HOLES, VALVE BOXES, ETC. AS REQUIRED TO MATCH PROPOSED GRADES.
7. ANY AREAS BEYOND THE LIMIT OF THE SITE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION AT THE CONTRACTOR'S EXPENSE.
8. RELOCATION OF EXISTING SERVICES AND/OR UTILITIES SHALL BE AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER AT THE EXPENSE OF THE CONTRACTOR.
9. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
10. ALL CONSTRUCTION SIGNAGE MUST CONFORM TO THE M.T.O. MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (LATEST AMENDMENT).
11. ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
12. THE SUPPORT OF ALL UTILITIES SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
13. THE CONTRACTOR WILL BE RESPONSIBLE FOR ADDITIONAL BEDDING OR ADDITIONAL STRENGTH PIPE IF THE MAXIMUM TRENCH WIDTH, AS SPECIFIED BY OPSD, IS EXCEEDED.
14. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REFER TO LANDSCAPE PLANS FOR ANY TREE CUTTING.
15. REFER TO GEOTECHNICAL INVESTIGATION PREPARED BY EXP DATED MARCH 2024.
16. THE CONTRACTOR IS RESPONSIBLE FOR AND SHALL PROVIDE FOR DEWATERING, SUPPORT AND PROTECTION OF EXCAVATIONS AND TRENCHING AS WELL AS RELEASE OF ANY PUMPED GROUNDWATER IN A CONTROLLED AND APPROVED MANNER.
17. DO NOT CONSTRUCT USING DRAWINGS THAT ARE NOT MARKED "ISSUED FOR CONSTRUCTION".
18. CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
19. THE CONTRACTOR SHALL BE RESPONSIBLE TO MANAGE EXCESS SOIL IN ACCORDANCE WITH ONTARIO REGULATION 406/19.

STORM SEWERS:

1. ALL REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.2 (LATEST AMENDMENT). ALL NON-REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.1 (LATEST AMENDMENT). PIPE SHALL BE JOINTED WITH STD. RUBBER GASKETS AS PER CSA A257.3 (LATEST AMENDMENT).
2. ALL PVC STORM SEWERS ARE TO BE SDR 35 APPROVED PER C.S.A. B182.2 OR LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
3. ALL STORM SEWER TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. S6 AND S7 CLASS 'B' UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY GEOTECHNICAL REPORT.
4. CLAY SEALS SHALL BE INSTALLED WITHIN SEWER TRENCHES IN ACCORDANCE WITH CITY STANDARD S8.
5. STORM MANHOLE FRAME AND COVERS SHALL BE AS PER CITY OF OTTAWA STD. S24.1 AND S25. CBMH COVER AND FRAME AS PER CITY OF OTTAWA STD. S19.
6. CB FRAME PER OPSD 400.020 AND COVER PER CITY OF OTTAWA STD. 19.1. CURB INLET CB FRAME AND COVER PER CITY OF OTTAWA STD. S28.
7. STORM SEWER MANHOLES SERVING SEWERS LESS THAN 900mm SHALL BE CONSTRUCTED WITH A 300mm SUMP. FOR STORM SEWERS 900mm AND OVER USE BENCHING IN ACCORDANCE WITH OPSD 701.021.
8. THE STORM SEWER CLASSES HAVE BEEN DESIGNED BASED ON BEDDING CONDITIONS SPECIFIED ABOVE. WHERE THE SPECIFIED TRENCH WIDTH IS EXCEEDED, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE ADDITIONAL BEDDING, A DIFFERENT TYPE OF BEDDING OR A HIGHER PIPE STRENGTH AT HIS OWN EXPENSE AND SHALL ALSO BE RESPONSIBLE FOR EXTRA TEMPORARY AND/OR PERMANENT REPAIRS MADE NECESSARY BY THE WIDENED TRENCH.
9. ALL STORM MANHOLES SHALL BE 1200mm DIAMETER AS PER OPSD 701.010 UNLESS OTHERWISE NOTED.
10. ALL CATCH BASINS SHALL BE 600mm X 600mm AS PER OPSD 705.010 UNLESS OTHERWISE NOTED.
11. ALL CB LATERALS SHALL BE 200mm PVC AT 2% UNLESS OTHERWISE NOTED.
12. STORM SERVICE CONNECTION REQUIRES APPROVED CONTROLLED SETTLEMENT JOINT IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S11 AND S11.1.
13. FOUNDATION DRAINS TO BE INSTALLED WITH BACKWATER VALVES PER CITY OF OTTAWA STD. S14.
14. SEWERS, SERVICES AND LATERALS WITH LESS THAN 2m COVER SHALL BE INSULATED PER CITY OF OTTAWA STD. S35.
15. CULVERTS TO BE INSTALLED IN ACCORDANCE WITH CITY OF OTTAWA STD. S26 AND SHALL BE PROVIDED WITH FROST TAPER IN ACCORANCE WITH OPSD 803.030.

SANITARY SEWERS:

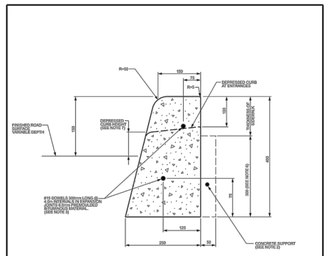
1. ALL SANITARY SEWERS SHALL BE PVC SDR 35 AND SERVICE LATERALS SHALL BE PVC SDR 28, IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS.
2. SANITARY SEWER TRENCH AND BEDDING SHALL BE AS PER CITY OF OTTAWA STD. S6 AND S7, CLASS 'B' BEDDING UNLESS OTHERWISE NOTED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY GEOTECHNICAL REPORT.
3. SANITARY MANHOLE FRAME AND COVERS SHALL BE WATERTIGHT AS PER CITY OF OTTAWA STD. S24 AND S25.
4. SANITARY SEWER MANHOLES SHALL BE 1200mm DIAMETER AS PER OPSD 701.010 AND BENCHED AS PER OPSD 701.021.
5. SANITARY PRE-CAST MANHOLE SHALL BE CONSTRUCTED WITH A HIGHER PERCENTAGE OF SILICA FUME IN THE CONCRETE TO MAKE IT MORE DENSE AND LESS SUSCEPTIBLE TO CORROSION OR PINHOLE LEAKS.
6. FOR SANITARY MANHOLES, DEPENDING ON THE ELEVATION OF THE GROUNDWATER TABLE, AND BASED ON THE RECOMMENDATION OF THE PROJECT GEOTECHNICAL CONSULTANT, CRETEX SEALS, OR A SIMILAR PRODUCT, SHALL BE INSTALLED IN THE PRE-CAST MANHOLE SECTION TO JUST BELOW THE MANHOLE FRAME TO PREVENT INFILTRATION.
7. CLAY SEALS SHALL BE INSTALLED WITHIN SEWER TRENCHES IN ACCORDANCE WITH CITY STANDARD S8.
8. CONTRACTOR SHALL PERFORM LEAKAGE TESTING, IN THE PRESENCE OF THE CONSULTANT, FOR SANITARY SEWERS IN ACCORDANCE WITH OPSS 410 AND OPSS 407. CONTRACTOR SHALL PERFORM VIDEO INSPECTION OF ALL STORM AND SANITARY SEWERS. A COPY OF THE VIDEO AND INSPECTION REPORT SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW.
9. SANITARY SERVICE CONNECTION REQUIRES APPROVED CONTROLLED SETTLEMENT JOINT IN ACCORDANCE WITH CITY OF OTTAWA STANDARD S11.1.
10. SEWERS AND LATERALS WITH LESS THAN 2m COVER SHALL BE INSULATED PER CITY OF OTTAWA STD. S35.

WATER SUPPLY:

1. ALL PVC WATERMAINS SHALL BE EQUAL TO AWWA C-900 CLASS 150, SDR 18, OR APPROVED EQUAL.
2. WATERMAIN TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W17, UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY GEOTECHNICAL REPORT.
3. ALL PVC WATERMAINS SHALL BE INSTALLED WITH A 10 GAUGE STRANDED COPPER TWU OR RWU TRACER WIRE IN ACCORDANCE WITH CITY OF OTTAWA STD. W36.
4. CATHODIC PROTECTION IS REQUIRED ON ALL METALLIC FITTINGS AS PER CITY OF OTTAWA STD. W40 AND W42.
5. CONTRACTOR TO SUPPLY HYDRANT EXTENSION TO ADJUST THE LENGTH OF HYDRANT BARREL IF REQUIRED.
6. FIRE HYDRANTS SHALL BE INSTALLED AS PER CITY OF OTTAWA STD. W19, AND LOCATED AS PER CITY STD. W18.
7. VALVE IN BOXES SHALL BE INSTALLED AS PER CITY OF OTTAWA STD. W24.
8. WATERMAIN IN FILL AREAS TO BE INSTALLED WITH RESTRAINED JOINTS AS PER CITY OF OTTAWA STD. W25.5 AND W25.6.
9. THRUST BLOCKING OF WATERMAIN TO BE INSTALLED AS PER CITY OF OTTAWA STD. W25.3 AND W25.4.
10. INSULATION FOR WATERMAIN CROSSING OVER AND BELOW SEWER SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. W25.2 AND W25, RESPECTIVELY, WHERE WATERMAIN COVER IS LESS THAN 2.4m.
11. INSULATION BETWEEN WATERMAIN AND OPEN STRUCTURES IN ACCORDANCE WITH CITY OF OTTAWA STD. W23 WHERE CLEARANCE IS LESS THAN 2.4m.
12. AS PER CITY GUIDELINE, THE MINIMUM VERTICAL CLEARANCE BETWEEN WATERMAIN AND SEWER / UTILITY IS 0.25m FOR CROSSING OVER THE SEWER, AS PER CITY STD. W25.2. FOR CROSSING UNDER SEWER, ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS IS REQUIRED TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING. THE LENGTH OF WATER PIPE SHALL BE CENTERED AT THE POINT OF CROSSING SO THAT THE JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER AS PER CITY STD. W25.
13. CONNECTION TO EXISTING WATERMAIN TO BE PERFORMED BY CITY FORCES. CONTRACTOR TO PROVIDE LABOUR, EQUIPMENT AND MATERIAL REQUIRED FOR EXCAVATION, BEDDING AND REINSTATEMENT.
14. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS AND BLOW-OFFS AND NOZZLES REQUIRED FOR TESTING AND DISINFECTION OF THE WATERMAIN.
15. SWABBING, DISINFECTION, AND HYDROSTATIC TESTING TO BE CONDUCTED AS PER CITY OF OTTAWA STANDARDS IN THE PRESENCE OF A CITY INSPECTOR AND/OR CONSULTANT.

ROADWORK SPECIFICATIONS:

1. CONCRETE CURB SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. SC1.1 (BARRIER CURB). PROVISION SHALL BE MADE FOR CURB DEPRESSIONS AT SIDEWALKS AND DRIVEWAYS.
2. ALL BARRIER CURB TO BE 150mm ABOVE FINISHED ASPHALT GRADE UNLESS OTHERWISE NOTED.
3. MONOLITHIC CURB AND SIDEWALK SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. SC2 WITH CONSTRUCTION JOINTS PER SC5.
4. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. R10 AND OPSD 509.010, OPSS 310.
5. GRANULAR "A" SHALL BE PLACED TO A MINIMUM THICKNESS OF 300mm AROUND ALL STRUCTURES WITHIN PAVEMENT AREA.
6. ASPHALT WEAR COURSE SHALL NOT BE PLACED UNTIL THE VIDEO INSPECTION OF SEWERS & NECESSARY REPAIRS HAVE BEEN CARRIED OUT TO THE SATISFACTION OF THE ENGINEER.
7. SUB-EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'B' COMPACTED IN MAXIMUM 300mm LIFTS.
8. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW-CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW ASPHALT.
9. PAVEMENT DESIGN AS PER GEOTECHNICAL RECOMMENDATIONS. SEE REPORT BY EXP DATED MARCH 2024.

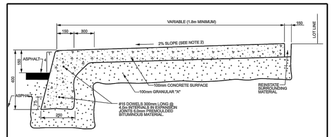


CONCRETE BARRIER CURB

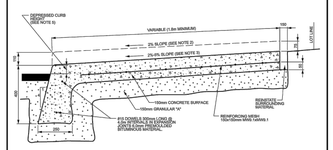
NOTES:
1. THE FULL CURB DEPTH SHALL BE CARRIED THROUGH THE DEPRESSED ACCESS CROSSING.
2. A CONCRETE SUPPORT IS REQUIRED WHEN BUILT ADJACENT TO THE SIDEWALK.
3. IF AN EXTRUSION CURBING MACHINE IS USED:
- THE EXPANSION BITUMINOUS MATERIAL AND THE #15 DOWELS ARE TO BE PLACED AT THE END OF THE EXTRUSION.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
5. SUNNY JOINTS SHALL BE 20mm DEEP, FRONT, BACK AND TOP OF SECTION. AT 4m SPACING OR MATCH JOINTING WHERE SIDEWALK IS ADJACENT.
6. FOR DEPRESSED CURB AT ENTRANCES USE 250.
7. DEPRESSED CURB HEIGHT - FOR PEDESTRIAN CURB RAMPS 0 TO 6 mm AND FOR PRIVATE ENTRANCES 0 TO 15mm.

N.T.S.

Ottawa	CONCRETE BARRIER CURB FOR GRANULAR BASE PAVEMENT (MODIFIED OPSD-600.110)	DATE:	JANUARY 2020
		REV. DATE:	MARCH 2021
		DWG. No.:	SC1.1



TYPICAL SIDEWALK SECTION

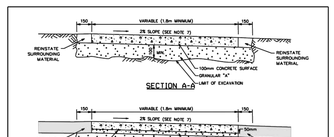


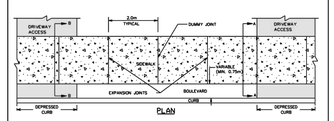
SECTION AT PRIVATE ENTRANCE AND PEDESTRIAN RAMPS

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. THE MAXIMUM SLOPE IS NOT TO EXCEED 2%.
3. FOR CURB RAMPS, SLOPE OF 2% TO 5% MAXIMUM 8%.
4. EXPANSION AND DUMMY JOINTS AS PER SC5.
5. DEPRESSED CURB HEIGHT - FOR PEDESTRIAN CURB RAMPS 0 TO 6 mm AND FOR PRIVATE ENTRANCES 0 TO 13 mm.

N.T.S.

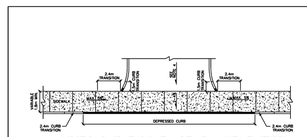
Ottawa	MONOLITHIC CONCRETE CURB AND SIDEWALK	DATE:	MAY 2001
		REV. DATE:	MAY 2021
		DWG. No.:	SC2

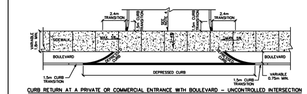




NOTES:
1. CONCRETE AND GRANULAR "A" IS TO BE INCREASED TO 150mm AT THE ENTRANCE AND 150x150mm WWS.1 x WWS.1 REINFORCING MESH IS TO BE PLACED AND DEPTH WITHIN DRIVEWAY ACCESS.
2. TRANSVERSE EXPANSION JOINTS ARE REQUIRED AT THE ENDS, THE MIDPOINT, AT INTERVALS OF 6m MAXIMUM, AND ALSO TO ISOLATE OBSTRUCTIONS FROM SIDEWALK, HYDRANTS, POLES, BUILDINGS, ETC.
3. WHEN THE OVERALL SIDEWALK WIDTH EXCEEDS 2.5m, A LONGITUDINAL CONSTRUCTION JOINT SHALL BE CREATED AT ITS MIDPOINT.
4. EDGES AND JOINTS ARE TO BE TROWED WITH A 75mm EDGING TOOL.
5. ALL CONCRETE SIDEWALKS ARE TO HAVE A BROOM FINISH UNLESS OTHERWISE SPECIFIED.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
7. THE MAXIMUM SLOPE IS NOT TO EXCEED 2%.
8. INSTALL DUMMY TRANSVERSE JOINTS AS REQUIRED SO THERE IS A MAXIMUM SPACING OF 3m BETWEEN ALL JOINTS.
9. SIDEWALK NOT TO BE DEPRESSED ACROSS DRIVEWAY ACCESSES.
10. EXPANSION AND DUMMY JOINTS AS PER SC5

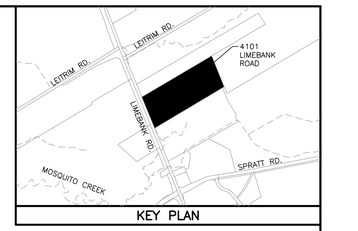
Ottawa	TYPICAL CONCRETE SIDEWALK IN BOULEVARD	DATE:	MAY 2001
		REV. DATE:	MARCH 2016
		DWG. No.:	SC4

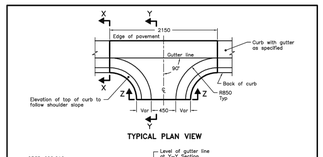




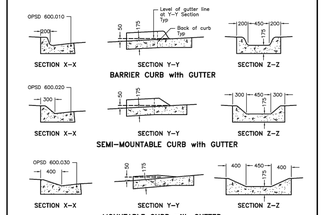
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
2. CURB DETAILS SEE SC1.1, SC1.2 AND SC1.3.
3. SIDEWALK DETAILS SEE SC2 AND SC3.
4. MAXIMUM SLOPE VARIES, SEE PRIVATE APPROACH BYLAW.
5. UNCONTROLLED INTERSECTION WEARS AN ENTRANCE NOT LOCATED AT A TRAFFIC SIGNAL OR ALL-WAY STOP CONTROL.

Ottawa	CURB RETURN ENTRANCES - UNCONTROLLED INTERSECTIONS	DATE:	MARCH 2007
		REV. DATE:	MARCH 2021
		DWG. No.:	SC7.1



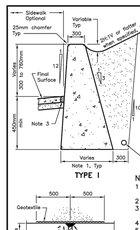


TYPICAL PLAN VIEW



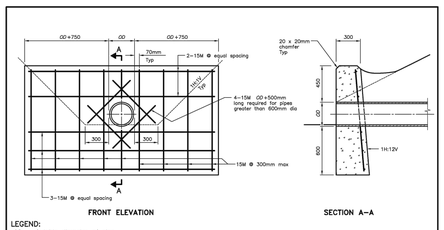
NOTES:
A For asphalt spillway details refer to OPSD 605.040.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
90° CONCRETE OUTLET FOR CONCRETE CURB WITH GUTTER		OPSD 604.010



NOTES:
1 Walls shall be founded on undisturbed soil having a minimum bearing capacity at ultimate limit states of 200kPa for Type I and 300kPa for Type II and Type III.
2 Excavation for toe walls shall be backfilled with free draining granular material.
3 10mm preformed joint filler, Type A, non-extruding and resilient bituminous type as specified.
4 Cold applied rubber asphalt joint sealing compound.
5 Where specified, wall drains shall be installed as per OPSD 3190.100.
6 A Maximum height of slope above top of wall is 4m.
B Concrete for toe walls shall be 30MPa.
C All dimensions are in millimetres unless otherwise shown.

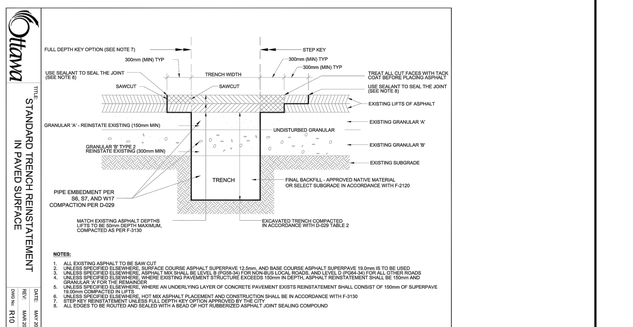
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2010	Rev 2
WALLS RETAINING CONCRETE TOE WALL		OPSD 3120.100



LEGEND:
00 – Outside diameter of pipe

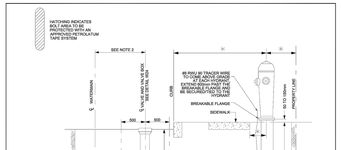
NOTES:
A This OPSD to be read in conjunction with OPSD 3940.150.
B If a steel grate is required, refer to OPSD 804.05.
C Class of concrete: 30MPa.
D Cover to reinforcing bars 70mm ± 20mm.
E All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2017	Rev 2
CONCRETE HEADWALL FOR PIPE LESS THAN 900mm DIAMETER		OPSD 804.030



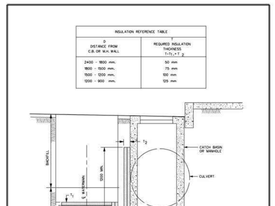
Ottawa	TITLE: STANDARD TRENCH REINSTATEMENT IN PAVED SURFACE	DATE:	MAY 2022
		REV:	MARCH 2023
		DWG No:	R10

NOTES:
1. ALL EXISTING ASPHALT TO BE SAW CUT.
2. UNLESS SPECIFIED ELSEWHERE, SURFACE COURSE ASPHALT SUPERPAVE 12.5mm, AND BASE COURSE ASPHALT SUPERPAVE 19.0mm IS TO BE USED.
3. UNLESS SPECIFIED ELSEWHERE, ASPHALT MIX SHALL BE LEVEL 'E' (PG58-34) FOR NON-BUS LOCAL ROADS, AND LEVEL 'D' (PG64-34) FOR COLLECTOR ROADS
4. UNLESS SPECIFIED ELSEWHERE, WHERE EXISTING PAVEMENT STRUCTURE EXCEEDS 150mm IN DEPTH, ASPHALT REINSTATEMENT SHALL BE 150mm AND UNLESS SPECIFIED ELSEWHERE, WHERE AN UNDERLYING LAYER OF CONCRETE PAVEMENT EXISTS REINSTATEMENT SHALL CONSIST OF 150mm OF SUPERPAVE 19.0mm COMPACTED IN LIFTS.
5. USE SEALANT TO SEAL THE JOINT. HOT MIX ASPHALT PLACEMENT AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH F-3130
6. CATHODIC PROTECTION MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH W36, W40, AND W42.
7. STEP KEY OPTION FOR FULL DEPTH PAVEMENT USE FULL DEPTH KEY OPTION APPROVED BY THE CITY
8. ALL EDGES TO BE ROUTED AND SEALED WITH A BEAD OF HOT RUBBERIZED ASPHALT JOINT SEALING COMPOUND

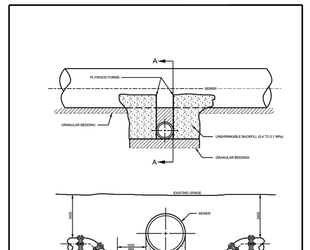


NOTES:
FOR ALL WATERMAINS
1. SEE DETAIL W26 FOR HYDRANTS IN DITCH AREAS
2. FOR WATERMAINS 400mm AND UNDER, LOCATE VALVE WITHIN 1.0m OF CENTRELINE. RETAINING/RESTRAINING DEVICES TO BE UTILIZED. FOR WATERMAINS 600mm AND OVER, BOLT VALVE WITH FLANGED END DIRECTLY TO FLANGED TEE
3. RETAINING/RESTRAINING DEVICES TO BE UTILIZED
4. TRACER WIRE TO BE TESTED AS PER PROCEDURE ESTABLISHED PRIOR TO INSTALLATION. REFER TO MMI 19.4 AND F-4414
5. SEE SPP-2.120 FOR BACKFILL REQUIREMENTS IN THIS AREA
6. SEE F-4414 FOR HYDRANT LOCATION REQUIREMENTS
7. ALL MEASUREMENTS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
8. FOR ALL 300mm WATERMAINS USE A 300 x 150 TANGENTIAL TEE WITH THE 150mm OUTLET ON TOP
9. FOR ALL 400mm WATERMAINS USE A 400 x 150 TANGENTIAL TEE WITH THE 150mm OUTLET ON TOP
10. "DUCTILE IRON ONLY" THERMITE WELD TWO #8 AWG/BI CABLES ACROSS EACH PIPE/FITTING JOINT OR CONNECTION TO ENSURE ELECTRICAL CONTINUITY ALONG ALL METALLIC COMPONENTS
11. ALL MATERIALS SHALL BE IN ACCORDANCE WITH MMI 19.19
12. TRACER WIRE BOLT CONNECTIONS TO BE COMPLETED PER W55
13. TRACER WIRE SPLICES TO BE COMPLETED PER MMI

Ottawa	TITLE: HYDRANT INSTALLATION - NEW CONSTRUCTION	DATE:	MAY 2001
		REV:	MAR 2023
		DWG No:	W19

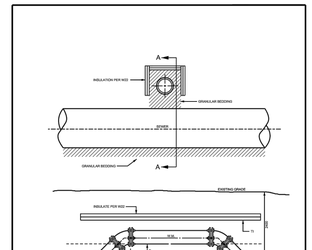


Ottawa	THERMAL INSULATION OF WATER-MAINS AT OPEN STRUCTURES	DATE:	MAY 2001
		REV. DATE:	MAR 2004
		DWG. No:	W23



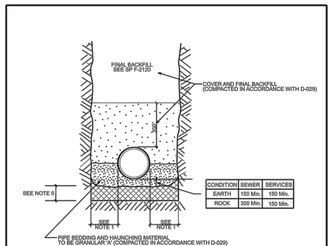
NOTES:
FOR WATERMAIN 150mm (NOMINAL) TO 400mm (NOMINAL)
1. MARKED TO INVERT DEPARTION (D.I.N.) AS SHOWN ON DRAWING.
2. THRUST BLOCKS FOR BARE LENGTH THAN 400mm (NOMINAL) SHALL BE PER SPECIAL DESIGN.
3. CONCRETE FOR THRUST BLOCKS SHALL BE 20 MPa. BRICKS SHALL BE MAX. 32° SE.
4. CONCRETE FOR THRUST BLOCKS SHALL BE 20 MPa.
5. REFER TO W25.4 FOR RESTRAINED LENGTH REQUIREMENTS.
6. REFER TO W25.5 AND W25.6 FOR THRUST BLOCK REQUIREMENTS.
7. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
8. CATHODIC PROTECTION MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH W36, W40, AND W42.
9. TRACER WIRE REQUIRED FOR PVC, PEA AND HDPE WATERMAIN PIPE ONLY AS PER W36.

Ottawa	WATERMAIN CROSSING BELOW SEWER	DATE:	MAY 2001
		REV. DATE:	MARCH 2021
		DWG No:	W25



NOTES:
FOR WATERMAIN 150mm (NOMINAL) TO 400mm (NOMINAL)
1. MARKED TO KNOWN DEPARTION (D.I.N.) AS SHOWN ON DRAWING.
2. THRUST BLOCKS FOR BARE LENGTH THAN 400mm (NOMIN

CROSSING TABLE			
CROSSING No.	SERVICE	INVERT/OBVERT	SEPARATION (m)
1	STM	89.67	1.73
	EX SAN	87.94	
2	STM	89.67	0.50
	WATER	89.17	
3	STM	89.70	1.53
	EX STM	88.17	
4	STM	89.72	0.50
	WATER	89.22	
5	CULVERT	91.08	0.17
	STM	90.91	
6	SAN	88.29	0.21
	EX STM	88.08	
7	*EX WATER*	89.60	0.91
	SAN	88.69	
8	CULVERT	91.07	2.36
	SAN	88.71	
9	CULVERT	91.06	1.17
	WATER	89.89	
10	CULVERT	90.11	1.03
	SAN	89.08	
11	CULVERT	90.11	0.67
	WATER	89.44	
12	WATER	89.42	0.25
	SAN	89.17	
13	CULVERT	90.24	0.68
	WATER	89.56	
14	CULVERT	90.24	0.97
	SAN	89.27	
15	WATER	89.54	0.25
	SAN	89.29	
16	WATER	89.82	0.25
	SAN	89.57	
17	STORM	90.26	0.50
	WATER	89.76	
18	STM	90.27	0.61
	SAN	89.66	
19	WATER	89.96	0.25
	SAN	89.71	
20	STM	91.21	1.01
	WATER	90.20	
21	STM	90.88	1.25
	SAN	89.63	
22	STM	90.93	1.18
	SAN	89.75	
23	STM	90.98	1.09
	SAN	89.89	
24	STM	91.08	1.05
	SAN	90.03	
25	STM	90.61	0.50
	SAN	90.11	
26	STM	91.46	1.05
	WATER	90.41	
27	STM	91.18	1.16
	WATER	90.02	
28	STM	91.20	0.99
	WATER	90.21	
29	STM	90.84	0.50
	WATER	90.34	
30	STM	91.64	0.74
	WATER	90.90	



NOTES:

1.

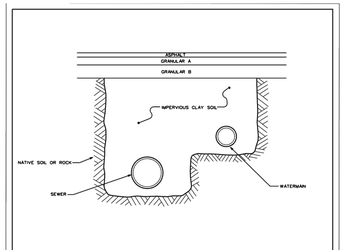
PIPE INSIDE DIAMETER (mm)	CLEARANCE (mm)
600 OR LESS	CONC 450 PVC 600
OVER 600	500

2. FINAL BACKFILL - APPROVED NATIVE MATERIAL OR SELECT SUBGRADE MATERIAL WITH 100% PASSING THE 37.5 mm SIEVE.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
4. INITIAL BACKFILL MATERIAL
   - CONCRETE PIPE - GRANULAR 'A', GRANULAR 'B', OR SELECT SUBGRADE MATERIAL WITH 100% PASSING THE 37.5 mm SIEVE
   - FLEXIBLE PIPE - WITH 19 mm MINUS
5. WHEN APPROVED BY THE CONTRACT ADMINISTRATOR, POOR SOILS SHALL BE EXCAVATED TO CREATE A FOUNDATION THAT SHALL BE FILLED TO THE BOTTOM OF THE BEDDING WITH GRANULAR 'B'.

N.T.S.

SINGLE TRENCH (SEWER & SEWER SERVICES)

DATE: MAY 2001 | REV. DATE: MARCH 2021 | DWG. No.: S6

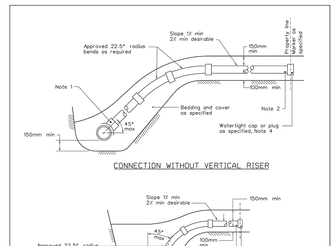


NOTES:

1. CLAY SEAL TO EXTEND FROM BOTTOM OF TRENCH EXCAVATION TO UNDERSIDE OF ROAD STRUCTURE.
2. CLAY SEAL TO EXTEND FULL TRENCH WIDTH TO EXISTING NATIVE SOILS WITH A MINIMUM THICKNESS OF 1.0m ALONG PIPES.
3. CLAY SEAL TO BE LOCATED SO THAT NO PIPE JOINTS ARE WITHIN THE CLAY SEAL MATERIAL.

CLAY SEAL FOR PIPE TRENCHES

DATE: MAY 2001 | REV. DATE: MARCH 2008 | DWG. No.: S8

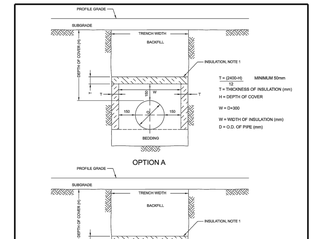


NOTES:

1. ALL DIMENSIONS OF SERVICE CONNECTIONS TO FLEXIBLE MAIN SEWER SHALL BE MADE USING APPROVED TEE OR WYE FITTINGS.
2. SERVICE SERVICES TO BE 150mmø AND STORM SERVICES TO BE 300mmø FOR NEW RESIDENCES UNLESS SPECIFIED OTHERWISE. SERVICE PIPE AND RADIUS BENDS TO BE APPROVED CSA B182.2, SEWER PRODUCTS UNLESS SPECIFIED OTHERWISE.
3. APPROVED CONTROLLED SETTLEMENT JOINTS OPTIONAL FOR SERVICE CONNECTIONS TO MAIN SEWERS UP TO 5m DEEP. WHERE APPROVED, CONNECTIONS TO SEWERS OVER 5m DEEP REQUIRE APPROVED CONTROLLED SETTLEMENT JOINTS.
4. CAP OR PLUG AT THE PROPERTY LINE SHALL BE ADEQUATELY BRACED TO WITHSTAND TESTING PRESSURE.
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

SEWER SERVICE CONNECTIONS FOR FLEXIBLE MAIN SEWER PIPE (MODIFIED OPSD-1006.020)

DATE: MARCH 2006 | REV. DATE: MARCH 2013 | DWG. No.: S11.1



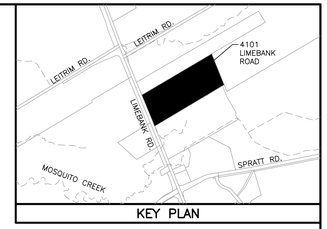
TYPICAL PIPE INSULATION DETAIL

NOTES:

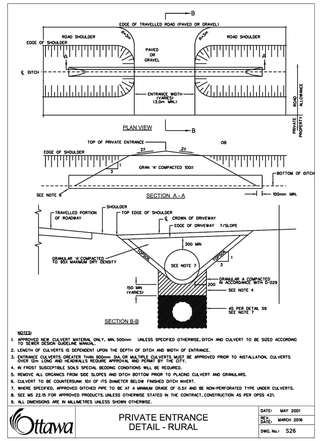
1. THE INSULATION MATERIAL SHALL BE EXTRUDED POLYSTYRENE ACCORDING TO MW-19.10 WITH
   A MINIMUM COMPRESSIVE STRENGTH OF 275 KPA.
2. MINIMUM INSULATION THICKNESS SHALL BE 50MM.
3. JOINTS SHALL BE STAGGERED FOR MULTIPLE INSULATION SHEETS.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

INSULATION FOR SHALLOW SEWERS

DATE: MARCH 2005 | REV. DATE: — | DWG. No.: S35



KEY PLAN



NOTES:

1. APPROVED NEW CULVERT MATERIAL ONLY, MIN. 500mm - UNLESS SPECIFIED OTHERWISE, DITCH AND CULVERT TO BE SIZED ACCORDING TO SEWER DESIGN GUIDELINE MANUAL.
2. LENGTH OF CULVERTS IS DEPENDENT UPON THE DEPTH OF DITCH AND WIDTH OF ENTRANCE.
3. ENTRANCE CULVERTS GREATER THAN 900mm DIA.OR MULTIPLE CULVERTS MUST BE APPROVED PRIOR TO INSTALLATION. CULVERTS GREATER THAN 1200mm DIA. REQUIRE ENGINEERED DESIGN. SEE NOTE 4.
4. IN FROST SUSCEPTIBLE SOILS SPECIAL BEDDING CONDITIONS WILL BE REQUIRED.
5. REMOVE ALL ORGANICS FROM SIDE SLOPES AND DITCH BOTTOM PRIOR TO PLACING CULVERT AND GRANULARS.
6. CULVERT TO BE COUNTERSUNK 150 OF ITS DIAMETER BELOW FINISHED DITCH INVERT.
7. WHERE SPECIFIED, APPROVED DITCHES PIPE TO BE AT A MINIMUM GRADE OF 0.5% AND BE NON-PERFORATED TYPE UNDER CULVERTS.
8. SEE MS 23.15 FOR APPROVED PRODUCTS, UNLESS OTHERWISE STATED IN THE CONTRACT, CONSTRUCTION AS PER OPSS 421.
9. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.

PRIVATE ENTRANCE DETAIL - RURAL

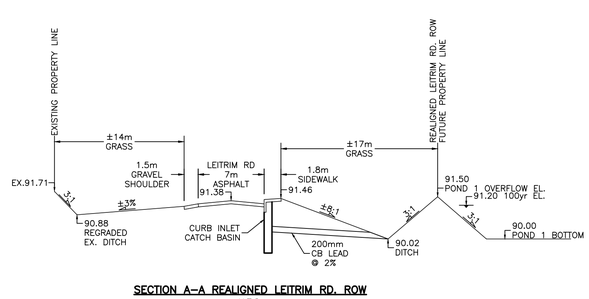
DATE: MAY 2001 | REV. DATE: MARCH 2015 | DWG. No.: S26

300mmø WATERMAIN GRADE TABLE				
STATION	FINISHED GRADE (m)	TOP OF WATER (m)	COVER DEPTH (m)	COMMENTS
0+000	92.29	89.89	2.40	300x300mm TEE TO EXISTING
0+020.7	92.29	89.89	2.40	300mm VALVE CHAMBER
0+025	92.24	89.84	2.40	TOP OF WATERMAIN
0+050	91.97	89.57	2.40	TOP OF WATERMAIN
0+075	91.69	89.29	2.40	TOP OF WATERMAIN
0+100	91.42	89.02	2.40	TOP OF WATERMAIN
0+125	91.35	88.95	2.40	TOP OF WATERMAIN
0+150	91.49	89.09	2.40	TOP OF WATERMAIN
0+175	91.63	89.23	2.40	TOP OF WATERMAIN
0+200	91.77	89.37	2.40	TOP OF WATERMAIN
0+225	91.91	89.51	2.40	TOP OF WATERMAIN
0+228.6	91.92	89.52	2.40	250x300mm TEE
0+235.0	91.96	89.56	2.40	CAP

250mmø WATERMAIN GRADE TABLE				
STATION	FINISHED GRADE (m)	TOP OF WATER (m)	COVER DEPTH (m)	COMMENTS
1+000	91.92	89.52	2.40	250x300mm TEE
1+010.0	91.93	89.53	2.40	250mm VALVE
1+025	92.05	89.65	2.40	TOP OF WATERMAIN
1+037.3	92.07	89.67	2.40	250x250mm TEE
1+050	92.17	89.77	2.40	TOP OF WATERMAIN
1+075	92.38	89.98	2.40	TOP OF WATERMAIN
1+082.9	92.46	90.06	2.40	150x250mm HYDRANT TEE
1+100	92.52	90.12	2.40	TOP OF WATERMAIN
1+101.8	92.52	90.12	2.40	150x250mm BUILDING TEE
1+125	92.56	90.16	2.40	TOP OF WATERMAIN
1+135.2	92.49	90.09	2.40	150x250mm BUILDING TEE
1+150	92.50	90.10	2.40	TOP OF WATERMAIN
1+151.2	92.49	90.09	2.40	150x250mm HYDRANT TEE
1+175	92.63	90.23	2.40	TOP OF WATERMAIN
1+184.6	92.56	90.16	2.40	150x250mm BUILDING TEE
1+188.2	92.55	90.15	2.40	150x250mm BUILDING TEE
1+200	92.56	90.16	2.40	TOP OF WATERMAIN
1+219.8	92.52	90.12	2.40	150x250mm HYDRANT TEE
1+250	92.40	90.00	2.40	TOP OF WATERMAIN
1+226.4	92.40	90.00	2.40	250mm VALVE
1+231.7	92.31	89.91	2.40	250x250mm TEE

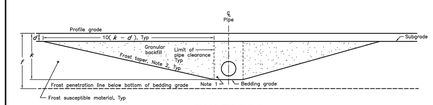
250mmø WATERMAIN GRADE TABLE				
STATION	FINISHED GRADE (m)	TOP OF WATER (m)	COVER DEPTH (m)	COMMENTS
2+000	92.07	89.67	2.40	250x250mm TEE
2+003.5	92.33	89.93	2.40	250mm VALVE
2+006.0	92.30	89.90	2.40	22.5° HORIZONTAL BEND
2+025	91.94	89.54	2.40	TOP OF WATERMAIN
2+050	92.41	90.01	2.40	TOP OF WATERMAIN
2+053.8	92.58	90.18	2.40	22.5° HORIZONTAL BEND
2+075	92.62	90.22	2.40	TOP OF WATERMAIN
2+100	92.57	90.17	2.40	TOP OF WATERMAIN
2+115.9	92.55	90.15	2.40	22.5° HORIZONTAL BEND
2+125	92.64	90.24	2.40	TOP OF WATERMAIN
2+126.6	92.66	90.26	2.40	22.5° HORIZONTAL BEND
2+128.7	92.66	90.26	2.40	250x250mm TEE
2+150	92.50	90.10	2.40	TOP OF WATERMAIN
2+162.1	92.58	90.18	2.40	150X250mm HYDRANT TEE
2+175	92.67	90.27	2.40	TOP OF WATERMAIN
2+200	92.65	90.25	2.40	TOP OF WATERMAIN
2+225	92.56	90.16	2.40	TOP OF WATERMAIN
2+250	92.69	90.29	2.40	TOP OF WATERMAIN
2+271.4	92.58	90.18	2.40	22.5° HORIZONTAL BEND
2+275	92.63	90.23	2.40	TOP OF WATERMAIN
2+288.4	92.61	90.21	2.40	22.5° HORIZONTAL BEND
2+292.8	92.57	90.17	2.40	250mm VALVE
2+300	92.49	90.09	2.40	TOP OF WATERMAIN
2+325	92.54	90.14	2.40	TOP OF WATERMAIN
2+326.5	92.55	90.15	2.40	150X250mm HYDRANT TEE
2+350	92.72	90.32	2.40	TOP OF WATERMAIN
2+375	92.61	90.21	2.40	TOP OF WATERMAIN
2+383.2	92.75	90.35	2.40	45° HORIZONTAL BEND
2+390.8	92.78	90.38	2.40	45° HORIZONTAL BEND
2+400	92.88	90.48	2.40	TOP OF WATERMAIN
2+425	92.68	90.28	2.40	TOP OF WATERMAIN
2+428.2	92.72	90.32	2.40	150X250mm BUILDING TEE
2+450	92.70	90.30	2.40	TOP OF WATERMAIN
2+475	92.95	90.55	2.40	TOP OF WATERMAIN
2+497.6	93.03	90.63	2.40	150X250mm BUILDING TEE
2+500	93.00	90.60	2.40	TOP OF WATERMAIN
2+508.7	92.93	90.53	2.40	150X250mm HYDRANT TEE
2+525	93.10	90.70	2.40	TOP OF WATERMAIN
2+546.7	93.10	90.70	2.40	150X250mm BUILDING TEE
2+550	93.10	90.70	2.40	TOP OF WATERMAIN
2+575	93.28	90.88	2.40	TOP OF WATERMAIN
2+589.7	93.10	90.70	2.40	45° HORIZONTAL BEND
2+595.4	93.11	90.71	2.40	45° HORIZONTAL BEND
2+600	93.11	90.71	2.40	TOP OF WATERMAIN
2+603.0	93.13	90.73	2.40	150X250mm HYDRANT TEE
2+625	93.49	91.09	2.40	TOP OF WATERMAIN
2+650	93.62	91.22	2.40	TOP OF WATERMAIN
2+675	93.60	91.20	2.40	TOP OF WATERMAIN
2+700	93.39	90.99	2.40	TOP OF WATERMAIN
2+725	93.00	90.60	2.40	TOP OF WATERMAIN
2+736.4	92.96	90.56	2.40	250mm VALVE
2+750	92.92	90.52	2.40	TOP OF WATERMAIN
2+775	92.97	90.57	2.40	TOP OF WATERMAIN
2+800	93.12	90.72	2.40	TOP OF WATERMAIN
2+825	93.11	90.71	2.40	TOP OF WATERMAIN
2+850	92.88	90.44	2.40	TOP OF WATERMAIN
2+870	92.68	90.28	2.40	250x250mm TEE
2+875	92.69	90.29	2.40	TOP OF WATERMAIN
2+900	92.58	90.20	2.40	TOP OF WATERMAIN
2+925	92.85	90.45	2.40	TOP OF WATERMAIN
2+950	92.97	90.57	2.40	TOP OF WATERMAIN
2+975	92.84	90.44	2.40	TOP OF WATERMAIN
3+000	92.43	90.03	2.40	TOP OF WATERMAIN
3+003.3	92.32	89.92	2.40	22.5° HORIZONTAL BEND
3+004.8	92.32	89.92	2.40	250x250mm TEE
3+009.1	92.30	89.90	2.40	250mm VALVE
3+025	92.41	90.01	2	TOP OF WATERMAIN
3+050	92.30	89.90	2.40	TOP OF WATERMAIN
3+075	92.26	89.86	2.40	TOP OF WATERMAIN
3+100	92.35	89.95	2.40	TOP OF WATERMAIN
3+125	92.24	89.84	2.40	TOP OF WATERMAIN
3+150	92.44	90.04	2.40	TOP OF WATERMAIN
3+175	92.85	90.45	2.40	250x250mm TEE
3+179.8	92.99	90.59	2.40	45° HORIZONTAL BEND
3+187.6	93.08	90.68	2.40	45° HORIZONTAL BEND
3+200	91.61	89.21	2.40	TOP OF WATERMAIN
3+225	91.91	89.51	2.40	TOP OF WATERMAIN
3+250	92.26	89.36	2.40	TOP OF WATERMAIN
3+275	91.60	89.21	2.40	TOP OF WATERMAIN
3+300	91.03	88.63	2.40	TOP OF WATERMAIN
3+314.3	92.20	89.80	2.40	300x250mm REDUCER
3+316.5	91.90	89.50	2.40	45° HORIZONTAL BEND
3+318.0	91.80	89.40	2.40	45° HORIZONTAL BEND
3+320.0	91.60	89.20	2.40	CONNECT TO EX. 300mm VALVE CHAMBER

250mmø WATERMAIN GRADE TABLE				
STATION	FINISHED GRADE (m)	TOP OF WATER (m)	COVER DEPTH (m)	COMMENTS
4+000	92.66	90.26	2.40	250x250mm TEE
4+009.6	92.56	89.93	2.63	250mm VALVE
4+017.4	92.67	89.76	2.91	22.5° HORIZONTAL BEND
4+025	92.60	89.93	2.67	TOP OF WATERMAIN
4+034.6	92.50	90.10	2.40	22.5° HORIZONTAL BEND
4+050	92.45	90.05	2.40	TOP OF WATERMAIN
4+064.0	92.45	90.05	2.40	150mm BUILDING TEE
4+075	92.59	90.19	2.40	TOP OF WATERMAIN
4+086.4	92.68	90.28	2.40	150mm HYDRANT TEE
4+100	92.51	90.11	2.40	TOP OF WATERMAIN
4+114.9	92.64	90.24	2.40	150mm BUILDING TEE
4+125	92.64	90.24	2.40	TOP OF WATERMAIN
4+150	92.74	90.34	2.40	TOP OF WATERMAIN
4+174.8	92.73	90.33	2.40	150mm BUILDING TEE
4+175	92.73	90.33	2.40	TOP OF WATERMAIN
4+200	92.58	90.18	2.40	TOP OF WATERMAIN
4+210.1	92.62	90.22	2.40	150mm HYDRANT TEE
4+212.3	92.65	90.25	2.40	250mm VALVE
4+214.2	92.68	90.28	2.40	250x250mm TEE



SECTION A–A REALIGNED LEITRIM RD. ROW

N.T.S.



FROST TREATMENT
RIGID AND FLEXIBLE PIPE

NOTES:

1 Pipe embedment or bedding, cover, and backfill shall be according to:
  a) Flexible OPSD 802.010, 802.013, 802.014, 802.020, 802.023, and 802.024.
  b) Rigid – OPSD 802.030, 802.031, 802.032, 802.033, 802.034, 802.050, 802.051, 802.052, 802.053, and 802.054.
2 Frost tapers shall start at bedding grade.

LEGEND:

d –depth of roadbed granular
k –depth of frost treatment below profile grade
f –depth of frost penetration below profile grade

ONTARIO PROVINCIAL STANDARD DRAWING	Nov. 2015	Rev 3
FROST TREATMENT – PIPE CULVERTS FROST PENETRATION LINE BELOW BEDDING GRADE		
	OPSD 803.030	

NOT FOR CONSTRUCTION

NOTES

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NO.	REVISION DESCRIPTION	DATE	BY

SCALE

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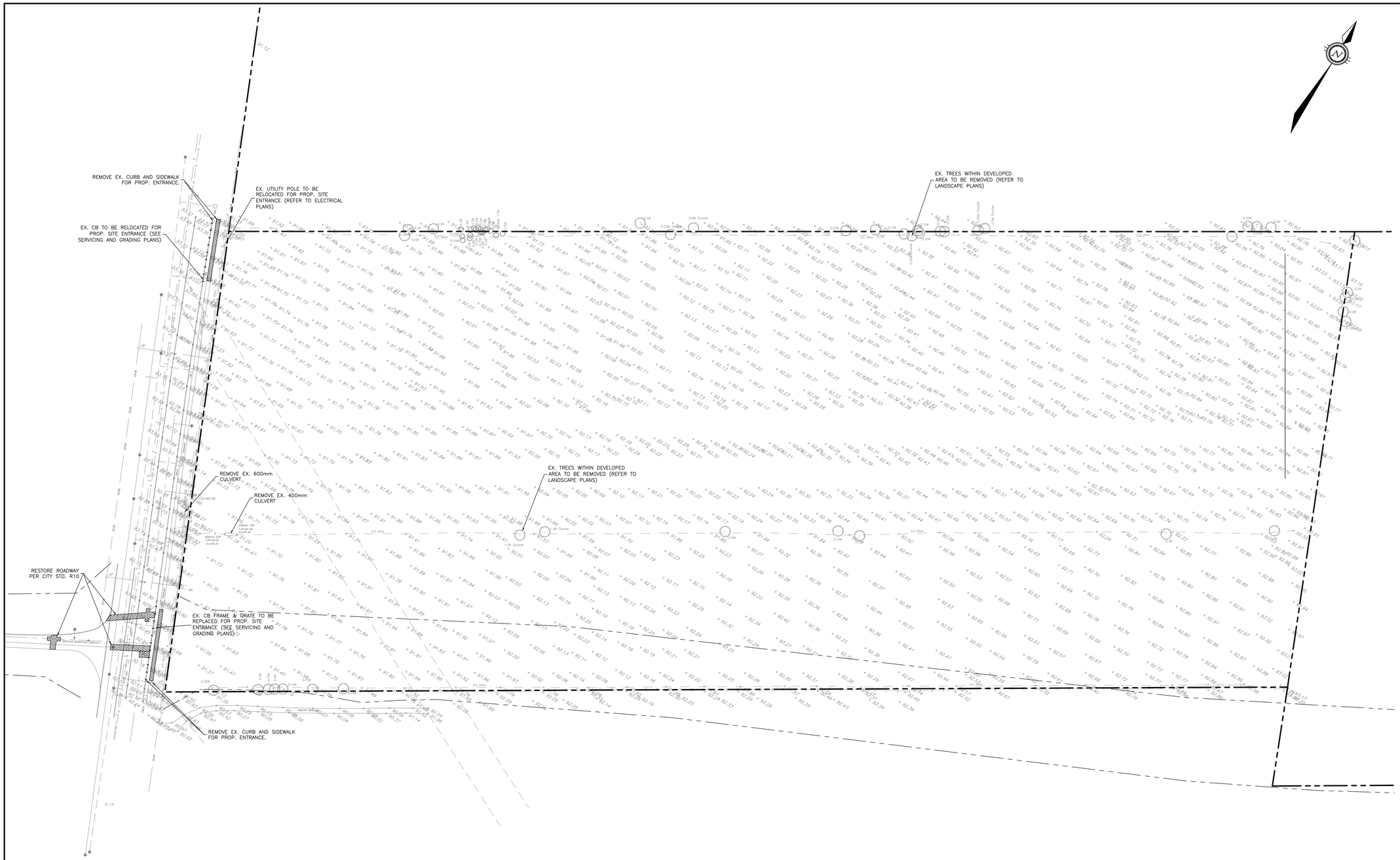
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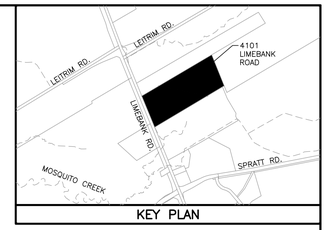
GROUPE MONTONI

4101 LIMEBANK RD.
CITY OF OTTAWA

NOTES AND DETAILS PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	SEPT 2024
DWG. No:	23074-N2





KEY PLAN

LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- FUTURE LEITRIM RD. REALIGNMENT ROW
- EASEMENT
- ×104.00 EXISTING ELEVATION
- EXISTING HYDRANT
- V&VB EXISTING VALVE & VALVE BOX
- EXISTING WATERMAIN
- EXISTING SANITARY SEWER & MAINTENANCE HOLE
- EXISTING STORM SEWER & MAINTENANCE HOLE
- EXISTING CATCH BASIN
- GAS EXISTING GAS LINE
- H EXISTING HYDRO LINE
- T EXISTING TRAFFIC LINE
- OHW EXISTING OVERHEAD LINE
- EXISTING DITCH CENTRELINE
- X EXISTING FENCE

NOT FOR CONSTRUCTION

NOTES

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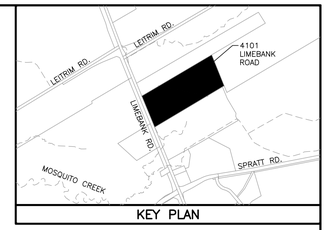
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GROUPE MONTONI

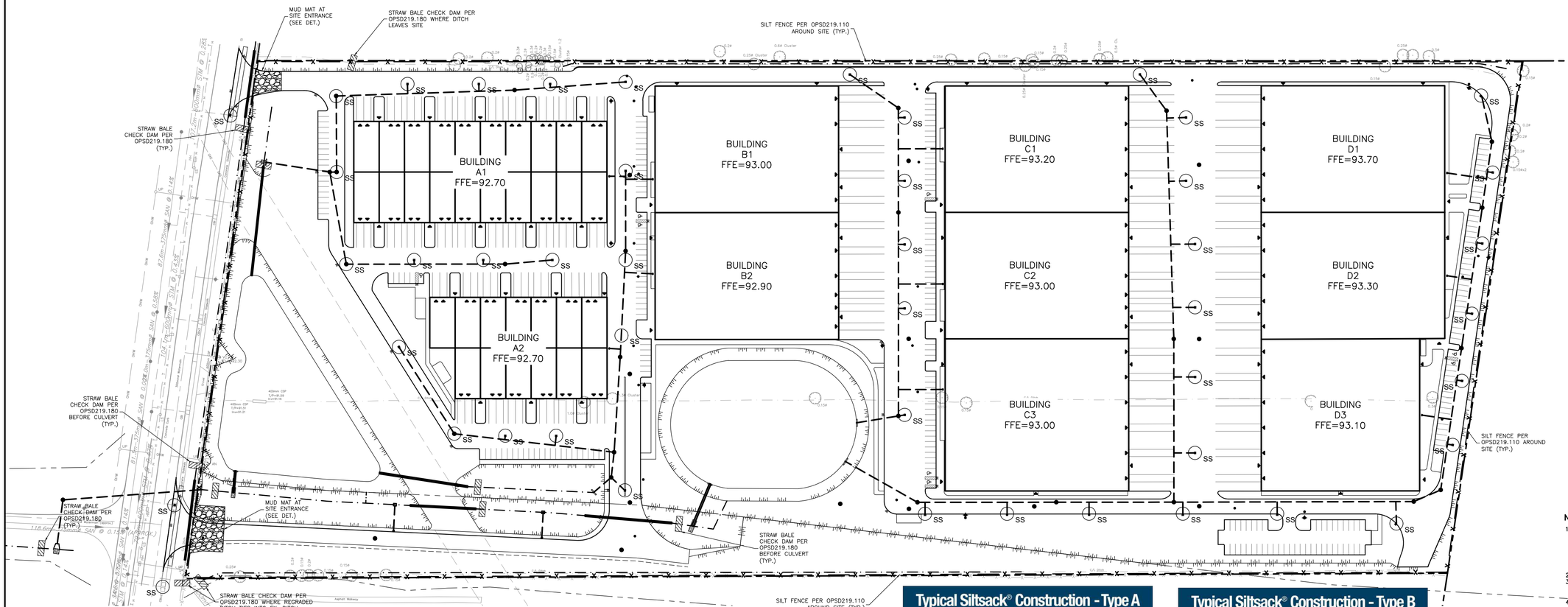
4101 LIMEBANK RD.
CITY OF OTTAWA

EXISTING CONDITIONS AND REMOVALS PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	SEPT 2024
DWG. No:	23074-R1

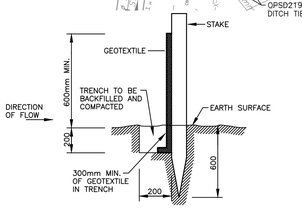


KEY PLAN

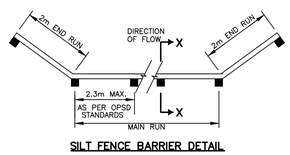


LEGEND

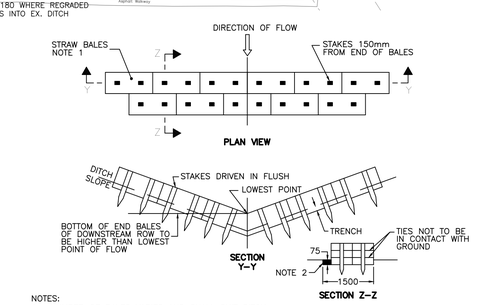
- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- FUTURE LEITRIM RD. REALIGNMENT ROW
- EASEMENT
- EXISTING STORM SEWER & MAINTENANCE HOLE
- EXISTING CATCH BASIN
- EXISTING DITCH CENTRELINE
- EXISTING DITCH CENTRELINE
- CATCH BASIN MAINTENANCE HOLE
- CATCH BASIN
- SWALE
- DOORWAY
- VEHICLE ENTRANCE
- SILT FENCE
- STRAW BALE CHECK DAM
- SILT SACK (OR APPROVED EQUIVALENT)



SECTION X–X
N.T.S.

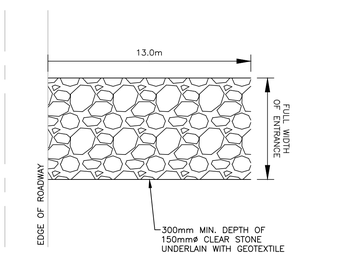


SILT FENCE BARRIER DETAIL
N.T.S.



NOTES:
1. NUMBER OF BALES VARIES AND SHALL SUIT DITCH.
2. STRAW BALES SHALL BE BUTTED TIGHTLY AGAINST ADJOINING BALES AND SHAPED TO CONFORM TO THE SIDES OF THE DITCH TO PREVENT WATER FLOW THROUGH BARRIER
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN

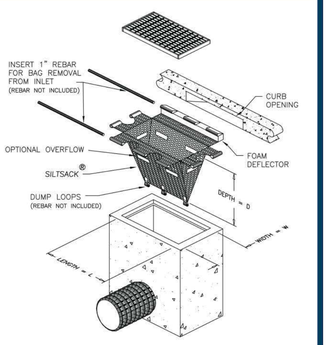
SEDIMENT CONTROL STRAW BALE DETAIL OPSD 219.180



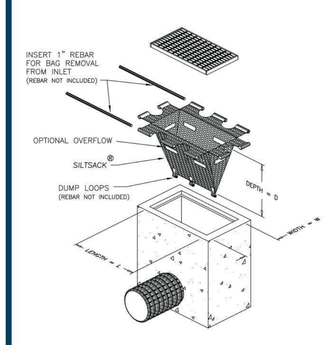
NOTES:
1. MUD MAT TO BE UNDERLAIN WITH A GEOTEXTILE FABRIC.
2. SEDIMENT SHALL BE CLEANED FROM ROADWAYS AS REQUIRED.
3. STORM INLETS IN CLOSE VICINITY TO MUD MAT SHALL BE PROTECTED WITH INLET CONTROL MEASURES.

MUD MAT DETAIL
N.T.S.

Typical Siltsack® Construction - Type A



Typical Siltsack® Construction - Type B



NOTES:

1. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE ULTIMATE RECEIVING WATERCOURSE DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.
2. LIMIT THE EXTENT OF EXPOSED SOILS AT ANY GIVEN TIME.
3. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED UNTIL VEGETATION HAS BEEN RE-ESTABLISHED IN ALL DISTURBED AREAS. RE-VEGETATE DISTURBED AREAS AS SOON AS POSSIBLE.
4. STOCKPILE SOIL AWAY (15 METRES OR GREATER) FROM WATERCOURSES, DRAINAGE FEATURES AND TOP OF STEEP SLOPES.
5. SILT SACKS ARE TO BE PLACED UNDERNEATH THE FRAME AND COVER OF ALL PROPOSED AND EXISTING CATCH BASIN AND OPEN COVER STORM MANHOLES UNTIL CONSTRUCTION IS COMPLETED.
6. A SILT FENCE BARRIER SHALL BE INSTALLED AS PER OPSD 219.110 WHERE INDICATED AND MAINTAINED AS REQUIRED.
7. INSTALL MUD MATS AT ALL CONSTRUCTION ENTRANCES.
8. DURING ACTIVE CONSTRUCTION PERIODS, VISUAL INSPECTIONS SHALL BE UNDERTAKEN ON A WEEKLY BASIS AND AFTER MAJOR STORM EVENTS (>25mm RAIN IN 24 HOUR PERIOD) ON SEDIMENT CONTROL BARRIERS AND ANY DAMAGE REPAIRED IMMEDIATELY.
9. EROSION AND SEDIMENT CONTROL BARRIERS SHALL ALSO BE ASSESSED (AND REPAIRED AS REQUIRED) FOLLOWING SIGNIFICANT SNOWMELT EVENTS.
10. VISUAL INSPECTIONS SHALL ALSO BE UNDERTAKEN IN ANTICIPATION OF LARGE STORM EVENTS (OR A SERIES OF RAINFALL AND/OR SNOWMELT DAYS) THAT COULD POTENTIALLY YIELD SIGNIFICANT RUNOFF VOLUMES.
11. CARE SHALL BE TAKEN TO PREVENT DAMAGE TO EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION OPERATIONS.
12. IN SOME CASES, BARRIERS MAY BE REMOVED TEMPORARILY TO ACCOMMODATE THE CONSTRUCTION OPERATIONS. THE AFFECTED BARRIERS SHALL BE REINSTATED IMMEDIATELY AFTER CONSTRUCTION OPERATIONS ARE COMPLETED.
13. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE ADJUSTED AS REQUIRED AS THE SITE BECOMES DEVELOPED.
14. SEDIMENT CONTROL DEVICES SHALL BE CLEANED OF ACCUMULATED SEDIMENTATION AS REQUIRED AND REPLACED AS NECESSARY.
15. DURING THE COURSE OF CONSTRUCTION, IF THE ENGINEER BELIEVES THAT ADDITIONAL PREVENTION METHODS ARE REQUIRED TO CONTROL EROSION AND SEDIMENTATION, THE CONTRACTOR SHALL IMPLEMENT ADDITIONAL MEASURES, AS REQUIRED, TO THE SATISFACTION OF THE ENGINEER.
16. CONSTRUCTION AND MAINTENANCE REQUIREMENTS FOR EROSION AND SEDIMENT CONTROLS ARE TO COMPLY WITH OPSS 805.

NOT FOR CONSTRUCTION

NOTES

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NO.	REVISION DESCRIPTION	DATE	BY

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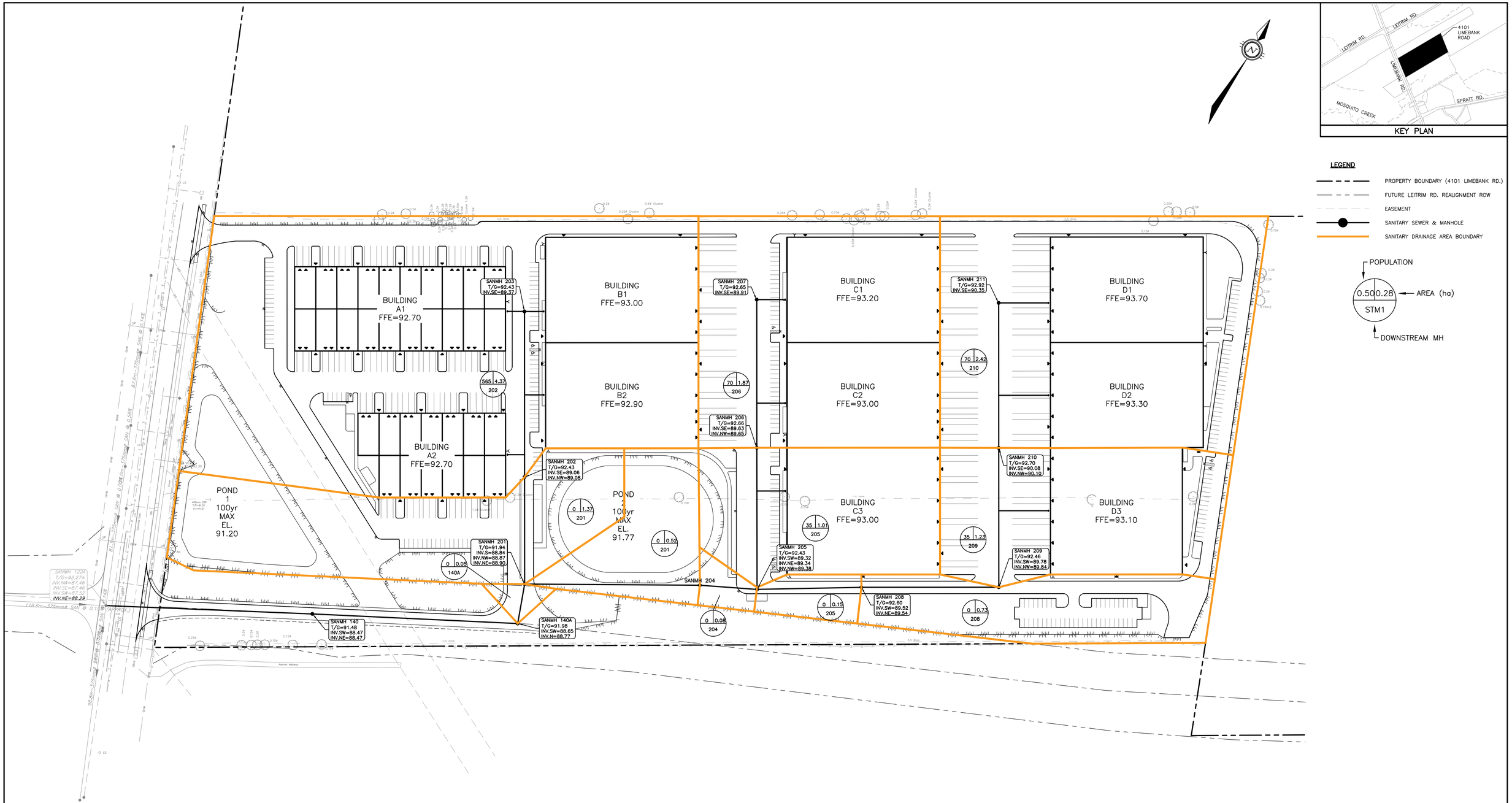
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GROUPE MONTONI

4101 LIMEBANK RD.
CITY OF OTTAWA

EROSION & SEDIMENT CONTROL PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	SEPT 2024
DWG. No:	23074-ESC1



KEY PLAN

LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- FUTURE LEITRIM RD. REALIGNMENT ROW
- EASEMENT
- SANITARY SEWER & MANHOLE
- SANITARY DRAINAGE AREA BOUNDARY

POPULATION
0.50 0.28 ← AREA (ha)
STM1
DOWNSTREAM MH

NOT FOR CONSTRUCTION

NOTES

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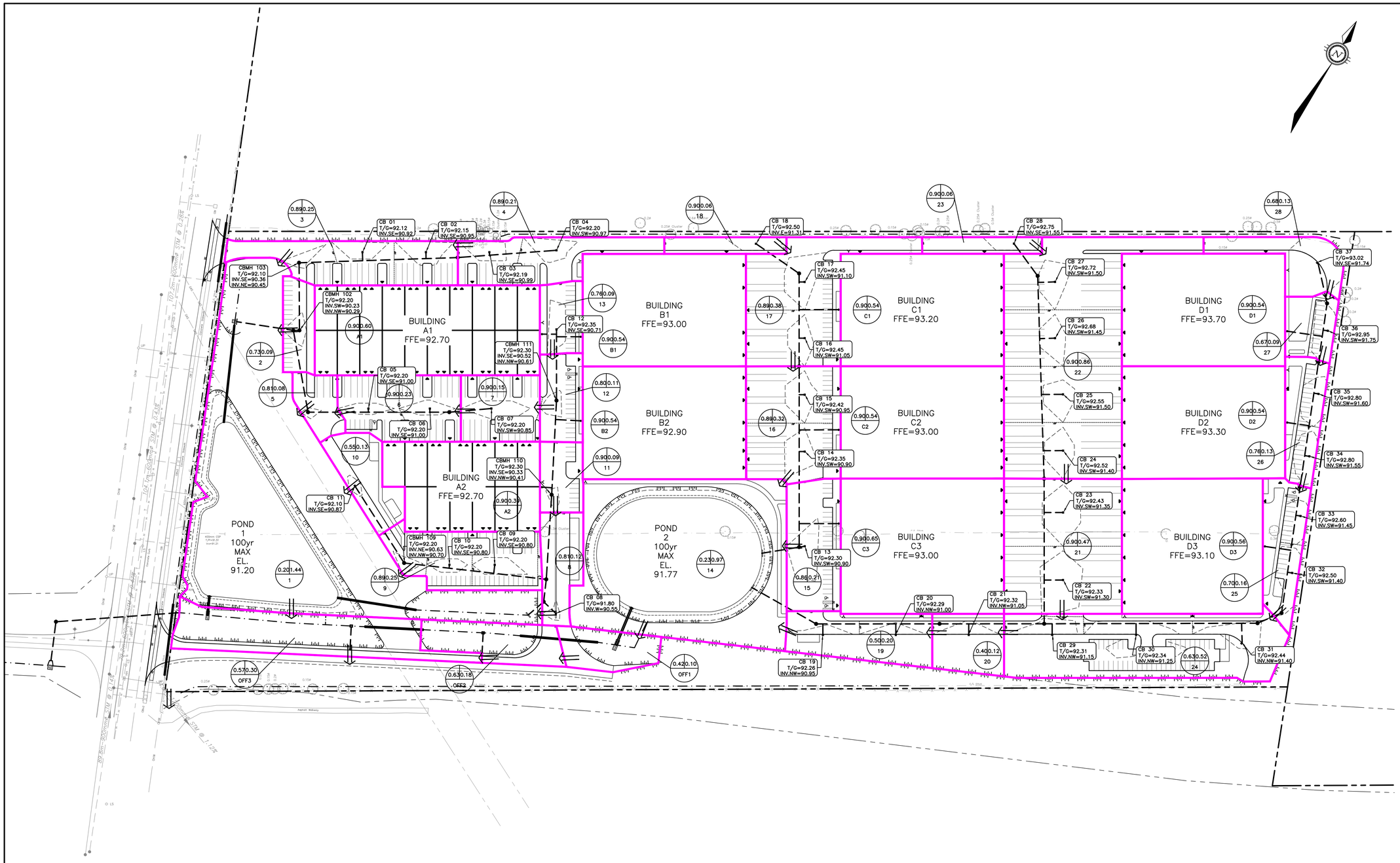
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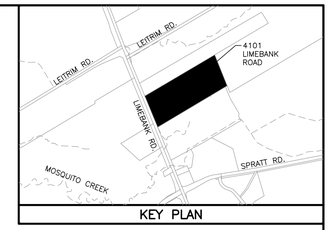
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4101 LIMEBANK RD.
CITY OF OTTAWA

SANITARY DRAINAGE PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	SEPT 2024
DWG. No:	23069-SAN1





KEY PLAN

LEGEND

- PROPERTY BOUNDARY (4101 LIMEBANK RD.)
- FUTURE LEITRIM RD. REALIGNMENT ROW
- EASEMENT
- STORM SEWER & MANHOLE
- CATCH BASIN MAINTENANCE HOLE
- CATCH BASIN
- STORM DRAINAGE AREA BOUNDARY
- MAJOR OVERLAND FLOW ROUTE
- 100-YEAR PONDING LIMIT
- 5-YEAR PONDING LIMIT

RUNOFF COEFFICIENT — 0.50 — 0.28 — AREA (ha)

10 — DRAINAGE AREA ID

NOT FOR CONSTRUCTION

NOTES

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CITY OF OTTAWA

POST-DEVELOPMENT
STORM AREA DRAINAGE PLAN

PROJECT No.	23074
SURVEY	AOV
DATED	SEPT 2024
DWG. No:	23074-STM1

Appendix C

WATERMAIN DESIGN SHEET

4101 Limebank Rd., City of Ottawa

Project No. 23074

Robinson Consultants

	RESIDENTIAL POPULATION				NON-RES				AVG. DAILY					MAX. DAILY					PEAK HOURLY				
	ACTUAL COUNT				IND.	IND.	COMM.	INST.	DEMAND (L/s)					DEMAND (L/s)					DEMAND (L/s)				
	Low Density	Medium Density	High Density	Total Population	(ha)	(pop.)	(ha)	(ha)	RES.	IND.	COMM.	INST.	TOTAL	RES.	IND.	COMM.	INST.	TOTAL	RES.	IND.	COMM.	INST.	TOTAL
Bldg A1						300				0.48			0.48		0.71			0.71		1.28			1.28
Bldg A2						195				0.31			0.31		0.46			0.46		0.83			0.83
Bldg B1						35				0.06			0.06		0.08			0.08		0.15			0.15
Bldg B2						35				0.06			0.06		0.08			0.08		0.15			0.15
Bldg C1						35				0.06			0.06		0.08			0.08		0.15			0.15
Bldg C2						35				0.06			0.06		0.08			0.08		0.15			0.15
Bldg C3						35				0.06			0.06		0.08			0.08		0.15			0.15
Bldg D1						35				0.06			0.06		0.08			0.08		0.15			0.15
Bldg D2						35				0.06			0.06		0.08			0.08		0.15			0.15
Bldg D3						35				0.06			0.06		0.08			0.08		0.15			0.15
													1.23					**1.84**					**3.32**

Residential Densities

Low Density (SFH's) =	3.4	cap/unit
Medium Density (Townhouses) =	2.7	cap/unit
High Density (Apartments) =	1.8	cap/unit

Avg. Daily Demand:			Max. Daily Demand:		Max. Hourly Demand:	
Residential =	280	L/cap/day	2.5	x Avg. Day	2.2	x Max. Day
Employment*=	137	L/cap/day	1.5	x Avg. Day	1.8	x Max. Day
Industrial (Light) =	35000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day
Commercial =	28000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day
Institutional =	28000	L/ha/day	1.5	x Avg. Day	1.8	x Max. Day

*Employee demand based on Riverside South Community Infrastructure Servicing Study Update Phase 1, Mosquito Creek Study Area

Note: employee count based on preliminary site plan: average 15 employees per office unit, 35 per warehouse unit

2024-08-26

Table 6

Distance to the Exposure (m)	Length-Height Factor of Exposing Building Face	Construction Type of Exposed Building Face				
		Type V	Type III-IV[2]	Type III-IV[3]	Type I-II[2]	Type I-II[3]
0 - 3	0-20	20%	15%	5%	10%	0%
	21-40	21%	16%	6%	11%	1%
	41-60	22%	17%	7%	12%	2%
	61-80	23%	18%	8%	13%	3%
	81-100	24%	19%	9%	14%	4%
	Over 100	25%	20%	10%	15%	5%
3.1 to 10	0-20	15%	10%	3%	6%	0%
	21-40	16%	11%	4%	7%	0%
	41-60	17%	12%	5%	8%	1%
	61-80	18%	13%	6%	9%	2%
	81-100	19%	14%	7%	10%	3%
	Over 100	20%	15%	8%	11%	4%
10.1 to 20	0-20	10%	5%	0%	3%	0%
	21-40	11%	6%	1%	4%	0%
	41-60	12%	7%	2%	5%	0%
	61-80	13%	8%	3%	6%	1%
	81-100	14%	9%	4%	7%	2%
	Over 100	15%	10%	5%	8%	3%
20.1 to 30	0-20	0%	0%	0%	0%	0%
	21-40	2%	1%	0%	0%	0%
	41-60	4%	2%	0%	1%	0%
	61-80	6%	3%	1%	2%	0%
	81-100	8%	4%	2%	3%	0%
	Over 100	10%	5%	3%	4%	0%
Over 30	All	0%	0%	0%	0%	0%

[2] *with unprotected openings*
[3] *without unprotected openings*

1.5 for **Type V** Wood Frame Construction
0.8 for **Type IV-A** Mass Timber Construction
0.9 for **Type IV-B** Mass Timber Construction
1.0 for **Type IV-C** Mass Timber Construction
1.5 for **Type IV-D** Mass Timber Construction
1.0 for **Type III** Ordinary Construction
0.8 for **Type II** Noncombustible Construction
0.6 for **Type I** Fire Resistive Construction

Type V

Seperation Distance	Length-Height Factor					
	0	20.00001	40.00001	60.00001	80.00001	100
0	20%	21%	22%	23%	24%	25%
3	15%	16%	17%	18%	19%	20%
10	10%	11%	12%	13%	14%	15%
20	0%	2%	4%	6%	8%	10%
30.00001	0%	0%	0%	0%	0%	0%

Type III-IV2

Seperation Distance	Length-Height Factor					
	0	20.00001	40.00001	60.00001	80.00001	100
0	15%	16%	17%	18%	19%	20%
3	10%	11%	12%	13%	14%	15%
10	5%	6%	7%	8%	9%	10%
20	0%	1%	2%	3%	4%	5%
30.00001	0%	0%	0%	0%	0%	0%

Type III-IV3

Seperation Distance	Length-Height Factor					
	0	20.00001	40.00001	60.00001	80.00001	100
0	5%	6%	7%	8%	9%	10%
3	3%	4%	5%	6%	7%	8%
10	0%	1%	2%	3%	4%	5%
20	0%	0%	0%	1%	2%	3%
30.00001	0%	0%	0%	0%	0%	0%

Type I-II2

Seperation Distance	Length-Height Factor					
	0	20.00001	40.00001	60.00001	80.00001	100
0	10%	11%	12%	13%	14%	15%
3	6%	7%	8%	9%	10%	11%
10	3%	4%	5%	6%	7%	8%
20	0%	0%	1%	2%	3%	4%
30.00001	0%	0%	0%	0%	0%	0%

Type I-II3

Seperation Distance	Length-Height Factor					
	0	20.00001	40.00001	60.00001	80.00001	100
0	0%	1%	2%	3%	4%	5%
3	0%	0%	1%	2%	3%	4%
10	0%	0%	0%	1%	2%	3%
20	0%	0%	0%	0%	0%	0%
30.00001	0%	0%	0%	0%	0%	0%

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	26-Aug-24
Building Type:	Light Industrial
Building Being Considered:	Bldg A1

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				11900.0	m^2
	Total Effective Floor Area				**11,900.0**	**m^2**
C	**Fire Flow**				**19,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Combustible	0	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**0**	**L/min**
	Fire Flow				**19,000**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-9,500**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				50	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				100	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	100	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				120	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				240	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**>30m; No Exposure**	100	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			50	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			100	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance			23	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			120	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			240	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	36	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	26-Aug-24
Building Type:	Light Industrial
Building Being Considered:	Bldg A2

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				7740.0	m^2
	Total Effective Floor Area				**7,740.0**	**m^2**
C	**Fire Flow**				**15,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Combustible	0	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**0**	**L/min**
	Fire Flow				**15,000**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-7,500**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				50	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				100	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	100	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				120	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				240	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**>30m; No Exposure**	36	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			50	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			100	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	23	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			120	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			240	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**8,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	26-Aug-24
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg B1

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10780.0	m^2
	Total Effective Floor Area				**10,780.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				45	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				90	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	23	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				88	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				176	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**>30m; No Exposure**	100	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			61	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			122	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	51	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			88	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			176	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	26-Aug-24
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg B2

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10820.0	m^2
	Total Effective Floor Area				**10,820.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				25	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				50	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	23	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				88	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				176	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			61	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			122	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	51	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			88	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			176	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	26-Aug-24
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg C1

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10780.0	m^2
	Total Effective Floor Area				**10,780.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				61	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				122	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	51	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				88	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				176	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**>30m; No Exposure**	100	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			61	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			122	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	64	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			88	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			176	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	26-Aug-24
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg C2

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10780.0	m^2
	Total Effective Floor Area				**10,780.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				61	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				122	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	51	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				88.4	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				176.8	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			61	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			122	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	64	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			88	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			176	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	26-Aug-24
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg C3

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				12980.0	m^2
	Total Effective Floor Area				**12,980.0**	**m^2**
C	**Fire Flow**				**20,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**3000**	**L/min**
	Fire Flow				**23,000**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-11,500**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				73	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				146	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	100	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				88	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				176	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			73	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			146	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	64	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			88	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			176	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**12,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	26-Aug-24
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg D1

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10800.0	m^2
	Total Effective Floor Area				**10,800.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				61	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				122	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	64	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				88	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				176	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**>30m; No Exposure**	100	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			61	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			122	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			88	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			176	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	26-Aug-24
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg D2

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				10780.0	m^2
	Total Effective Floor Area				**10,780.0**	**m^2**
C	**Fire Flow**				**18,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2700**	**L/min**
	Fire Flow				**20,700**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,350**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				61	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				122	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	64	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				88	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				176	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			61	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			122	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			76	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			152	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**Fire Wall Separation**	0	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**10,000**	**L/min**

Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).

Project Name:	4101 Limebank Rd.
Project Location:	Ottawa ON
Project No:	23074
Date:	26-Aug-24
Building Type:	Light Industrial - Warehousing
Building Being Considered:	Bldg D3

Robinson Land Development

Calculations for Total Required Fire Flow

Step	Parameter				Value	
A	Type of Construction	**Options**	**C**			
		Wood Frame (Type V)	1.5	Non-Combustible Construction (Type II)	0.8	
		Ordinary Construction (Type III)	1.0			
		Non-Combustible Construction (Type II)	0.8			
		Fire Resistive Construction (Type I)	0.6			
B	Ground Floor Area				11180.0	m^2
	Total Effective Floor Area				**11,180.0**	**m^2**
C	**Fire Flow**				**19,000**	**L/min**
D	Occupancy Class	**Options**	**Charge**			
		Non-combustible	-0.25	Free burning	0.15	
		Limited Combustible	-0.15			
		Combustible	0.00			
		Free burning	0.15			
		Rapid Burning	0.25			
	Occupancy Adjustment				**2850**	**L/min**
	Fire Flow				**21,850**	**L/min**
E	Sprinkler Protection	**Options**	**Charge**			
		Automatic Sprinkler Protection	-0.30	Automatic Sprinkler Protection	-0.30	
		None	0.00			
		Water Supply is Standard for System and Hose Lines	-0.10	Yes	-0.10	
		Full Supervision of the Sprinker System	-0.10	Yes	-0.10	
	Sprinkler Reduction				**-10,925**	**L/min**
	Exposures					
	West Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				61	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				122	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				
	Separation Distance			**>30m; No Exposure**	64	m
	West Side Exposure Charge				**0.00**	
	North Side					
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems				Yes	
	Exposed Wall Length				76	m
	Exposed Wall No. of Storeys				2	
	Length-Height Factor of Exposed Wall				152	m.storeys
	Construction Type of Exposed Wall	**Options**				
		Wood Frame		Noncombustible or Fire Resistive with Unprotected Openings		
		Ordinary with Unprotected Openings				
		Ordinary without Unprotected Openings				
		Noncombustible or Fire Resistive with Unprotected Openings				
		Noncombustible or Fire Resistive without Unprotected Openings				

	Separation Distance		**Fire Wall Separation**	0	m
	North Side Exposure Charge			**0.00**	
F	**East Side**				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			61	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			122	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	East Side Exposure Charge			**0.00**	
	South Side				
	Subject Building and Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Building Fully Protected with Automatic Sprinker Systems			Yes	
	Exposed Wall Length			76	m
	Exposed Wall No. of Storeys			2	
	Length-Height Factor of Exposed Wall			152	m.storeys
	Construction Type of Exposed Wall	**Options**	Noncombustible or Fire Resistive with Unprotected Openings		
		Wood Frame			
		Ordinary with Unprotected Openings			
		Ordinary without Unprotected Openings			
		Noncombustible or Fire Resistive with Unprotected Openings			
		Noncombustible or Fire Resistive without Unprotected Openings			
	Separation Distance		**>30m; No Exposure**	100	m
	South Side Exposure Charge			**0.00**	
	Total Exposure Charage			**0**	**< 0.75**
	Increase for Exposures			**0**	**L/min**
G	**Total Required Fire Flow**			**11,000**	**L/min**

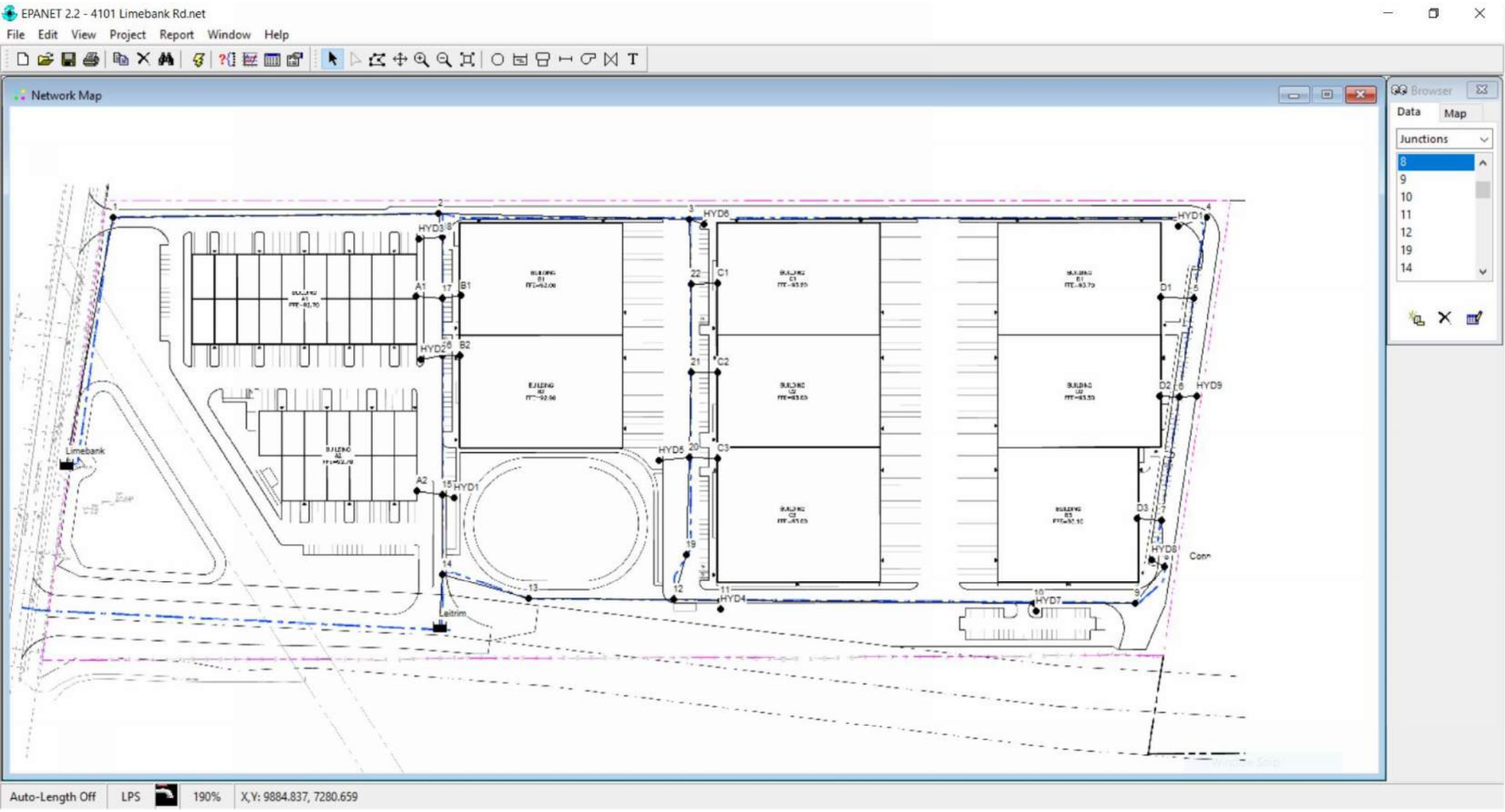
Notes:

1. Fire flow calculations have been prepared in accordance with Fire Underwriters Survey (v. 2020)

2. Building construction type and fire wall dividing blocks assumed based on site plan

3. Floor areas used in Step B equivalent to 2-storey due to high 1-storey building height

4. Where buildings are at a diagonal to each other, the shortest separtion distance is increased by 3 metres and used as the exposure distance (Ref. FUS v.2020 pg.30).


EPANET 2.2 - 4101 Limebank Rd.net
File Edit View Project Report Window Help
Network Map
Browser
Data Map
Junctions
8
9
10
11
12
19
14
HYD1
HYD2
HYD3
HYD4
HYD5
HYD6
HYD7
HYD8
HYD9
A1
A2
B1
B2
C1
C2
C3
D1
D2
D3
Limebank
Leitrim
Conn
Auto-Length Off
LPS
190%
X,Y: 9884.837, 7280.659

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******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                          Version 2.2                           *
******************************************************************
```

Input File: 4101 Limebank Rd.net

Average Day Demand, Current PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	131.74	41.24	0.00
2	0.00	131.74	41.74	0.00
3	0.00	131.74	41.74	0.00
4	0.00	131.74	41.24	0.00
6	0.00	131.74	41.24	0.00
8	0.00	131.74	41.74	0.00
9	0.00	131.74	41.74	0.00
10	0.00	131.74	41.74	0.00
11	0.00	131.74	41.74	0.00
12	0.00	131.74	41.74	0.00
19	0.00	131.74	41.74	0.00
14	0.00	131.74	42.24	0.00
15	0.00	131.74	41.74	0.00
16	0.00	131.74	41.74	0.00
18	0.00	131.74	41.74	0.00
HYD1	0.00	131.74	39.24	0.00
HYD2	0.00	131.74	39.24	0.00
HYD3	0.00	131.74	39.24	0.00
HYD4	0.00	131.74	39.24	0.00
HYD7	0.00	131.74	39.24	0.00
HYD8	0.00	131.74	38.74	0.00
HYD9	0.00	131.74	38.74	0.00
HYD5	0.00	131.74	39.24	0.00
HYD6	0.00	131.74	38.74	0.00
20	0.00	131.74	41.74	0.00

B2	0.06	131.74	38.84	0.00
A2	0.31	131.74	39.04	0.00
17	0.00	131.74	41.74	0.00
B1	0.06	131.74	38.74	0.00
A1	0.48	131.74	39.04	0.00
21	0.00	131.74	41.74	0.00
C2	0.06	131.74	38.74	0.00
22	0.00	131.74	41.74	0.00
C1	0.06	131.74	38.54	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.06	131.74	38.74	0.00	
13	0.00	131.74	41.74	0.00	
7	0.00	131.74	41.74	0.00	
D2	0.06	131.74	38.44	0.00	
D3	0.06	131.74	38.64	0.00	
5	0.00	131.74	41.24	0.00	
D1	0.06	131.74	38.04	0.00	
Leitrim	-0.92	131.74	0.00	0.00	Reservoir
Limebank	-0.35	131.74	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	0.35	0.01	0.00	Open
2	0.35	0.01	0.00	Open
3	0.02	0.00	0.00	Open
4	0.05	0.00	0.00	Open
7	-0.13	0.00	0.00	Open
8	-0.13	0.00	0.00	Open
9	-0.13	0.00	0.00	Open
10	-0.13	0.00	0.00	Open
12	0.92	0.02	0.00	Open
13	0.58	0.01	0.00	Open
14	0.27	0.01	0.00	Open
16	-0.33	0.01	0.00	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	0.21	0.00	0.00	Open
20	0.21	0.00	0.00	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	0.33	0.01	0.00	Open
31	-0.21	0.00	0.00	Open
32	0.06	0.00	0.00	Open
33	0.48	0.03	0.02	Open
34	0.06	0.00	0.00	Open
35	-0.31	0.02	0.01	Open
36	0.06	0.00	0.00	Open
37	0.06	0.00	0.00	Open
38	0.06	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	-0.03	0.00	0.00	Open
40	-0.09	0.00	0.00	Open
41	-0.15	0.00	0.00	Open
42	-0.34	0.01	0.00	Open
43	-0.34	0.01	0.00	Open
44	0.13	0.00	0.00	Open
45	0.07	0.00	0.00	Open
46	0.06	0.00	0.00	Open
47	0.06	0.00	0.00	Open
48	0.01	0.00	0.00	Open
49	-0.05	0.00	0.00	Open
50	0.06	0.00	0.00	Open

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******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
******************************************************************
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Input File: 4101 Limebank Rd.net

Average Day Demand, Future PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	148.34	57.84	0.00
2	0.00	148.34	58.34	0.00
3	0.00	148.34	58.34	0.00
4	0.00	148.34	57.84	0.00
6	0.00	148.34	57.84	0.00
8	0.00	148.34	58.34	0.00
9	0.00	148.34	58.34	0.00
10	0.00	148.34	58.34	0.00
11	0.00	148.34	58.34	0.00
12	0.00	148.34	58.34	0.00
19	0.00	148.34	58.34	0.00
14	0.00	148.34	58.84	0.00
15	0.00	148.34	58.34	0.00
16	0.00	148.34	58.34	0.00
18	0.00	148.34	58.34	0.00
HYD1	0.00	148.34	55.84	0.00
HYD2	0.00	148.34	55.84	0.00
HYD3	0.00	148.34	55.84	0.00
HYD4	0.00	148.34	55.84	0.00
HYD7	0.00	148.34	55.84	0.00
HYD8	0.00	148.34	55.34	0.00
HYD9	0.00	148.34	55.34	0.00
HYD5	0.00	148.34	55.84	0.00
HYD6	0.00	148.34	55.34	0.00
20	0.00	148.34	58.34	0.00

B2	0.06	148.34	55.44	0.00
A2	0.31	148.34	55.64	0.00
17	0.00	148.34	58.34	0.00
B1	0.06	148.34	55.34	0.00
A1	0.48	148.34	55.64	0.00
21	0.00	148.34	58.34	0.00
C2	0.06	148.34	55.34	0.00
22	0.00	148.34	58.34	0.00
C1	0.06	148.34	55.14	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.06	148.34	55.34	0.00	
13	0.00	148.34	58.34	0.00	
7	0.00	148.34	58.34	0.00	
D2	0.06	148.34	55.04	0.00	
D3	0.06	148.34	55.24	0.00	
5	0.00	148.34	57.84	0.00	
D1	0.06	148.34	54.64	0.00	
Leitrim	-0.92	148.34	0.00	0.00	Reservoir
Limebank	-0.35	148.34	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	0.35	0.01	0.00	Open
2	0.35	0.01	0.00	Open
3	0.02	0.00	0.00	Open
4	0.05	0.00	0.00	Open
7	-0.13	0.00	0.00	Open
8	-0.13	0.00	0.00	Open
9	-0.13	0.00	0.00	Open
10	-0.13	0.00	0.00	Open
12	0.92	0.02	0.00	Open
13	0.58	0.01	0.00	Open
14	0.27	0.01	0.00	Open
16	-0.33	0.01	0.00	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	0.21	0.00	0.00	Open
20	0.21	0.00	0.00	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	0.33	0.01	0.00	Open
31	-0.21	0.00	0.00	Open
32	0.06	0.00	0.00	Open
33	0.48	0.03	0.02	Open
34	0.06	0.00	0.00	Open
35	-0.31	0.02	0.01	Open
36	0.06	0.00	0.00	Open
37	0.06	0.00	0.00	Open
38	0.06	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	-0.03	0.00	0.00	Open
40	-0.09	0.00	0.00	Open
41	-0.15	0.00	0.00	Open
42	-0.34	0.01	0.00	Open
43	-0.34	0.01	0.00	Open
44	0.13	0.00	0.00	Open
45	0.07	0.00	0.00	Open
46	0.06	0.00	0.00	Open
47	0.06	0.00	0.00	Open
48	0.01	0.00	0.00	Open
49	-0.05	0.00	0.00	Open
50	0.06	0.00	0.00	Open

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******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
******************************************************************
```

Input File: 4101 Limebank Rd.net

Peak Hour Demand, Current PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	124.94	34.44	0.00
2	0.00	124.93	34.93	0.00
3	0.00	124.93	34.93	0.00
4	0.00	124.93	34.43	0.00
6	0.00	124.93	34.43	0.00
8	0.00	124.93	34.93	0.00
9	0.00	124.93	34.93	0.00
10	0.00	124.93	34.93	0.00
11	0.00	124.93	34.93	0.00
12	0.00	124.93	34.93	0.00
19	0.00	124.93	34.93	0.00
14	0.00	124.93	35.43	0.00
15	0.00	124.93	34.93	0.00
16	0.00	124.93	34.93	0.00
18	0.00	124.93	34.93	0.00
HYD1	0.00	124.93	32.43	0.00
HYD2	0.00	124.93	32.43	0.00
HYD3	0.00	124.93	32.43	0.00
HYD4	0.00	124.93	32.43	0.00
HYD7	0.00	124.93	32.43	0.00
HYD8	0.00	124.93	31.93	0.00
HYD9	0.00	124.93	31.93	0.00
HYD5	0.00	124.93	32.43	0.00
HYD6	0.00	124.93	31.93	0.00
20	0.00	124.93	34.93	0.00

B2	0.15	124.93	32.03	0.00
A2	0.83	124.93	32.23	0.00
17	0.00	124.93	34.93	0.00
B1	0.15	124.93	31.93	0.00
A1	1.28	124.93	32.23	0.00
21	0.00	124.93	34.93	0.00
C2	0.15	124.93	31.93	0.00
22	0.00	124.93	34.93	0.00
C1	0.15	124.93	31.73	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.15	124.93	31.93	0.00	
13	0.00	124.93	34.93	0.00	
7	0.00	124.93	34.93	0.00	
D2	0.15	124.93	31.63	0.00	
D3	0.15	124.93	31.83	0.00	
5	0.00	124.93	34.43	0.00	
D1	0.15	124.93	31.23	0.00	
Leitrim	-0.44	124.93	0.00	0.00	Reservoir
Limebank	-2.87	124.94	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	2.87	0.06	0.03	Open
2	2.87	0.06	0.03	Open
3	0.96	0.02	0.00	Open
4	0.33	0.01	0.00	Open
7	-0.12	0.00	0.00	Open
8	-0.12	0.00	0.00	Open
9	-0.12	0.00	0.00	Open
10	-0.12	0.00	0.00	Open
12	0.44	0.01	0.00	Open
13	0.50	0.01	0.00	Open
14	-0.33	0.01	0.00	Open
16	-1.91	0.04	0.01	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	-0.18	0.00	0.00	Open
20	-0.18	0.00	0.00	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	1.91	0.04	0.01	Open
31	0.48	0.01	0.00	Open
32	0.15	0.01	0.00	Open
33	1.28	0.07	0.10	Open
34	0.15	0.01	0.00	Open
35	-0.83	0.05	0.04	Open
36	0.15	0.01	0.00	Open
37	0.15	0.01	0.00	Open
38	0.15	0.01	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
39	0.63	0.01	0.00	Open
40	0.48	0.01	0.00	Open
41	0.33	0.01	0.00	Open
42	0.06	0.00	0.00	Open
43	0.06	0.00	0.00	Open
44	0.12	0.00	0.00	Open
45	-0.03	0.00	0.00	Open
46	0.15	0.01	0.00	Open
47	0.15	0.01	0.00	Open
48	-0.18	0.00	0.00	Open
49	-0.33	0.01	0.00	Open
50	0.15	0.01	0.00	Open

```
******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
******************************************************************
```

Input File: 4101 Limebank Rd.net

Peak Hour Demand, Future PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	145.39	54.89	0.00
2	0.00	145.38	55.38	0.00
3	0.00	145.38	55.38	0.00
4	0.00	145.38	54.88	0.00
6	0.00	145.38	54.88	0.00
8	0.00	145.38	55.38	0.00
9	0.00	145.38	55.38	0.00
10	0.00	145.38	55.38	0.00
11	0.00	145.38	55.38	0.00
12	0.00	145.38	55.38	0.00
19	0.00	145.38	55.38	0.00
14	0.00	145.38	55.88	0.00
15	0.00	145.38	55.38	0.00
16	0.00	145.38	55.38	0.00
18	0.00	145.38	55.38	0.00
HYD1	0.00	145.38	52.88	0.00
HYD2	0.00	145.38	52.88	0.00
HYD3	0.00	145.38	52.88	0.00
HYD4	0.00	145.38	52.88	0.00
HYD7	0.00	145.38	52.88	0.00
HYD8	0.00	145.38	52.38	0.00
HYD9	0.00	145.38	52.38	0.00
HYD5	0.00	145.38	52.88	0.00
HYD6	0.00	145.38	52.38	0.00
20	0.00	145.38	55.38	0.00

B2	0.15	145.38	52.48	0.00
A2	0.83	145.38	52.68	0.00
17	0.00	145.38	55.38	0.00
B1	0.15	145.38	52.38	0.00
A1	1.28	145.38	52.68	0.00
21	0.00	145.38	55.38	0.00
C2	0.15	145.38	52.38	0.00
22	0.00	145.38	55.38	0.00
C1	0.15	145.38	52.18	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.15	145.38	52.38	0.00	
13	0.00	145.38	55.38	0.00	
7	0.00	145.38	55.38	0.00	
D2	0.15	145.38	52.08	0.00	
D3	0.15	145.38	52.28	0.00	
5	0.00	145.38	54.88	0.00	
D1	0.15	145.38	51.68	0.00	
Leitrim	-0.44	145.38	0.00	0.00	Reservoir
Limebank	-2.87	145.39	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	2.87	0.06	0.03	Open
2	2.87	0.06	0.03	Open
3	0.96	0.02	0.00	Open
4	0.33	0.01	0.00	Open
7	-0.12	0.00	0.00	Open
8	-0.12	0.00	0.00	Open
9	-0.12	0.00	0.00	Open
10	-0.12	0.00	0.00	Open
12	0.44	0.01	0.00	Open
13	0.50	0.01	0.00	Open
14	-0.33	0.01	0.00	Open
16	-1.91	0.04	0.01	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	-0.18	0.00	0.00	Open
20	-0.18	0.00	0.00	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	1.91	0.04	0.01	Open
31	0.48	0.01	0.00	Open
32	0.15	0.01	0.00	Open
33	1.28	0.07	0.10	Open
34	0.15	0.01	0.00	Open
35	-0.83	0.05	0.04	Open
36	0.15	0.01	0.00	Open
37	0.15	0.01	0.00	Open
38	0.15	0.01	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
39	0.63	0.01	0.00	Open
40	0.48	0.01	0.00	Open
41	0.33	0.01	0.00	Open
42	0.06	0.00	0.00	Open
43	0.06	0.00	0.00	Open
44	0.12	0.00	0.00	Open
45	-0.03	0.00	0.00	Open
46	0.15	0.01	0.00	Open
47	0.15	0.01	0.00	Open
48	-0.18	0.00	0.00	Open
49	-0.33	0.01	0.00	Open
50	0.15	0.01	0.00	Open

```
******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                          Version 2.2                           *
******************************************************************
```

Input File: 4101 Limebank Rd.net

Max Day + Fire, Building A1 or B1 (Hyd 2 & 3), Current PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	118.02	27.52	0.00
2	0.00	116.46	26.46	0.00
3	0.00	116.86	26.86	0.00
4	0.00	116.98	26.48	0.00
6	0.00	117.01	26.51	0.00
8	0.00	117.05	27.05	0.00
9	0.00	117.06	27.06	0.00
10	0.00	117.09	27.09	0.00
11	0.00	117.16	27.16	0.00
12	0.00	117.17	27.17	0.00
19	0.00	117.12	27.12	0.00
14	0.00	117.48	27.98	0.00
15	0.00	116.94	26.94	0.00
16	0.00	116.13	26.13	0.00
18	0.00	116.16	26.16	0.00
HYD1	0.00	116.94	24.44	0.00
HYD2	83.33	113.51	21.01	0.00
HYD3	83.33	113.54	21.04	0.00
HYD4	0.00	117.16	24.66	0.00
HYD7	0.00	117.09	24.59	0.00
HYD8	0.00	117.01	24.01	0.00
HYD9	0.00	116.98	23.98	0.00
HYD5	0.00	117.05	24.55	0.00
HYD6	0.00	116.86	23.86	0.00
20	0.00	117.05	27.05	0.00

B2	0.08	116.13	23.23	0.00
A2	0.46	116.94	24.24	0.00
17	0.00	116.14	26.14	0.00
B1	0.08	116.14	23.14	0.00
A1	0.71	116.14	23.44	0.00
21	0.00	116.99	26.99	0.00
C2	0.08	116.99	23.99	0.00
22	0.00	116.91	26.91	0.00
C1	0.08	116.91	23.71	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	117.05	24.05	0.00	
13	0.00	117.41	27.41	0.00	
7	0.00	117.04	27.04	0.00	
D2	0.08	117.01	23.71	0.00	
D3	0.08	117.04	23.94	0.00	
5	0.00	116.99	26.49	0.00	
D1	0.08	116.99	23.29	0.00	
Leitrim	-106.75	118.22	0.00	0.00	Reservoir
Limebank	-61.72	119.20	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	61.72	1.26	8.71	Open
2	61.72	1.26	8.71	Open
3	-34.85	0.71	3.02	Open
4	-11.63	0.24	0.40	Open
7	-11.87	0.24	0.41	Open
8	-11.87	0.24	0.41	Open
9	-11.87	0.24	0.41	Open
10	-11.87	0.24	0.41	Open
12	106.75	2.17	24.02	Open
13	71.42	1.45	11.41	Open
14	70.96	1.45	11.27	Open
16	-96.57	1.97	19.95	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	23.46	0.48	1.45	Open
20	23.46	0.48	1.45	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	83.33	4.72	218.08	Open
28	83.33	4.72	218.08	Open
29	0.00	0.00	0.00	Open
30	13.24	0.27	0.50	Open
31	12.45	0.25	0.45	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	-23.22	0.47	1.42	Open
40	-23.30	0.47	1.43	Open
41	-23.38	0.48	1.44	Open
42	-35.33	0.72	3.10	Open
43	-35.33	0.72	3.10	Open
44	11.87	0.24	0.41	Open
45	11.79	0.24	0.41	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	11.71	0.24	0.40	Open
49	11.63	0.24	0.40	Open
50	0.08	0.00	0.00	Open

```
******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                          Version 2.2                           *
******************************************************************
```

Input File: 4101 Limebank Rd.net

Max Day + Fire, Building A1 or B1 (Hyd 2 & 3), Future PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	136.97	46.47	0.00
2	0.00	135.41	45.41	0.00
3	0.00	135.81	45.81	0.00
4	0.00	135.93	45.43	0.00
6	0.00	135.96	45.46	0.00
8	0.00	136.00	46.00	0.00
9	0.00	136.01	46.01	0.00
10	0.00	136.04	46.04	0.00
11	0.00	136.11	46.11	0.00
12	0.00	136.12	46.12	0.00
19	0.00	136.07	46.07	0.00
14	0.00	136.43	46.93	0.00
15	0.00	135.89	45.89	0.00
16	0.00	135.08	45.08	0.00
18	0.00	135.11	45.11	0.00
HYD1	0.00	135.89	43.39	0.00
HYD2	83.33	132.46	39.96	0.00
HYD3	83.33	132.49	39.99	0.00
HYD4	0.00	136.11	43.61	0.00
HYD7	0.00	136.04	43.54	0.00
HYD8	0.00	135.96	42.96	0.00
HYD9	0.00	135.93	42.93	0.00
HYD5	0.00	136.00	43.50	0.00
HYD6	0.00	135.81	42.81	0.00
20	0.00	136.00	46.00	0.00

B2	0.08	135.08	42.18	0.00
A2	0.46	135.89	43.19	0.00
17	0.00	135.09	45.09	0.00
B1	0.08	135.09	42.09	0.00
A1	0.71	135.09	42.39	0.00
21	0.00	135.94	45.94	0.00
C2	0.08	135.94	42.94	0.00
22	0.00	135.86	45.86	0.00
C1	0.08	135.86	42.66	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	136.00	43.00	0.00	
13	0.00	136.36	46.36	0.00	
7	0.00	135.99	45.99	0.00	
D2	0.08	135.96	42.66	0.00	
D3	0.08	135.99	42.89	0.00	
5	0.00	135.94	45.44	0.00	
D1	0.08	135.94	42.24	0.00	
Leitrim	-106.75	137.17	0.00	0.00	Reservoir
Limebank	-61.72	138.15	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	61.72	1.26	8.71	Open
2	61.72	1.26	8.71	Open
3	-34.85	0.71	3.02	Open
4	-11.63	0.24	0.40	Open
7	-11.87	0.24	0.41	Open
8	-11.87	0.24	0.41	Open
9	-11.87	0.24	0.41	Open
10	-11.87	0.24	0.41	Open
12	106.75	2.17	24.02	Open
13	71.42	1.45	11.41	Open
14	70.96	1.45	11.27	Open
16	-96.57	1.97	19.95	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	23.46	0.48	1.45	Open
20	23.46	0.48	1.45	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	83.33	4.72	218.08	Open
28	83.33	4.72	218.08	Open
29	0.00	0.00	0.00	Open
30	13.24	0.27	0.50	Open
31	12.45	0.25	0.45	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	-23.22	0.47	1.42	Open
40	-23.30	0.47	1.43	Open
41	-23.38	0.48	1.44	Open
42	-35.33	0.72	3.10	Open
43	-35.33	0.72	3.10	Open
44	11.87	0.24	0.41	Open
45	11.79	0.24	0.41	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	11.71	0.24	0.40	Open
49	11.63	0.24	0.40	Open
50	0.08	0.00	0.00	Open

```
******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
******************************************************************
```

Input File: 4101 Limebank Rd.net

Max Day + Fire, Building A2 (Hyd 1 & 2), Current PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	118.51	28.01	0.00
2	0.00	117.59	27.59	0.00
3	0.00	117.63	27.63	0.00
4	0.00	117.64	27.14	0.00
6	0.00	117.64	27.14	0.00
8	0.00	117.65	27.65	0.00
9	0.00	117.65	27.65	0.00
10	0.00	117.65	27.65	0.00
11	0.00	117.66	27.66	0.00
12	0.00	117.66	27.66	0.00
19	0.00	117.65	27.65	0.00
14	0.00	117.69	28.19	0.00
15	0.00	117.05	27.05	0.00
16	0.00	117.02	27.02	0.00
18	0.00	117.48	27.48	0.00
HYD1	66.67	116.33	23.83	0.00
HYD2	66.67	115.29	22.79	0.00
HYD3	0.00	117.48	24.98	0.00
HYD4	0.00	117.66	25.16	0.00
HYD7	0.00	117.65	25.15	0.00
HYD8	0.00	117.64	24.64	0.00
HYD9	0.00	117.64	24.64	0.00
HYD5	0.00	117.65	25.15	0.00
HYD6	0.00	117.63	24.63	0.00
20	0.00	117.65	27.65	0.00

B2	0.08	117.02	24.12	0.00
A2	0.46	117.05	24.35	0.00
17	0.00	117.24	27.24	0.00
B1	0.08	117.24	24.24	0.00
A1	0.71	117.24	24.54	0.00
21	0.00	117.64	27.64	0.00
C2	0.08	117.64	24.64	0.00
22	0.00	117.63	27.63	0.00
C1	0.08	117.63	24.43	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	117.65	24.65	0.00	
13	0.00	117.68	27.68	0.00	
7	0.00	117.65	27.65	0.00	
D2	0.08	117.64	24.34	0.00	
D3	0.08	117.65	24.55	0.00	
5	0.00	117.64	27.14	0.00	
D1	0.08	117.64	23.94	0.00	
Leitrim	-88.84	118.22	0.00	0.00	Reservoir
Limebank	-46.31	119.20	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	46.31	0.94	5.12	Open
2	46.31	0.94	5.11	Open
3	-9.86	0.20	0.29	Open
4	-3.27	0.07	0.04	Open
7	-3.51	0.07	0.04	Open
8	-3.51	0.07	0.04	Open
9	-3.51	0.07	0.04	Open
10	-3.51	0.07	0.04	Open
12	88.84	1.81	17.09	Open
13	78.50	1.60	13.59	Open
14	11.37	0.23	0.38	Open
16	-56.17	1.14	7.31	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	6.83	0.14	0.15	Open
20	6.83	0.14	0.15	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	66.67	3.77	144.28	Open
29	-66.67	3.77	144.28	Open
30	56.17	1.14	7.31	Open
31	55.38	1.13	7.12	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	-6.59	0.13	0.14	Open
40	-6.67	0.14	0.14	Open
41	-6.75	0.14	0.14	Open
42	-10.34	0.21	0.32	Open
43	-10.34	0.21	0.32	Open
44	3.51	0.07	0.04	Open
45	3.43	0.07	0.04	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	3.35	0.07	0.04	Open
49	3.27	0.07	0.04	Open
50	0.08	0.00	0.00	Open

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******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                          Version 2.2                           *
******************************************************************
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Input File: 4101 Limebank Rd.net

Max Day + Fire, Building A2 (Hyd 1 & 2), Future PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	137.46	46.96	0.00
2	0.00	136.54	46.54	0.00
3	0.00	136.58	46.58	0.00
4	0.00	136.59	46.09	0.00
6	0.00	136.59	46.09	0.00
8	0.00	136.60	46.60	0.00
9	0.00	136.60	46.60	0.00
10	0.00	136.60	46.60	0.00
11	0.00	136.61	46.61	0.00
12	0.00	136.61	46.61	0.00
19	0.00	136.60	46.60	0.00
14	0.00	136.64	47.14	0.00
15	0.00	136.00	46.00	0.00
16	0.00	135.97	45.97	0.00
18	0.00	136.43	46.43	0.00
HYD1	66.67	135.28	42.78	0.00
HYD2	66.67	134.24	41.74	0.00
HYD3	0.00	136.43	43.93	0.00
HYD4	0.00	136.61	44.11	0.00
HYD7	0.00	136.60	44.10	0.00
HYD8	0.00	136.59	43.59	0.00
HYD9	0.00	136.59	43.59	0.00
HYD5	0.00	136.60	44.10	0.00
HYD6	0.00	136.58	43.58	0.00
20	0.00	136.60	46.60	0.00

B2	0.08	135.97	43.07	0.00
A2	0.46	136.00	43.30	0.00
17	0.00	136.19	46.19	0.00
B1	0.08	136.19	43.19	0.00
A1	0.71	136.19	43.49	0.00
21	0.00	136.59	46.59	0.00
C2	0.08	136.59	43.59	0.00
22	0.00	136.58	46.58	0.00
C1	0.08	136.58	43.38	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	136.60	43.60	0.00	
13	0.00	136.63	46.63	0.00	
7	0.00	136.60	46.60	0.00	
D2	0.08	136.59	43.29	0.00	
D3	0.08	136.60	43.50	0.00	
5	0.00	136.59	46.09	0.00	
D1	0.08	136.59	42.89	0.00	
Leitrim	-88.84	137.17	0.00	0.00	Reservoir
Limebank	-46.31	138.15	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	46.31	0.94	5.11	Open
2	46.31	0.94	5.12	Open
3	-9.86	0.20	0.29	Open
4	-3.27	0.07	0.04	Open
7	-3.51	0.07	0.04	Open
8	-3.51	0.07	0.04	Open
9	-3.51	0.07	0.04	Open
10	-3.51	0.07	0.04	Open
12	88.84	1.81	17.09	Open
13	78.50	1.60	13.59	Open
14	11.37	0.23	0.38	Open
16	-56.17	1.14	7.31	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	6.83	0.14	0.15	Open
20	6.83	0.14	0.15	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	66.67	3.77	144.28	Open
29	-66.67	3.77	144.28	Open
30	56.17	1.14	7.31	Open
31	55.38	1.13	7.12	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	-6.59	0.13	0.14	Open
40	-6.67	0.14	0.14	Open
41	-6.75	0.14	0.14	Open
42	-10.34	0.21	0.32	Open
43	-10.34	0.21	0.32	Open
44	3.51	0.07	0.04	Open
45	3.43	0.07	0.04	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	3.35	0.07	0.04	Open
49	3.27	0.07	0.04	Open
50	0.08	0.00	0.00	Open

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******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
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Input File: 4101 Limebank Rd.net

Max Day + Fire, Building B2 (Hyd 1 & 2), Current PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	118.31	27.81	0.00
2	0.00	117.13	27.13	0.00
3	0.00	117.22	27.22	0.00
4	0.00	117.25	26.75	0.00
6	0.00	117.25	26.75	0.00
8	0.00	117.26	27.26	0.00
9	0.00	117.26	27.26	0.00
10	0.00	117.27	27.27	0.00
11	0.00	117.29	27.29	0.00
12	0.00	117.29	27.29	0.00
19	0.00	117.28	27.28	0.00
14	0.00	117.36	27.86	0.00
15	0.00	116.37	26.37	0.00
16	0.00	116.32	26.32	0.00
18	0.00	116.97	26.97	0.00
HYD1	83.33	115.28	22.78	0.00
HYD2	83.33	113.70	21.20	0.00
HYD3	0.00	116.97	24.47	0.00
HYD4	0.00	117.29	24.79	0.00
HYD7	0.00	117.27	24.77	0.00
HYD8	0.00	117.25	24.25	0.00
HYD9	0.00	117.25	24.25	0.00
HYD5	0.00	117.26	24.76	0.00
HYD6	0.00	117.22	24.22	0.00
20	0.00	117.26	27.26	0.00

B2	0.08	116.32	23.42	0.00
A2	0.46	116.37	23.67	0.00
17	0.00	116.63	26.63	0.00
B1	0.08	116.63	23.63	0.00
A1	0.71	116.62	23.92	0.00
21	0.00	117.25	27.25	0.00
C2	0.08	117.25	24.25	0.00
22	0.00	117.23	27.23	0.00
C1	0.08	117.23	24.03	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	117.26	24.26	0.00	
13	0.00	117.34	27.34	0.00	
7	0.00	117.26	27.26	0.00	
D2	0.08	117.25	23.95	0.00	
D3	0.08	117.26	24.16	0.00	
5	0.00	117.25	26.75	0.00	
D1	0.08	117.25	23.55	0.00	
Leitrim	-115.47	118.22	0.00	0.00	Reservoir
Limebank	-53.00	119.20	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	53.00	1.08	6.57	Open
2	53.00	1.08	6.57	Open
3	-15.40	0.31	0.67	Open
4	-5.12	0.10	0.09	Open
7	-5.36	0.11	0.09	Open
8	-5.36	0.11	0.09	Open
9	-5.36	0.11	0.09	Open
10	-5.36	0.11	0.09	Open
12	115.47	2.35	27.78	Open
13	99.58	2.03	21.12	Open
14	15.79	0.32	0.70	Open
16	-68.41	1.39	10.53	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	10.52	0.21	0.33	Open
20	10.52	0.21	0.33	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	83.33	4.72	218.08	Open
29	-83.33	4.72	218.08	Open
30	68.41	1.39	10.53	Open
31	67.62	1.38	10.31	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	-10.28	0.21	0.31	Open
40	-10.36	0.21	0.32	Open
41	-10.44	0.21	0.32	Open
42	-15.88	0.32	0.70	Open
43	-15.88	0.32	0.70	Open
44	5.36	0.11	0.09	Open
45	5.28	0.11	0.09	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	5.20	0.11	0.09	Open
49	5.12	0.10	0.09	Open
50	0.08	0.00	0.00	Open

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******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
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Input File: 4101 Limebank Rd.net

Max Day + Fire, Building B2 (Hyd 1 & 2), Future PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	137.26	46.76	0.00
2	0.00	136.08	46.08	0.00
3	0.00	136.17	46.17	0.00
4	0.00	136.20	45.70	0.00
6	0.00	136.20	45.70	0.00
8	0.00	136.21	46.21	0.00
9	0.00	136.21	46.21	0.00
10	0.00	136.22	46.22	0.00
11	0.00	136.24	46.24	0.00
12	0.00	136.24	46.24	0.00
19	0.00	136.23	46.23	0.00
14	0.00	136.31	46.81	0.00
15	0.00	135.32	45.32	0.00
16	0.00	135.27	45.27	0.00
18	0.00	135.92	45.92	0.00
HYD1	83.33	134.23	41.73	0.00
HYD2	83.33	132.65	40.15	0.00
HYD3	0.00	135.92	43.42	0.00
HYD4	0.00	136.24	43.74	0.00
HYD7	0.00	136.22	43.72	0.00
HYD8	0.00	136.20	43.20	0.00
HYD9	0.00	136.20	43.20	0.00
HYD5	0.00	136.21	43.71	0.00
HYD6	0.00	136.17	43.17	0.00
20	0.00	136.21	46.21	0.00

B2	0.08	135.27	42.37	0.00
A2	0.46	135.32	42.62	0.00
17	0.00	135.58	45.58	0.00
B1	0.08	135.58	42.58	0.00
A1	0.71	135.57	42.87	0.00
21	0.00	136.20	46.20	0.00
C2	0.08	136.20	43.20	0.00
22	0.00	136.18	46.18	0.00
C1	0.08	136.18	42.98	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	136.21	43.21	0.00	
13	0.00	136.29	46.29	0.00	
7	0.00	136.21	46.21	0.00	
D2	0.08	136.20	42.90	0.00	
D3	0.08	136.21	43.11	0.00	
5	0.00	136.20	45.70	0.00	
D1	0.08	136.20	42.50	0.00	
Leitrim	-115.47	137.17	0.00	0.00	Reservoir
Limebank	-53.00	138.15	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	53.00	1.08	6.57	Open
2	53.00	1.08	6.57	Open
3	-15.40	0.31	0.67	Open
4	-5.12	0.10	0.09	Open
7	-5.36	0.11	0.09	Open
8	-5.36	0.11	0.09	Open
9	-5.36	0.11	0.09	Open
10	-5.36	0.11	0.09	Open
12	115.47	2.35	27.78	Open
13	99.58	2.03	21.12	Open
14	15.79	0.32	0.70	Open
16	-68.41	1.39	10.53	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	10.52	0.21	0.33	Open
20	10.52	0.21	0.33	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	83.33	4.72	218.08	Open
29	-83.33	4.72	218.08	Open
30	68.41	1.39	10.53	Open
31	67.62	1.38	10.31	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	-10.28	0.21	0.31	Open
40	-10.36	0.21	0.32	Open
41	-10.44	0.21	0.32	Open
42	-15.88	0.32	0.70	Open
43	-15.88	0.32	0.71	Open
44	5.36	0.11	0.09	Open
45	5.28	0.11	0.09	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	5.20	0.11	0.09	Open
49	5.12	0.10	0.09	Open
50	0.08	0.00	0.00	Open

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******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
******************************************************************
```

Input File: 4101 Limebank Rd.net

Max Day + Fire, Building C1 or C2 (Hyd 5 & 6), Current PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	118.26	27.76	0.00
2	0.00	117.01	27.01	0.00
3	0.00	115.07	25.07	0.00
4	0.00	115.33	24.83	0.00
6	0.00	115.41	24.91	0.00
8	0.00	115.50	25.50	0.00
9	0.00	115.53	25.53	0.00
10	0.00	115.58	25.58	0.00
11	0.00	115.74	25.74	0.00
12	0.00	115.77	25.77	0.00
19	0.00	115.46	25.46	0.00
14	0.00	117.38	27.88	0.00
15	0.00	117.29	27.29	0.00
16	0.00	117.15	27.15	0.00
18	0.00	117.04	27.04	0.00
HYD1	0.00	117.29	24.79	0.00
HYD2	0.00	117.15	24.65	0.00
HYD3	0.00	117.04	24.54	0.00
HYD4	0.00	115.74	23.24	0.00
HYD7	0.00	115.58	23.08	0.00
HYD8	0.00	115.41	22.41	0.00
HYD9	0.00	115.33	22.33	0.00
HYD5	83.33	111.48	18.98	0.00
HYD6	83.33	113.54	20.54	0.00
20	0.00	114.97	24.97	0.00

B2	0.08	117.15	24.25	0.00
A2	0.46	117.29	24.59	0.00
17	0.00	117.10	27.10	0.00
B1	0.08	117.10	24.10	0.00
A1	0.71	117.10	24.40	0.00
21	0.00	115.01	25.01	0.00
C2	0.08	115.01	22.01	0.00
22	0.00	115.04	25.04	0.00
C1	0.08	115.04	21.84	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	114.97	21.97	0.00	
13	0.00	117.06	27.06	0.00	
7	0.00	115.48	25.48	0.00	
D2	0.08	115.41	22.11	0.00	
D3	0.08	115.48	22.38	0.00	
5	0.00	115.37	24.87	0.00	
D1	0.08	115.37	21.67	0.00	
Leitrim	-113.81	118.22	0.00	0.00	Reservoir
Limebank	-54.66	119.20	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	54.66	1.11	6.95	Open
2	54.66	1.11	6.95	Open
3	80.95	1.65	14.39	Open
4	-18.39	0.37	0.92	Open
7	-18.63	0.38	0.95	Open
8	-18.63	0.38	0.95	Open
9	-18.63	0.38	0.95	Open
10	-18.63	0.38	0.95	Open
12	113.81	2.32	27.04	Open
13	27.62	0.56	1.96	Open
14	27.16	0.55	1.90	Open
16	26.29	0.54	1.79	Open
17	83.33	4.72	218.08	Open
18	83.33	4.72	218.08	Open
19	67.55	1.38	10.29	Open
20	67.55	1.38	10.29	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	-26.29	0.54	1.79	Open
31	-27.08	0.55	1.89	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	16.02	0.33	0.72	Open
40	15.94	0.32	0.71	Open
41	15.86	0.32	0.70	Open
42	-86.19	1.76	16.16	Open
43	-86.19	1.76	16.16	Open
44	18.63	0.38	0.95	Open
45	18.55	0.38	0.94	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	18.47	0.38	0.93	Open
49	18.39	0.37	0.92	Open
50	0.08	0.00	0.00	Open

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******************************************************************
*                            E P A N E T                         *
*                    Hydraulic and Water Quality                 *
*                    Analysis for Pipe Networks                  *
*                          Version 2.2                           *
******************************************************************
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Input File: 4101 Limebank Rd.net

Max Day + Fire, Building C1 or C21 (Hyd 5 & 6), Future PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	137.21	46.71	0.00
2	0.00	135.96	45.96	0.00
3	0.00	134.02	44.02	0.00
4	0.00	134.28	43.78	0.00
6	0.00	134.36	43.86	0.00
8	0.00	134.45	44.45	0.00
9	0.00	134.48	44.48	0.00
10	0.00	134.53	44.53	0.00
11	0.00	134.69	44.69	0.00
12	0.00	134.72	44.72	0.00
19	0.00	134.41	44.41	0.00
14	0.00	136.33	46.83	0.00
15	0.00	136.24	46.24	0.00
16	0.00	136.10	46.10	0.00
18	0.00	135.99	45.99	0.00
HYD1	0.00	136.24	43.74	0.00
HYD2	0.00	136.10	43.60	0.00
HYD3	0.00	135.99	43.49	0.00
HYD4	0.00	134.69	42.19	0.00
HYD7	0.00	134.53	42.03	0.00
HYD8	0.00	134.36	41.36	0.00
HYD9	0.00	134.28	41.28	0.00
HYD5	83.33	130.43	37.93	0.00
HYD6	83.33	132.49	39.49	0.00
20	0.00	133.92	43.92	0.00

B2	0.08	136.10	43.20	0.00
A2	0.46	136.24	43.54	0.00
17	0.00	136.05	46.05	0.00
B1	0.08	136.05	43.05	0.00
A1	0.71	136.05	43.35	0.00
21	0.00	133.96	43.96	0.00
C2	0.08	133.96	40.96	0.00
22	0.00	133.99	43.99	0.00
C1	0.08	133.99	40.79	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	133.92	40.92	0.00	
13	0.00	136.01	46.01	0.00	
7	0.00	134.43	44.43	0.00	
D2	0.08	134.36	41.06	0.00	
D3	0.08	134.43	41.33	0.00	
5	0.00	134.32	43.82	0.00	
D1	0.08	134.32	40.62	0.00	
Leitrim	-113.81	137.17	0.00	0.00	Reservoir
Limebank	-54.66	138.15	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	54.66	1.11	6.95	Open
2	54.66	1.11	6.95	Open
3	80.95	1.65	14.39	Open
4	-18.39	0.37	0.92	Open
7	-18.63	0.38	0.95	Open
8	-18.63	0.38	0.95	Open
9	-18.63	0.38	0.95	Open
10	-18.63	0.38	0.95	Open
12	113.81	2.32	27.04	Open
13	27.62	0.56	1.96	Open
14	27.16	0.55	1.90	Open
16	26.29	0.54	1.79	Open
17	83.33	4.72	218.08	Open
18	83.33	4.72	218.08	Open
19	67.55	1.38	10.29	Open
20	67.55	1.38	10.29	Open
22	0.00	0.00	0.00	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	-26.29	0.54	1.79	Open
31	-27.08	0.55	1.89	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	16.02	0.33	0.72	Open
40	15.94	0.32	0.71	Open
41	15.86	0.32	0.70	Open
42	-86.19	1.76	16.16	Open
43	-86.19	1.76	16.16	Open
44	18.63	0.38	0.95	Open
45	18.55	0.38	0.94	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	18.47	0.38	0.93	Open
49	18.39	0.37	0.92	Open
50	0.08	0.00	0.00	Open

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******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                          Version 2.2                           *
******************************************************************
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Input File: 4101 Limebank Rd.net

Max Day + Fire, Building C3 (Hyd 5, 6 & 7), Current PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	118.11	27.61	0.00
2	0.00	116.67	26.67	0.00
3	0.00	114.70	24.70	0.00
4	0.00	114.23	23.73	0.00
6	0.00	114.08	23.58	0.00
8	0.00	113.92	23.92	0.00
9	0.00	113.87	23.87	0.00
10	0.00	113.78	23.78	0.00
11	0.00	113.67	23.67	0.00
12	0.00	114.01	24.01	0.00
19	0.00	113.90	23.90	0.00
14	0.00	116.95	27.45	0.00
15	0.00	116.88	26.88	0.00
16	0.00	116.77	26.77	0.00
18	0.00	116.69	26.69	0.00
HYD1	0.00	116.88	24.38	0.00
HYD2	0.00	116.77	24.27	0.00
HYD3	0.00	116.69	24.19	0.00
HYD4	95.00	112.84	20.34	0.00
HYD7	10.00	113.77	21.27	0.00
HYD8	0.00	114.08	21.08	0.00
HYD9	0.00	114.23	21.23	0.00
HYD5	95.00	109.28	16.78	0.00
HYD6	0.00	114.70	21.70	0.00
20	0.00	113.73	23.73	0.00

B2	0.08	116.77	23.87	0.00
A2	0.46	116.88	24.18	0.00
17	0.00	116.73	26.73	0.00
B1	0.08	116.73	23.73	0.00
A1	0.71	116.73	24.03	0.00
21	0.00	114.06	24.06	0.00
C2	0.08	114.06	21.06	0.00
22	0.00	114.46	24.46	0.00
C1	0.08	114.46	21.26	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	113.73	20.73	0.00	
13	0.00	116.36	26.36	0.00	
7	0.00	113.96	23.96	0.00	
D2	0.08	114.08	20.78	0.00	
D3	0.08	113.96	20.86	0.00	
5	0.00	114.15	23.65	0.00	
D1	0.08	114.15	20.45	0.00	
Leitrim	-142.67	118.22	0.00	0.00	Reservoir
Limebank	-59.14	119.20	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	59.14	1.20	8.04	Open
2	59.14	1.20	8.04	Open
3	81.57	1.66	14.59	Open
4	25.23	0.51	1.66	Open
7	24.99	0.51	1.63	Open
8	24.99	0.51	1.63	Open
9	14.99	0.31	0.63	Open
10	-80.01	1.63	14.08	Open
12	142.67	2.91	41.10	Open
13	23.76	0.48	1.49	Open
14	23.30	0.47	1.43	Open
16	22.43	0.46	1.34	Open
17	0.00	0.00	0.00	Open
18	95.00	5.38	277.99	Open
19	38.90	0.79	3.70	Open
20	38.90	0.79	3.70	Open
22	0.00	0.00	0.00	Open
23	10.00	0.57	4.30	Open

25	-95.00	5.38	278.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	-22.43	0.46	1.34	Open
31	-23.22	0.47	1.42	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	56.34	1.15	7.35	Open
40	56.26	1.15	7.34	Open
41	56.18	1.14	7.32	Open
42	-118.91	2.42	29.33	Open
43	-118.91	2.42	29.33	Open
44	-24.99	0.51	1.63	Open
45	-25.07	0.51	1.64	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	-25.15	0.51	1.65	Open
49	-25.23	0.51	1.66	Open
50	0.08	0.00	0.00	Open

```
******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                          Version 2.2                           *
******************************************************************
```

Input File: 4101 Limebank Rd.net

Max Day + Fire, Building C3 (Hyd 5, 6 & 7), Future PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	137.06	46.56	0.00
2	0.00	135.62	45.62	0.00
3	0.00	133.65	43.65	0.00
4	0.00	133.18	42.68	0.00
6	0.00	133.03	42.53	0.00
8	0.00	132.87	42.87	0.00
9	0.00	132.82	42.82	0.00
10	0.00	132.73	42.73	0.00
11	0.00	132.62	42.62	0.00
12	0.00	132.96	42.96	0.00
19	0.00	132.85	42.85	0.00
14	0.00	135.90	46.40	0.00
15	0.00	135.83	45.83	0.00
16	0.00	135.72	45.72	0.00
18	0.00	135.64	45.64	0.00
HYD1	0.00	135.83	43.33	0.00
HYD2	0.00	135.72	43.22	0.00
HYD3	0.00	135.64	43.14	0.00
HYD4	95.00	131.79	39.29	0.00
HYD7	10.00	132.72	40.22	0.00
HYD8	0.00	133.03	40.03	0.00
HYD9	0.00	133.18	40.18	0.00
HYD5	95.00	128.23	35.73	0.00
HYD6	0.00	133.65	40.65	0.00
20	0.00	132.68	42.68	0.00

B2	0.08	135.72	42.82	0.00
A2	0.46	135.83	43.13	0.00
17	0.00	135.68	45.68	0.00
B1	0.08	135.68	42.68	0.00
A1	0.71	135.68	42.98	0.00
21	0.00	133.01	43.01	0.00
C2	0.08	133.01	40.01	0.00
22	0.00	133.41	43.41	0.00
C1	0.08	133.41	40.21	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	132.68	39.68	0.00	
13	0.00	135.31	45.31	0.00	
7	0.00	132.91	42.91	0.00	
D2	0.08	133.03	39.73	0.00	
D3	0.08	132.91	39.81	0.00	
5	0.00	133.10	42.60	0.00	
D1	0.08	133.10	39.40	0.00	
Leitrim	-142.67	137.17	0.00	0.00	Reservoir
Limebank	-59.14	138.15	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	59.14	1.20	8.04	Open
2	59.14	1.20	8.04	Open
3	81.57	1.66	14.59	Open
4	25.23	0.51	1.66	Open
7	24.99	0.51	1.63	Open
8	24.99	0.51	1.63	Open
9	14.99	0.31	0.63	Open
10	-80.01	1.63	14.08	Open
12	142.67	2.91	41.10	Open
13	23.76	0.48	1.49	Open
14	23.30	0.47	1.43	Open
16	22.43	0.46	1.34	Open
17	0.00	0.00	0.00	Open
18	95.00	5.38	277.99	Open
19	38.90	0.79	3.70	Open
20	38.90	0.79	3.70	Open
22	0.00	0.00	0.00	Open
23	10.00	0.57	4.30	Open

25	-95.00	5.38	278.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	-22.43	0.46	1.34	Open
31	-23.22	0.47	1.42	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	56.34	1.15	7.35	Open
40	56.26	1.15	7.34	Open
41	56.18	1.14	7.32	Open
42	-118.91	2.42	29.33	Open
43	-118.91	2.42	29.33	Open
44	-24.99	0.51	1.63	Open
45	-25.07	0.51	1.64	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	-25.15	0.51	1.65	Open
49	-25.23	0.51	1.66	Open
50	0.08	0.00	0.00	Open

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******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
******************************************************************
```

Input File: 4101 Limebank Rd.net

Max Day + Fire, Building D1 or D2 (Hyd 8 & 9), Current PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	118.30	27.80	0.00
2	0.00	117.10	27.10	0.00
3	0.00	115.41	25.41	0.00
4	0.00	110.58	20.08	0.00
6	0.00	110.57	20.07	0.00
8	0.00	111.81	21.81	0.00
9	0.00	112.21	22.21	0.00
10	0.00	112.95	22.95	0.00
11	0.00	115.22	25.22	0.00
12	0.00	115.54	25.54	0.00
19	0.00	115.52	25.52	0.00
14	0.00	117.36	27.86	0.00
15	0.00	117.30	27.30	0.00
16	0.00	117.20	27.20	0.00
18	0.00	117.12	27.12	0.00
HYD1	0.00	117.30	24.80	0.00
HYD2	0.00	117.20	24.70	0.00
HYD3	0.00	117.12	24.62	0.00
HYD4	0.00	115.22	22.72	0.00
HYD7	0.00	112.95	20.45	0.00
HYD8	83.33	108.39	15.39	0.00
HYD9	83.33	109.71	16.71	0.00
HYD5	0.00	115.49	115.49	0.00
HYD6	0.00	115.41	22.41	0.00
20	0.00	115.49	25.49	0.00

B2	0.08	117.20	24.30	0.00
A2	0.46	117.30	24.60	0.00
17	0.00	117.16	27.16	0.00
B1	0.08	117.16	24.16	0.00
A1	0.71	117.16	24.46	0.00
21	0.00	115.46	25.46	0.00
C2	0.08	115.46	22.46	0.00
22	0.00	115.43	25.43	0.00
C1	0.08	115.43	22.23	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	115.49	22.49	0.00	
13	0.00	117.00	27.00	0.00	
7	0.00	111.48	21.48	0.00	
D2	0.08	110.57	17.27	0.00	
D3	0.08	111.48	18.38	0.00	
5	0.00	110.58	20.08	0.00	
D1	0.08	110.58	16.88	0.00	
Leitrim	-115.07	118.22	0.00	0.00	Reservoir
Limebank	-53.40	119.20	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	53.40	1.09	6.66	Open
2	53.40	1.09	6.66	Open
3	75.04	1.53	12.50	Open
4	89.28	1.82	17.25	Open
7	-77.62	1.58	13.31	Open
8	-77.62	1.58	13.31	Open
9	-77.62	1.58	13.31	Open
10	-77.62	1.58	13.31	Open
12	115.07	2.34	27.60	Open
13	22.96	0.47	1.40	Open
14	22.50	0.46	1.34	Open
16	21.63	0.44	1.25	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	14.48	0.30	0.59	Open
20	14.48	0.30	0.59	Open
22	83.33	4.72	218.08	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	-83.33	4.72	218.08	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	-21.63	0.44	1.25	Open
31	-22.42	0.46	1.33	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
39	-14.24	0.29	0.58	Open
40	-14.32	0.29	0.58	Open
41	-14.40	0.29	0.59	Open
42	-92.10	1.88	18.27	Open
43	-92.10	1.88	18.27	Open
44	77.62	1.58	13.31	Open
45	77.54	1.58	13.29	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	-5.87	0.12	0.11	Open
49	-5.95	0.12	0.11	Open
50	0.08	0.00	0.00	Open

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******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
******************************************************************
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Input File: 4101 Limebank Rd.net

Max Day + Fire, Building D1 or D2 (Hyd 8 & 9), Future PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	137.25	46.75	0.00
2	0.00	136.05	46.05	0.00
3	0.00	134.36	44.36	0.00
4	0.00	129.53	39.03	0.00
6	0.00	129.52	39.02	0.00
8	0.00	130.76	40.76	0.00
9	0.00	131.16	41.16	0.00
10	0.00	131.90	41.90	0.00
11	0.00	134.17	44.17	0.00
12	0.00	134.49	44.49	0.00
19	0.00	134.47	44.47	0.00
14	0.00	136.31	46.81	0.00
15	0.00	136.25	46.25	0.00
16	0.00	136.15	46.15	0.00
18	0.00	136.07	46.07	0.00
HYD1	0.00	136.25	43.75	0.00
HYD2	0.00	136.15	43.65	0.00
HYD3	0.00	136.07	43.57	0.00
HYD4	0.00	134.17	41.67	0.00
HYD7	0.00	131.90	39.40	0.00
HYD8	83.33	127.34	34.34	0.00
HYD9	83.33	128.66	35.66	0.00
HYD5	0.00	134.44	41.94	0.00
HYD6	0.00	134.36	41.36	0.00
20	0.00	134.44	44.44	0.00

B2	0.08	136.15	43.25	0.00
A2	0.46	136.25	43.55	0.00
17	0.00	136.11	46.11	0.00
B1	0.08	136.11	43.11	0.00
A1	0.71	136.11	43.41	0.00
21	0.00	134.41	44.41	0.00
C2	0.08	134.41	41.41	0.00
22	0.00	134.38	44.38	0.00
C1	0.08	134.38	41.18	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	134.44	41.44	0.00	
13	0.00	135.95	45.95	0.00	
7	0.00	130.43	40.43	0.00	
D2	0.08	129.52	36.22	0.00	
D3	0.08	130.43	37.33	0.00	
5	0.00	129.53	39.03	0.00	
D1	0.08	129.53	35.83	0.00	
Leitrim	-115.07	137.17	0.00	0.00	Reservoir
Limebank	-53.40	138.15	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	53.40	1.09	6.66	Open
2	53.40	1.09	6.66	Open
3	75.04	1.53	12.50	Open
4	89.28	1.82	17.25	Open
7	-77.62	1.58	13.31	Open
8	-77.62	1.58	13.31	Open
9	-77.62	1.58	13.31	Open
10	-77.62	1.58	13.31	Open
12	115.07	2.34	27.60	Open
13	22.96	0.47	1.40	Open
14	22.50	0.46	1.34	Open
16	21.63	0.44	1.25	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	14.48	0.30	0.59	Open
20	14.48	0.30	0.59	Open
22	83.33	4.72	218.08	Open
23	0.00	0.00	0.00	Open

25	0.00	0.00	0.00	Open
26	-83.33	4.72	218.08	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	-21.63	0.44	1.25	Open
31	-22.42	0.46	1.33	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
39	-14.24	0.29	0.58	Open
40	-14.32	0.29	0.58	Open
41	-14.40	0.29	0.59	Open
42	-92.10	1.88	18.27	Open
43	-92.10	1.88	18.27	Open
44	77.62	1.58	13.31	Open
45	77.54	1.58	13.29	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	-5.87	0.12	0.11	Open
49	-5.95	0.12	0.11	Open
50	0.08	0.00	0.00	Open

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******************************************************************
*                          E P A N E T                           *
*                  Hydraulic and Water Quality                   *
*                  Analysis for Pipe Networks                    *
*                        Version 2.2                             *
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Input File: 4101 Limebank Rd.net

Max Day + Fire, Building D3 (Hyd 7 & 8), Current PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	118.20	27.70	0.00
2	0.00	116.86	26.86	0.00
3	0.00	114.93	24.93	0.00
4	0.00	111.31	20.81	0.00
6	0.00	110.10	19.60	0.00
8	0.00	110.16	20.16	0.00
9	0.00	110.18	20.18	0.00
10	0.00	110.22	20.22	0.00
11	0.00	114.33	24.33	0.00
12	0.00	114.92	24.92	0.00
19	0.00	114.92	24.92	0.00
14	0.00	117.17	27.67	0.00
15	0.00	117.09	27.09	0.00
16	0.00	116.98	26.98	0.00
18	0.00	116.88	26.88	0.00
HYD1	0.00	117.09	24.59	0.00
HYD2	0.00	116.98	24.48	0.00
HYD3	0.00	116.88	24.38	0.00
HYD4	0.00	114.33	21.83	0.00
HYD7	91.67	109.44	16.94	0.00
HYD8	91.67	107.50	14.50	0.00
HYD9	0.00	111.31	111.31	0.00
HYD5	0.00	114.92	114.92	0.00
HYD6	0.00	114.93	21.93	0.00
20	0.00	114.92	24.92	0.00

B2	0.08	116.98	24.08	0.00
A2	0.46	117.09	24.39	0.00
17	0.00	116.93	26.93	0.00
B1	0.08	116.93	23.93	0.00
A1	0.71	116.93	24.23	0.00
21	0.00	114.92	24.92	0.00
C2	0.08	114.92	21.92	0.00
22	0.00	114.93	24.93	0.00
C1	0.08	114.93	21.73	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	114.92	21.92	0.00	
13	0.00	116.72	26.72	0.00	
7	0.00	110.14	20.14	0.00	
D2	0.08	110.10	16.80	0.00	
D3	0.08	110.14	17.04	0.00	
5	0.00	110.70	20.20	0.00	
D1	0.08	110.70	17.00	0.00	
Leitrim	-128.45	118.22	0.00	0.00	Reservoir
Limebank	-56.70	119.20	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	56.70	1.15	7.44	Open
2	56.70	1.15	7.44	Open
3	80.64	1.64	14.29	Open
4	76.37	1.56	12.92	Open
7	-15.54	0.32	0.68	Open
8	-15.54	0.32	0.68	Open
9	-107.21	2.18	24.21	Open
10	-107.21	2.18	24.21	Open
12	128.45	2.62	33.84	Open
13	25.27	0.51	1.67	Open
14	24.81	0.51	1.61	Open
16	23.94	0.49	1.51	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	-4.03	0.08	0.06	Open
20	-4.03	0.08	0.06	Open
22	91.67	5.19	260.22	Open
23	91.67	5.19	260.22	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	-23.94	0.49	1.51	Open
31	-24.73	0.50	1.60	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	4.27	0.09	0.06	Open
40	4.19	0.09	0.06	Open
41	4.11	0.08	0.06	Open
42	-103.18	2.10	22.55	Open
43	-103.18	2.10	22.55	Open
44	15.54	0.32	0.68	Open
45	15.46	0.31	0.67	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	-76.29	1.55	12.89	Open
49	-76.37	1.56	12.92	Open
50	0.08	0.00	0.00	Open

```
******************************************************************
*                            E P A N E T                         *
*                     Hydraulic and Water Quality                *
*                     Analysis for Pipe Networks                 *
*                          Version 2.2                           *
******************************************************************
```

Input File: 4101 Limebank Rd.net

Max Day + Fire, Building D3 (Hyd 7 & 8), Future PZ

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
1	Limebank	1	135	250
2	1	2	180	250
3	2	3	135	250
4	3	4	280	250
7	8	9	30	250
8	9	10	56	250
9	10	11	170	250
10	11	12	24	250
12	Leitrim	14	31	250
13	14	15	47	250
14	15	16	72	250
16	18	2	15	250
17	3	HYD6	7	150
18	20	HYD5	16	150
19	12	19	30	250
20	19	20	47	250
22	6	HYD8	10	150
23	10	HYD7	3	150
25	HYD4	11	3	150
26	HYD9	4	4	150
27	18	HYD3	12	150
28	16	HYD2	12	150
29	HYD1	15	5	150
30	18	17	33	250
31	17	16	30	250
32	17	B1	9	150
33	17	A1	14	150
34	16	B2	9	150
35	A2	15	14	150
36	20	C3	15	150
37	21	C2	15	150
38	22	C1	15	150
39	3	22	32	250

40	22	21	54	250
41	21	20	46	250
42	12	13	80	250
43	13	14	20	250

Link - Node Table: (continued)

Link ID	Start Node	End Node	Length m	Diameter mm
44	8	7	25	250
45	7	6	68	250
46	7	D3	12	150
47	6	D2	10	150
48	6	5	47	250
49	5	4	47	250
50	5	D1	18	150

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality
1	0.00	137.15	46.65	0.00
2	0.00	135.81	45.81	0.00
3	0.00	133.88	43.88	0.00
4	0.00	130.26	39.76	0.00
6	0.00	129.05	38.55	0.00
8	0.00	129.11	39.11	0.00
9	0.00	129.13	39.13	0.00
10	0.00	129.17	39.17	0.00
11	0.00	133.28	43.28	0.00
12	0.00	133.87	43.87	0.00
19	0.00	133.87	43.87	0.00
14	0.00	136.12	46.62	0.00
15	0.00	136.04	46.04	0.00
16	0.00	135.93	45.93	0.00
18	0.00	135.83	45.83	0.00
HYD1	0.00	136.04	43.54	0.00
HYD2	0.00	135.93	43.43	0.00
HYD3	0.00	135.83	43.33	0.00
HYD4	0.00	133.28	40.78	0.00
HYD7	91.67	128.39	35.89	0.00
HYD8	91.67	126.45	33.45	0.00
HYD9	0.00	130.26	37.26	0.00
HYD5	0.00	133.87	41.37	0.00
HYD6	0.00	133.88	40.88	0.00
20	0.00	133.87	43.87	0.00

B2	0.08	135.93	43.03	0.00
A2	0.46	136.04	43.34	0.00
17	0.00	135.88	45.88	0.00
B1	0.08	135.88	42.88	0.00
A1	0.71	135.88	43.18	0.00
21	0.00	133.87	43.87	0.00
C2	0.08	133.87	40.87	0.00
22	0.00	133.88	43.88	0.00
C1	0.08	133.88	40.68	0.00

Node Results: (continued)

Node ID	Demand LPS	Head m	Pressure m	Quality	
C3	0.08	133.87	40.87	0.00	
13	0.00	135.67	45.67	0.00	
7	0.00	129.09	39.09	0.00	
D2	0.08	129.05	35.75	0.00	
D3	0.08	129.09	35.99	0.00	
5	0.00	129.65	39.15	0.00	
D1	0.08	129.65	35.95	0.00	
Leitrim	-128.45	137.17	0.00	0.00	Reservoir
Limebank	-56.70	138.15	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status
1	56.70	1.15	7.44	Open
2	56.70	1.15	7.44	Open
3	80.64	1.64	14.29	Open
4	76.37	1.56	12.92	Open
7	-15.54	0.32	0.68	Open
8	-15.54	0.32	0.68	Open
9	-107.21	2.18	24.21	Open
10	-107.21	2.18	24.21	Open
12	128.45	2.62	33.84	Open
13	25.27	0.51	1.67	Open
14	24.81	0.51	1.61	Open
16	23.94	0.49	1.51	Open
17	0.00	0.00	0.00	Open
18	0.00	0.00	0.00	Open
19	-4.03	0.08	0.06	Open
20	-4.03	0.08	0.06	Open
22	91.67	5.19	260.22	Open
23	91.67	5.19	260.22	Open

25	0.00	0.00	0.00	Open
26	0.00	0.00	0.00	Open
27	0.00	0.00	0.00	Open
28	0.00	0.00	0.00	Open
29	0.00	0.00	0.00	Open
30	-23.94	0.49	1.51	Open
31	-24.73	0.50	1.60	Open
32	0.08	0.00	0.00	Open
33	0.71	0.04	0.03	Open
34	0.08	0.00	0.00	Open
35	-0.46	0.03	0.01	Open
36	0.08	0.00	0.00	Open
37	0.08	0.00	0.00	Open
38	0.08	0.00	0.00	Open

Link Results: (continued)

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
39	4.27	0.09	0.06	Open
40	4.19	0.09	0.06	Open
41	4.11	0.08	0.06	Open
42	-103.18	2.10	22.55	Open
43	-103.18	2.10	22.55	Open
44	15.54	0.32	0.68	Open
45	15.46	0.31	0.67	Open
46	0.08	0.00	0.00	Open
47	0.08	0.00	0.00	Open
48	-76.29	1.55	12.89	Open
49	-76.37	1.56	12.92	Open
50	0.08	0.00	0.00	Open

Appendix D

SANITARY SEWER DESIGN SHEET
for
4101 LIMEBANK RD., CITY OF OTTAWA

Robinson
Land Development

LOCATION							COMMERCIAL / INSTITUTIONAL FLOW				CUM. EXTRAN. FLOW (L/s)	CUM. PEAK DESIGN FLOW (L/s)	PIPE									
	FROM MH	TO MH	DRAINAGE AREA (ha)	CUM. DRAINAGE AREA (ha)	INFILTRATION AREA (ha)	CUM. INFILTRATION AREA (ha)	POPULATION	CUM. POPULATION	AVG FLOW (L/s)	PEAK FLOW (L/s)			LENGTH (m)	DIAMETER (mm)	UPSTREAM MH INV. (m)	DNSTREAM MH INV. (m)	SLOPE (%)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)	EXCESS CAPACITY (L/s)	PERCENT FULL
UPSTREAM SITES	142	141	21.00	21.00	44.69	44.69			8.51	8.51	14.75	**23.25**	680	299	92.47	90.09	0.35%	56.76	0.81	0.77	33.50	41%
UPSTREAM SITES	141	140A		21.00		44.69			8.51	8.51	14.75	**23.25**	390	299	90.09	88.72	0.35%	56.76	0.81	0.77	33.50	41%
D1, D2	SANMH 211	SANMH 210	2.42	2.42	2.42	2.42	70	70	0.11	0.11	0.80	**0.91**	83.9	251	90.35	90.10	0.30%	32.95	0.67	0.29	32.04	3%
D3	SANMH 210	SANMH 209	1.23	3.65	1.23	3.65	35	105	0.17	0.17	1.20	**1.37**	80.6	251	90.08	89.84	0.30%	32.95	0.67	0.33	31.58	4%
SITE	SANMH 209	SANMH 208	0.73	4.38	0.73	4.38	0	105	0.17	0.17	1.44	**1.61**	79.5	251	89.78	89.54	0.30%	32.95	0.67	0.34	31.34	5%
SITE	SANMH 208	SANMH 205	0.15	4.52	0.15	4.52	0	105	0.17	0.17	1.49	**1.66**	60.4	251	89.52	89.34	0.30%	32.95	0.67	0.34	31.29	5%
C1, C2	SANMH 208	SANMH 206	1.87	1.87	1.87	1.87	70	70	0.11	0.11	0.62	**0.73**	85.8	251	89.91	89.65	0.30%	32.95	0.67	0.27	32.22	2%
C3	SANMH 206	SANMH 205	1.01	2.89	1.01	2.89	35	105	0.17	0.17	0.95	**1.12**	82.0	251	89.63	89.38	0.30%	32.95	0.67	0.31	31.83	3%
SITE	SANMH 205	SANMH 204	0.08	7.49	0.08	7.49	0	210	0.33	0.33	2.47	**2.80**	33.2	251	89.32	89.22	0.30%	32.95	0.67	0.40	30.15	9%
SITE	SANMH 204	SANMH 201	0.52	8.00	0.52	8.00	0	210	0.33	0.33	2.64	**2.97**	101.4	251	89.20	88.90	0.30%	32.95	0.67	0.41	29.98	9%
A1, A2, B1, B2	SANMH 203	SANMH 202	4.37	4.37	4.37	4.37	565	565	0.90	0.90	1.44	**2.34**	95.9	251	89.37	89.08	0.30%	32.95	0.67	0.38	30.61	7%
SITE	SANMH 202	SANMH 201	1.37	5.75	1.37	5.75	0	565	0.90	0.90	1.90	**2.79**	61.9	251	89.06	88.87	0.30%	32.95	0.67	0.40	30.16	8%
SITE	SANMH 201	SANMH 140A	0.05	13.80	0.05	13.80	0	775	1.23	1.23	4.55	**5.78**	23.2	251	88.84	88.77	0.30%	32.95	0.67	0.50	27.17	18%
LEITRIM	SANMH 140A	SANMH 140		34.80		58.49		775	9.74	9.74	19.30	**29.04**	119.0	366	88.65	88.47	0.15%	63.71	0.61	0.59	34.67	46%
LEITRIM	SANMH 140	SANMH 122A		34.80		58.49		775	9.74	9.74	19.30	**29.04**	119.5	366	88.47	88.29	0.15%	63.71	0.61	0.59	34.67	46%

DESIGN PARAMETERS

Employment Flow =	137	L/cap/day	per ISSU for w	per ISSU for water
Employment Flow =	35000	L/ha/day	per ISSU	per ISSU
Maximum Residential Peak Factor =	4.0			
Employment Peak Factor =	1.0	if >20% area	per ISSU	per ISSU
Employment Peak Factor =	1.5	if <20% area	per ISSU	per ISSU
Extraneous Flow =	0.33	L/s/ha		
Minimum Full Flow Velocity =	0.6	m/s		
Maximum Full Flow Velocity =	3.0	m/s		

Note: employee count based on site plan: average 15 employees per office unit, 35 per warehouse unit
Note: See Scoped Master Servicing Report for details on upstream flows

2024-10-01

Appendix E

Stephen McCaughey

From: Adams, Reed <reed.adams@ottawa.ca>
Sent: June 26, 2024 9:49 AM
To: Stephen McCaughey
Subject: Re: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

As always, I appreciate your patience on this. I'm good with the approach you detailed in your previous email, however I would want to see you compare the post-development runoff volume increase to the estimated 101% runoff increase detailed in the phase 1 MSS in the scoped MSS.

There will also be an area specific development charge (ASDC) implemented on all of the lands tributary to Mosquito Creek in order to pay for the restoration project for the creek itself mentioned in both the MDP and the phase 1 MSS. The timeline of the development of this plan is 2-3 years, so details of actual cost that each landowner will have to pay do not need to be discussed in the scoped MSS, however the ASDC itself needs to be mentioned.

Since 4101 Limebank is of course tributary to Mosquito Creek but will likely be site plan approved before the restoration plan is developed, we will need to include some sort of mechanism with the site plan to ensure that the landowners pay their share of the ASDC. We're still exploring our options here, but I'll let you know when we have something.

Let me know if you have any questions.

Thanks,

Reed

From: Stephen McCaughey <smccaughey@rcii.com>
Sent: Tuesday, June 25, 2024 4:05 PM
To: Adams, Reed <reed.adams@ottawa.ca>
Subject: RE: 4101 Limebank - Phase 2 Comments

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Hi Reed,

I just wanted to touch base if there were any updates regarding expected LIDs.

Also, have you received any word from Trans National Pipeline regarding the existing pipe(s) in the easement through the site?

Thank you,

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Adams, Reed <reed.adams@ottawa.ca>
Sent: Wednesday, June 19, 2024 2:26 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Chris Collins <ccollins@rcii.com>; Tyler Yakichuk <yakichuk@fotenn.com>; Nadia Thaonguyen Nguyen-Dong <ntnguyendong@groupemontoni.com>; Sharif, Golam <sharif.sharif@ottawa.ca>
Subject: Re: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

Thanks for your email. For Geomorphix's validation, we'd only need a memo from them confirming whether MC stabilization works are required to be completed before 4101 Limebank moves forward, no need for an updated report/addendum.

Abiding by the 159.72 L/s release rate as identified in the MSS with the required storage volume to detain runoff up to the 100-yr storm also sounds good. I'll get back to you shortly on the approach/measures we're looking to have you implement in lieu of LIDs. There are still a few things I need to confirm internally.

Thanks again,

Reed

From: Stephen McCaughey <smccaughey@rcii.com>
Sent: Tuesday, June 18, 2024 3:11 PM
To: Adams, Reed <reed.adams@ottawa.ca>
Cc: Chris Collins <ccollins@rcii.com>; Sevigny, John <John.Sevigny@ottawa.ca>; Tyler Yakichuk <yakichuk@fotenn.com>; Nadia Thaonguyen Nguyen-Dong <ntnguyendong@groupemontoni.com>
Subject: RE: 4101 Limebank - Phase 2 Comments

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Hi Reed,

Thanks for the information. We're looking for greater clarification on the expectations for the water budget and LID measures for the site, and to validate our intended approach prior to advancement of the design:

- The Master Drainage Plan and Phase 1 Master Servicing Study for Riverside South Community both had developed the overarching stormwater criteria and water budget based on LID measures, with the

attached the assumed LID measures for the Employment Lands (including the subject site of 4101 Limebank).
- These employment land LIDs are explicitly infiltration/exfiltration-based in design.
- Accordingly, the updated model in the Phase 1 Master Servicing Study estimated there would be a runoff volume increase of 101% without LIDs and 61% with the noted LIDs compared to pre-development runoff.
- The comments and clarifications received by the City for the Phase 2 Scope Master Servicing Study in support of the proposed 4101 Limebank development noted that a pre-development water budget would be needed as a measure against post-development runoff volumes.
- Also, the City noted that exfiltration/infiltration-based LIDs will not be permitted in clay soils.
- Therefore, it is our position that the runoff volume targets associated with the Phase 1 Master Servicing Study no longer apply since the LID measures assumed cannot be implemented.
- Further to the soils constraint for LID implementation, the geotechnical investigation indicated shallow groundwater table/perched water and provided a 1m grade raise restriction. This condition further limits the ability to retain runoff volumes on-site. Additionally, due to Ottawa International Airport requirements no standing water is permitted for longer than 48 hours, therefore no wet pond can be implemented.

In moving forward the following would be our understanding of the next steps:
- Generate the pre-development water budget for comparison of post-development runoff volumes. The post-development runoff volumes will be calculated and compared but will not be associated with the Phase 1 Master Servicing Study runoff volumes.
- Abide by the peak runoff rate of 159.72 L/s for the subject site defined by the Phase 1 Master Servicing Study, with the required storage volume to provide detention of the runoff up to the 100yr storm without any exfiltration/infiltration. The Phase 1 Master Servicing Study assumed a typical 600 m^3/ha storage requirements.
- We are seeking the validation of Geomorphix, who previously did the fluvial geomorphology for the MDP and Phase 1 MSS, to confirm whether any erosion control recommendations are required. Is the expectation just a written recommendation based on the existing study or is an update or addendum to the fluvial geomorphology report required for this Phase 2 Scoped Master Servicing Study?

Thank you,

Stephen McCaughey, P.Eng.| Project Engineer
210-350 Palladium Drive, Ottawa ON, K2V 1A8
O: 613-592-6060 x160 | smccaughey@rcii.com | www.rcii.com

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From: Adams, Reed <reed.adams@ottawa.ca>
Sent: Wednesday, June 12, 2024 2:27 PM
To: Stephen McCaughey <smccaughey@rcii.com>
Cc: Chris Kimmerly <chris.kimmerly@exp.com>; Daniel Wall <daniel.wall@exp.com>; Chris Collins <ccollins@rcii.com>; Sharif, Golam <sharif.sharif@ottawa.ca>
Subject: Re: 4101 Limebank - Phase 2 Comments

"CAUTION: External Sender"
Hi Stephen,

	Impervious	Pervious	Gravel
C	0.9	0.2	0.8

Runoff Coefficient Calculations - On-Site

Drainage Area ID	Impervious Area (ha)	Pervious Area (ha)	Gravel Area (ha)	Total Area (ha)	C	C (100 YR)	Percent Impervious (%)
A1	0.595			0.60	0.90	1.00	100.0
A2	0.387			0.39	0.90	1.00	100.0
B1	0.539			0.54	0.90	1.00	100.0
B2	0.541			0.54	0.90	1.00	100.0
C1	0.539			0.54	0.90	1.00	100.0
C2	0.539			0.54	0.90	1.00	100.0
C3	0.649			0.65	0.90	1.00	100.0
D1	0.540			0.54	0.90	1.00	100.0
D2	0.539			0.54	0.90	1.00	100.0
D3	0.559			0.56	0.90	1.00	100.0
1	0.008	1.440		1.45	0.20	0.25	0.6
2	0.066	0.021		0.09	0.73	0.91	75.9
3	0.245	0.004		0.25	0.89	1.00	98.2
4	0.203	0.004		0.21	0.89	1.00	98.1
5	0.065	0.010		0.08	0.81	1.00	87.2
6	0.227			0.23	0.90	1.00	100.0
7	0.154			0.15	0.90	1.00	100.0
8	0.107	0.017		0.12	0.81	1.00	86.5
9	0.244	0.005		0.25	0.89	1.00	98.2
10	0.065	0.066		0.13	0.55	0.68	49.6
11	0.089			0.09	0.90	1.00	100.0
12	0.096	0.015		0.11	0.80	1.00	86.3
13	0.071	0.018		0.09	0.76	0.95	80.1
14	0.041	0.933		0.97	0.23	0.29	4.2
15	0.198	0.009		0.21	0.87	1.00	95.7
16	0.312	0.004		0.32	0.89	1.00	98.8
17	0.375	0.004		0.38	0.89	1.00	98.9
18	0.060			0.06	0.90	1.00	100.0
19	0.086	0.115		0.20	0.50	0.63	42.9
20	0.035	0.088		0.12	0.40	0.50	28.4
21	0.468			0.47	0.90	1.00	100.0
22	0.858			0.86	0.90	1.00	100.0
23	0.058			0.06	0.90	1.00	100.0
24	0.321	0.202		0.52	0.63	0.79	61.4
25	0.114	0.044		0.16	0.70	0.88	72.0
26	0.107	0.027		0.13	0.76	0.95	80.1
27	0.061	0.030		0.09	0.67	0.84	66.9
28	0.091	0.042		0.13	0.68	0.85	68.2
TOTAL	**10.25**	**3.10**	**0.00**	**13.35**	**0.74**	**0.92**	**76.8**

Runoff Coefficient Calculations - Off-Site

Drainage Area ID	Impervious Area (ha)	Pervious Area (ha)	Gravel Area (ha)	Total Area (ha)	C	C (100 YR)	Percent Impervious (%)
OFF1	0.031	0.077		0.11	0.40	0.50	28.9
OFF2	0.049	0.101		0.15	0.43	0.53	32.5
OFF3	0.090	0.228		0.32	0.40	0.50	28.2
TOTAL	**0.17**	**0.41**	**0.00**	**0.58**	**0.41**	**0.51**	**29.4**

Robinson Consultants

Off-Site Runoff

OFF1

Given:

Area (ha) =	0.11
C =	0.40
C (50 YR) =	0.48
C (100 YR) =	0.50

Return Period	Time of Concentration (min)	Intensity[*1], i (mm/hr)	Flow[*2], Q (L/s)
2 Year	10	76.8	9.28
5 Year	10	104.2	12.58
50 Year	10	161.5	23.40
100 Year	10	178.6	26.95

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method (Q = 2.78CiA).

OFF2

Given:

Area (ha) =	0.15
C =	0.43
C (50 YR) =	0.51
C (100 YR) =	0.53

Return Period	Time of Concentration (min)	Intensity[*1], i (mm/hr)	Flow[*2], Q (L/s)
2 Year	10	76.8	13.68
5 Year	10	104.2	18.56
50 Year	10	161.5	34.52
100 Year	10	178.6	39.77

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method (Q = 2.78CiA).

OFF3

Given:

Area (ha) =	0.32
C =	0.40
C (50 YR) =	0.48
C (100 YR) =	0.50

Return Period	Time of Concentration (min)	Intensity[*1], i (mm/hr)	Flow[*2], Q (L/s)
2 Year	10	76.8	26.97
5 Year	10	104.2	36.59
50 Year	10	161.5	68.04
100 Year	10	178.6	78.38

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method (Q = 2.78CiA).

OFF2 - Hardscape to CB 102

Given:

Area (ha) =	0.05	(impervious area of OFF2)
C =	0.90	
C (50 YR) =	1.00	
C (100 YR) =	1.00	

Return Period	Time of Concentration (min)	Intensity[*1], i (mm/hr)	Flow[*2], Q (L/s)
2 Year	10	76.8	9.36
5 Year	10	104.2	12.70
50 Year	10	161.5	19.67
100 Year	10	178.6	21.76

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method (Q = 2.78CiA).

OFF3 - Hardscape to CB 101

Given:

Area (ha) =	0.09	(impervious area of OFF3)
C =	0.90	
C (50 YR) =	1.00	
C (100 YR) =	1.00	

Return Period	Time of Concentration (min)	Intensity[*1], i (mm/hr)	Flow[*2], Q (L/s)
2 Year	10	76.8	17.22
5 Year	10	104.2	23.36
50 Year	10	161.5	36.20
100 Year	10	178.6	40.03

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Flow calculated using the Rational Method (Q = 2.78CiA).

STORM SEWER DESIGN SHEET
for
4101 LIMEBANK ROAD, OTTAWA

Robinson Consultants

LOCATION			2 YEAR				FLOW				PROPOSED SEWER								
DRAINAGE AREA	FROM MH	TO MH	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	TIME OF CONC. (min)	2 YEAR RAINFALL INTENSITY (mm/hr)	2 YEAR PEAK FLOW (L/s)	CUMULATIVE CONTROLLED PEAK FLOW (L/s)	PIPE DIA. (mm)	UPSTREAM INV.	DNSTREAM INV.	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
7	CB07	MH106	0.15	0.90	0.39	0.39	10.00	76.81	29.59	29.6	299	90.85	90.77	0.34	22.9	55.94	0.80	0.48	53%
6	MH106	CBMH105	0.23	0.90	0.57	0.95	10.48	75.01	71.51	71.5	366	90.70	90.50	0.26	76.4	83.88	0.80	1.60	85%
5	CBMH105	MH101	0.08	0.81	0.17	1.12	12.08	69.66	78.17	78.2	366	90.44	90.31	0.29	45.1	88.58	0.84	0.89	88%
4	CB04	MH104	0.21	0.89	0.51	0.51	10.00	76.81	39.18	39.2	299	90.97	90.79	0.34	53.6	55.94	0.80	1.12	70%
3	MH104	CBMH103	0.25	0.89	0.61	1.12	11.12	72.75	81.81	81.8	366	90.72	90.45	0.31	86.0	91.59	0.87	1.65	89%
	CBMH103	CBMH102	0.00	0.00	0.00	1.12	12.77	67.59	76.01	76.0	457	90.36	90.29	0.20	36.7	133.00	0.81	0.75	57%
2	CBMH102	MH101	0.09	0.73	0.18	1.30	13.52	65.49	85.23	85.2	457	90.23	90.22	0.20	3.3	133.00	0.81	0.07	64%
	MH101	POND	0.00	0.00	0.00	2.42	13.59	65.31	158.28	158.3	533	90.14	90.08	0.18	31.3	190.16	0.85	0.61	83%
A1	BLDG	PIPE	0.60	0.90	1.49	1.49	10.00	76.81	114.34	*23.8*	201	91.06	90.88	2.00	9.0	47.05	1.48	0.10	51%
B1	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	76.81	103.58	*21.6*	201	91.16	90.88	2.00	14.2	47.05	1.48	0.16	46%
13	CB12	CBMH111	0.09	0.76	0.19	3.03	10.00	76.81	232.37	*59.8*	366	90.71	90.61	0.26	38.6	83.88	0.80	0.81	71%
B2	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	76.81	103.96	*21.6*	201	91.02	90.75	2.00	13.6	47.05	1.48	0.15	46%
A2	BLDG	PIPE	0.39	0.90	0.97	0.97	10.00	76.81	74.37	*15.5*	201	90.75	90.64	2.00	5.6	47.05	1.48	0.06	33%
12	CBMH111	CBMH110	0.11	0.80	0.25	5.60	10.81	73.84	413.17	*114.7*	457	90.52	90.41	0.22	51.2	139.49	0.85	1.00	82%
11	CBMH110	MH108	0.09	0.90	0.22	5.82	11.81	70.49	410.12	*128.9*	533	90.33	90.26	0.16	46.0	179.28	0.80	0.95	72%
10	CB11	CBMH109	0.13	0.55	0.20	0.20	10.00	76.81	15.19	15.2	299	90.87	90.70	0.34	49.7	55.94	0.80	1.04	27%
9	CBMH109	MH108	0.25	0.89	0.61	0.81	11.04	73.03	59.12	59.1	366	90.63	90.43	0.26	77.5	83.88	0.80	1.62	70%
	MH108	MH107	0.00	0.00	0.00	6.63	12.76	67.60	448.05	*181.8*	533	90.26	90.23	0.24	12.2	219.58	0.98	0.21	83%
8	CB08	MH107	0.12	0.81	0.28	0.28	10.00	76.81	21.32	21.3	251	90.55	90.51	0.45	9.1	40.36	0.82	0.19	53%
	MH107	POND	0.00	0.00	0.00	6.91	12.97	67.01	462.73	*199.5*	610	90.15	90.13	0.14	11.2	240.34	0.82	0.23	83%
1	POND	DITCH	1.45	0.20	0.82	10.15	14.20	63.72	646.70	*400.5*	700	89.91	89.90	0.10	10.5	525	1.36	0.30	76%

STORM SEWER DESIGN SHEET
for
4101 LIMEBANK ROAD, OTTAWA

Robinson Consultants

LOCATION			2 YEAR				FLOW				PROPOSED SEWER								
DRAINAGE AREA	FROM MH	TO MH	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	TIME OF CONC. (min)	2 YEAR RAINFALL INTENSITY (mm/hr)	2 YEAR PEAK FLOW (L/s)	CUMULATIVE CONTROLLED PEAK FLOW (L/s)	PIPE DIA. (mm)	UPSTREAM INV.	DNSTREAM INV.	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
28	CB37	MH124	0.13	0.68	0.25	0.25	10.00	76.81	19.24	19.2	251	91.74	91.64	0.45	22.7	40.36	0.82	0.46	48%
D1	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	76.81	103.77	*21.6*	201	91.88	91.47	2.00	20.3	47.05	1.48	0.23	46%
27	MH124	MH123	0.09	0.67	0.17	1.77	10.46	75.07	132.92	*53.1*	366	91.52	91.44	0.26	32.1	83.88	0.80	0.67	63%
D2	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	76.81	103.58	*21.6*	201	91.76	91.50	2.00	13.1	47.05	1.48	0.15	46%
26	MH123	MH122	0.13	0.76	0.28	3.40	11.13	72.71	247.23	*94.1*	457	91.35	91.21	0.20	68.4	133.00	0.81	1.41	71%
D3	BLDG	PIPE	0.56	0.90	1.40	1.40	10.00	76.81	107.42	*22.4*	201	91.65	91.34	2.00	15.3	47.05	1.48	0.17	48%
25	MH122	MH121	0.16	0.70	0.31	5.11	12.54	68.25	348.67	*134.5*	533	91.13	91.02	0.16	69.1	179.28	0.80	1.43	75%
	MH121	MH120	0.00	0.00	0.00	5.11	13.97	64.30	328.46	*130.5*	610	90.94	90.92	0.14	14.1	240.34	0.82	0.29	54%
24	MH120	MH117	0.52	0.63	0.92	6.02	14.26	63.57	382.95	*187.9*	686	90.84	90.70	0.12	115.6	304.32	0.82	2.34	62%
23	CB28	MH119	0.06	0.90	0.15	0.15	10.00	76.81	11.15	11.1	251	91.55	91.38	0.80	21.7	53.81	1.09	0.33	21%
22	MH119	MH118	0.86	0.90	2.15	2.29	10.33	75.55	173.15	173.2	610	91.02	90.87	0.14	110.0	240.34	0.82	2.23	72%
21	MH118	MH117	0.47	0.90	1.17	3.46	12.56	68.19	236.14	236.1	686	90.79	90.70	0.12	78.7	304.32	0.82	1.59	78%
20	MH117	MH116	0.12	0.40	0.14	9.62	16.60	58.23	560.37	*387.2*	762	90.62	90.53	0.16	56.7	465.03	1.02	0.93	83%
19	MH116	MH115	0.20	0.50	0.28	9.90	17.53	56.38	558.34	*392.8*	762	90.53	90.42	0.16	66.9	465.03	1.02	1.09	84%
	MH115	POND	0.00	0.00	0.00	9.90	18.62	54.36	538.33	*381.1*	762	90.39	90.33	0.16	40.1	465.03	1.02	0.66	82%
18	CB 18	MH114	0.06	0.90	0.15	0.15	10.00	76.81	11.53	11.5	201	91.31	91.08	0.80	28.4	29.76	0.94	0.50	39%
C1	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	76.81	103.58	*21.6*	201	91.46	91.01	2.00	22.5	47.05	1.48	0.25	46%
17	MH114	MH113	0.38	0.89	0.94	2.44	10.50	74.92	182.74	*103.3*	457	90.82	90.72	0.20	50.3	133.00	0.81	1.03	78%
C2	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	76.81	103.58	*21.6*	201	91.27	90.82	2.00	22.5	47.05	1.48	0.25	46%
C3	BLDG	PIPE	0.65	0.90	1.62	1.62	10.00	76.81	124.72	*26.0*	201	91.20	90.75	2.00	22.5	47.05	1.48	0.25	55%
16	MH113	MH112	0.32	0.89	0.78	6.19	11.54	71.36	442.07	*202.8*	610	90.57	90.43	0.14	98.1	240.34	0.82	1.99	84%
15	CB13	MH112	0.21	0.87	0.50	0.50	10.00	76.81	38.45	38.4	201	90.90	90.84	2.00	3.0	47.05	1.48	0.03	82%
	MH112	POND	0.00	0.00	0.00	6.70	13.53	65.48	438.40	*224.6*	686	90.35	90.33	0.12	20.5	304.32	0.82	0.41	74%
14	POND	DITCH	0.97	0.23	0.62	17.22	19.28	53.23	916.53	*603.0*	800	90.25	90.23	0.10	22.0	700	1.39	0.26	86%
			13.35																

Design Parameters

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Peak flows calculated using the Rational Method.
3. Manning's roughness coefficient = 0.013
4. Full flow velocity: MIN 0.8 m/s; MAX 3.0 m/s (City of Ottawa Sewer Design Guidelines, v.2012)
5. Building roofs are controlled, assumed at a typical 40 L/s/ha
6. Italicized "Cumulative Controlled Peak Flow " indicates the equivalent peak flow from the contributing roofs are assumed at the controlled flow rate
7. "Percent Full" based on "Cumulative Controlled Peak Flow"
8. Refer to Culvert Sizing Sheets for capacity of Pond outlets

STORM SEWER DESIGN SHEET
for
4101 LIMEBANK RD, OTTAWA

Robinson Consultants

LOCATION			100 YEAR				FLOW				PROPOSED SEWER								
DRAINAGE AREA	FROM MH	TO MH	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	TIME OF CONC. (min)	5 YEAR RAINFALL INTENSITY (mm/hr)	5 YEAR PEAK FLOW (L/s)	CUMULATIVE CONTROLLED PEAK FLOW (L/s)	PIPE DIA. (mm)	UPSTREAM INV.	DNSTREAM INV.	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
7	CB07	MH106	0.15	0.90	0.39	0.39	10.00	104.19	40.15	40.1	299	90.85	90.77	0.34	22.9	55.94	0.80	0.48	72%
6	MH106	CBMH105	0.23	0.90	0.57	0.95	10.48	101.73	96.97	97.0	366	90.70	90.50	0.26	76.4	83.88	0.80	1.60	116%
5	CBMH105	MH101	0.08	0.81	0.17	1.12	12.08	94.37	105.91	105.9	366	90.44	90.31	0.29	45.1	88.58	0.84	0.89	120%
4	CB04	MH104	0.21	0.89	0.51	0.51	10.00	104.19	53.15	53.2	299	90.97	90.79	0.34	53.6	55.94	0.80	1.12	95%
3	MH104	CBMH103	0.25	0.89	0.61	1.12	11.12	98.62	110.91	110.9	366	90.72	90.45	0.31	86.0	91.59	0.87	1.65	121%
	CBMH103	CBMH102	0.00	0.00	0.00	1.12	12.77	91.54	102.94	102.9	457	90.36	90.29	0.20	36.7	133.00	0.81	0.75	77%
2	CBMH102	MH101	0.09	0.73	0.18	1.30	13.52	88.66	115.38	115.4	457	90.23	90.22	0.20	3.3	133.00	0.81	0.07	87%
	MH101	POND	0.00	0.00	0.00	2.42	13.59	88.41	214.27	214.3	533	90.14	90.08	0.18	31.3	190.16	0.85	0.61	113%
A1	BLDG	PIPE	0.60	0.90	1.49	1.49	10.00	104.19	155.11	*23.8*	201	91.06	90.88	2.00	9.0	47.05	1.48	0.10	51%
B1	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	104.19	140.51	*21.6*	201	91.16	90.88	2.00	14.2	47.05	1.48	0.16	46%
13	CB12	CBMH111	0.09	0.76	0.19	3.03	10.00	104.19	315.24	*65.0*	366	90.71	90.61	0.26	38.6	83.88	0.80	0.81	77%
B2	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	104.19	141.03	*21.6*	201	91.02	90.75	2.00	13.6	47.05	1.48	0.15	46%
A2	BLDG	PIPE	0.39	0.90	0.97	0.97	10.00	104.19	100.89	*15.5*	201	90.75	90.64	2.00	5.6	47.05	1.48	0.06	33%
12	CBMH111	CBMH110	0.11	0.80	0.25	5.60	10.81	100.12	560.20	*126.2*	457	90.52	90.41	0.22	51.2	139.49	0.85	1.00	90%
11	CBMH110	MH108	0.09	0.90	0.22	5.82	11.81	95.51	555.71	*145.4*	533	90.33	90.26	0.16	46.0	179.28	0.80	0.95	81%
10	CB11	CBMH109	0.13	0.55	0.20	0.20	10.00	104.19	20.61	20.6	299	90.87	90.70	0.34	49.7	55.94	0.80	1.04	37%
9	CBMH109	MH108	0.25	0.89	0.61	0.81	11.04	99.00	80.15	80.1	366	90.63	90.43	0.26	77.5	83.88	0.80	1.62	96%
	MH108	MH107	0.00	0.00	0.00	6.63	12.76	91.55	606.78	*216.9*	533	90.26	90.23	0.24	12.2	219.58	0.98	0.21	99%
8	CB08	MH107	0.12	0.81	0.28	0.28	10.00	104.19	28.92	28.9	251	90.55	90.51	0.45	9.1	40.36	0.82	0.19	72%
	MH107	POND	0.00	0.00	0.00	6.91	12.97	90.74	626.60	*240.9*	610	90.15	90.13	0.14	11.2	240.34	0.82	0.23	100%
1	POND	DITCH	1.45	0.20	0.82	10.15	14.20	86.23	875.16	*512.8*	700	89.91	89.90	0.10	10.5	525	1.36	0.30	98%

STORM SEWER DESIGN SHEET
for
4101 LIMEBANK RD, OTTAWA

Robinson Consultants

LOCATION			100 YEAR				FLOW				PROPOSED SEWER								
DRAINAGE AREA	FROM MH	TO MH	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	TIME OF CONC. (min)	5 YEAR RAINFALL INTENSITY (mm/hr)	5 YEAR PEAK FLOW (L/s)	CUMULATIVE CONTROLLED PEAK FLOW (L/s)	PIPE DIA. (mm)	UPSTREAM INV.	DNSTREAM INV.	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
28	CB37	MH124	0.13	0.68	0.25	0.25	10.00	104.19	26.10	26.1	251	91.74	91.64	0.45	22.7	40.36	0.82	0.46	65%
D1	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	104.19	140.77	*21.6*	201	91.88	91.47	2.00	20.3	47.05	1.48	0.23	46%
27	MH124	MH123	0.09	0.67	0.17	1.77	10.46	101.80	180.26	*64.3*	366	91.52	91.44	0.26	32.1	83.88	0.80	0.67	77%
D2	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	104.19	140.51	*21.6*	201	91.76	91.50	2.00	13.1	47.05	1.48	0.15	46%
26	MH123	MH122	0.13	0.76	0.28	3.40	11.13	98.56	335.14	*112.2*	457	91.35	91.21	0.20	68.4	133.00	0.81	1.41	84%
D3	BLDG	PIPE	0.56	0.90	1.40	1.40	10.00	104.19	145.73	*22.4*	201	91.65	91.34	2.00	15.3	47.05	1.48	0.17	48%
25	MH122	MH121	0.16	0.70	0.31	5.11	12.54	92.45	472.25	*158.9*	533	91.13	91.02	0.16	69.1	179.28	0.80	1.43	89%
	MH121	MH120	0.00	0.00	0.00	5.11	13.97	87.02	444.55	*153.4*	610	90.94	90.92	0.14	14.1	240.34	0.82	0.29	64%
24	MH120	MH117	0.52	0.63	0.92	6.02	14.26	86.03	518.22	*231.2*	686	90.84	90.70	0.12	115.6	304.32	0.82	2.34	76%
23	CB28	MH119	0.06	0.90	0.15	0.15	10.00	104.19	15.12	15.1	251	91.55	91.38	0.80	21.7	53.81	1.09	0.33	28%
22	MH119	MH118	0.86	0.90	2.15	2.29	10.33	102.47	234.84	234.8	610	91.02	90.87	0.14	110.0	240.34	0.82	2.23	98%
21	MH118	MH117	0.47	0.90	1.17	3.46	12.56	92.36	319.83	319.8	686	90.79	90.70	0.12	78.7	304.32	0.82	1.59	105%
20	MH117	MH116	0.12	0.40	0.14	9.62	16.60	78.72	757.54	*500.4*	762	90.62	90.53	0.16	56.7	465.03	1.02	0.93	108%
19	MH116	MH115	0.20	0.50	0.28	9.90	17.53	76.19	754.51	*507.8*	762	90.53	90.42	0.16	66.9	465.03	1.02	1.09	109%
	MH115	POND	0.00	0.00	0.00	9.90	18.62	73.43	727.18	*491.7*	762	90.39	90.33	0.16	40.1	465.03	1.02	0.66	106%
18	CB 18	MH114	0.06	0.90	0.15	0.15	10.00	104.19	15.64	15.6	201	91.31	91.08	0.80	28.4	29.76	0.94	0.50	53%
C1	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	104.19	140.51	*21.6*	201	91.46	91.01	2.00	22.5	47.05	1.48	0.25	46%
17	MH114	MH113	0.38	0.89	0.94	2.44	10.50	101.60	247.82	*132.4*	457	90.82	90.72	0.20	50.3	133.00	0.81	1.03	100%
C2	BLDG	PIPE	0.54	0.90	1.35	1.35	10.00	104.19	140.51	*21.6*	201	91.27	90.82	2.00	22.5	47.05	1.48	0.25	46%
C3	BLDG	PIPE	0.65	0.90	1.62	1.62	10.00	104.19	169.19	*26.0*	201	91.20	90.75	2.00	22.5	47.05	1.48	0.25	55%
16	MH113	MH112	0.32	0.89	0.78	6.19	11.54	96.71	599.11	*250.3*	610	90.57	90.43	0.14	98.1	240.34	0.82	1.99	104%
15	CB13	MH112	0.21	0.87	0.50	0.50	10.00	104.19	52.16	52.2	201	90.90	90.84	2.00	3.0	47.05	1.48	0.03	111%
	MH112	POND	0.00	0.00	0.00	6.70	13.53	88.64	593.48	*279.5*	686	90.35	90.33	0.12	20.5	304.32	0.82	0.41	92%
14	POND	DITCH	0.97	0.23	0.62	17.22	19.28	71.88	1237.77	*767.2*	800	90.25	90.23	0.10	22.0	700	1.39	0.26	110%
			13.35																

Design Parameters

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. Peak flows calculated using the Rational Method.
3. Manning's roughness coefficient = 0.013
4. Full flow velocity: MIN 0.8 m/s; MAX 3.0 m/s (City of Ottawa Sewer Design Guidelines, v.2012)
5. Building roofs are controlled, assumed at a typical 40 L/s/ha
6. Italicized "Cumulative Controlled Peak Flow " indicates the equivalent peak flow from the contributing roofs are assumed at the controlled flow rate
7. "Percent Full" based on "Cumulative Controlled Peak Flow"
8. Refer to Culvert Sizing Sheets for capacity of Pond outlets

STORM SEWER DESIGN SHEET
for
4101 LIMEBANK RD, OTTAWA

Robinson Consultants

LOCATION			100 YEAR				FLOW				PROPOSED SEWER								
DRAINAGE AREA	FROM MH	TO MH	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	TIME OF CONC. (min)	100 YEAR RAINFALL INTENSITY (mm/hr)	100 YEAR PEAK FLOW (L/s)	CUMULATIVE CONTROLLED PEAK FLOW (L/s)	PIPE DIA. (mm)	UPSTREAM INV.	DNSTREAM INV.	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
7	CB07	MH106	0.15	1.00	0.43	0.43	10.00	178.56	76.44	76.4	299	90.85	90.77	0.34	22.9	55.94	0.80	0.48	137%
6	MH106	CBMH105	0.23	1.00	0.63	1.06	10.48	174.30	184.61	184.6	366	90.70	90.50	0.26	76.4	83.88	0.80	1.60	220%
5	CBMH105	MH101	0.08	1.00	0.21	1.27	12.08	161.57	204.82	204.8	366	90.44	90.31	0.29	45.1	88.58	0.84	0.89	231%
4	CB04	MH104	0.21	1.00	0.58	0.58	10.00	178.56	102.75	102.8	299	90.97	90.79	0.34	53.6	55.94	0.80	1.12	184%
3	MH104	CBMH103	0.25	1.00	0.69	1.27	11.12	168.92	214.14	214.1	366	90.72	90.45	0.31	86.0	91.59	0.87	1.65	234%
	CBMH103	CBMH102	0.00	0.00	0.00	1.27	12.77	156.68	198.62	198.6	457	90.36	90.29	0.20	36.7	133.00	0.81	0.75	149%
2	CBMH102	MH101	0.09	0.91	0.22	1.49	13.52	151.70	225.83	225.8	457	90.23	90.22	0.20	3.3	133.00	0.81	0.07	170%
	MH101	POND	0.00	0.00	0.00	2.76	13.59	151.27	416.95	417.0	533	90.14	90.08	0.18	31.3	190.16	0.85	0.61	219%
A1	BLDG	PIPE	0.60	1.00	1.65	1.65	10.00	178.56	295.35	*23.8*	201	91.06	90.88	2.00	9.0	47.05	1.48	0.10	51%
B1	BLDG	PIPE	0.54	1.00	1.50	1.50	10.00	178.56	267.56	*21.6*	201	91.16	90.88	2.00	14.2	47.05	1.48	0.16	46%
13	CB12	CBMH111	0.09	0.95	0.24	3.39	10.00	178.56	604.92	*87.4*	366	90.71	90.61	0.26	38.6	83.88	0.80	0.81	104%
B2	BLDG	PIPE	0.54	1.00	1.50	1.50	10.00	178.56	268.55	*21.6*	201	91.02	90.75	2.00	13.6	47.05	1.48	0.15	46%
A2	BLDG	PIPE	0.39	1.00	1.08	1.08	10.00	178.56	192.10	*15.5*	201	90.75	90.64	2.00	5.6	47.05	1.48	0.06	33%
12	CBMH111	CBMH110	0.11	1.00	0.31	6.28	10.81	171.50	1076.40	*175.8*	457	90.52	90.41	0.22	51.2	139.49	0.85	1.00	126%
11	CBMH110	MH108	0.09	1.00	0.25	6.52	11.81	163.55	1066.92	*211.9*	533	90.33	90.26	0.16	46.0	179.28	0.80	0.95	118%
10	CB11	CBMH109	0.13	0.68	0.25	0.25	10.00	178.56	44.15	44.1	299	90.87	90.70	0.34	49.7	55.94	0.80	1.04	79%
9	CBMH109	MH108	0.25	1.00	0.69	0.94	11.04	169.58	158.85	158.8	366	90.63	90.43	0.26	77.5	83.88	0.80	1.62	189%
	MH108	MH107	0.00	0.00	0.00	7.46	12.76	156.70	1169.03	*353.3*	533	90.26	90.23	0.24	12.2	219.58	0.98	0.21	161%
8	CB08	MH107	0.12	1.00	0.34	0.34	10.00	178.56	61.55	61.6	251	90.55	90.51	0.45	9.1	40.36	0.82	0.19	153%
	MH107	POND	0.00	0.00	0.00	7.81	12.97	155.30	1212.13	*404.4*	610	90.15	90.13	0.14	11.2	240.34	0.82	0.23	168%
1	POND	DITCH	1.45	0.25	1.03	11.59	14.20	147.50	1709.15	*946.1*	700	89.91	89.90	0.10	10.5	525	1.36	0.30	180%

STORM SEWER DESIGN SHEET
for
4101 LIMEBANK RD, OTTAWA

Robinson Consultants

LOCATION			100 YEAR				FLOW				PROPOSED SEWER								
DRAINAGE AREA	FROM MH	TO MH	AREA (ha)	C	INDIV. 2.78AC	ACCUM. 2.78AC	TIME OF CONC. (min)	100 YEAR RAINFALL INTENSITY (mm/hr)	100 YEAR PEAK FLOW (L/s)	CUMULATIVE CONTROLLED PEAK FLOW (L/s)	PIPE DIA. (mm)	UPSTREAM INV.	DNSTREAM INV.	GRADE (%)	LENGTH (m)	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min)	PERCENT FULL
28	CB37	MH124	0.13	0.85	0.31	0.31	10.00	178.56	55.90	55.9	251	91.74	91.64	0.45	22.7	40.36	0.82	0.46	139%
D1	BLDG	PIPE	0.54	1.00	1.50	1.50	10.00	178.56	268.05	*21.6*	201	91.88	91.47	2.00	20.3	47.05	1.48	0.23	46%
27	MH124	MH123	0.09	0.84	0.21	2.03	10.46	174.43	353.33	*113.1*	366	91.52	91.44	0.26	32.1	83.88	0.80	0.67	135%
D2	BLDG	PIPE	0.54	1.00	1.50	1.50	10.00	178.56	267.56	*21.6*	201	91.76	91.50	2.00	13.1	47.05	1.48	0.15	46%
26	MH123	MH122	0.13	0.95	0.35	3.88	11.13	168.81	654.23	*191.0*	457	91.35	91.21	0.20	68.4	133.00	0.81	1.41	144%
D3	BLDG	PIPE	0.56	1.00	1.55	1.55	10.00	178.56	277.48	*22.4*	201	91.65	91.34	2.00	15.3	47.05	1.48	0.17	48%
25	MH122	MH121	0.16	0.88	0.39	5.82	12.54	158.25	920.40	*265.3*	533	91.13	91.02	0.16	69.1	179.28	0.80	1.43	148%
	MH121	MH120	0.00	0.00	0.00	5.82	13.97	148.88	865.92	*253.5*	610	90.94	90.92	0.14	14.1	240.34	0.82	0.29	105%
24	MH120	MH117	0.52	0.79	1.14	6.96	14.26	147.16	1024.33	*419.7*	686	90.84	90.70	0.12	115.6	304.32	0.82	2.34	138%
23	CB28	MH119	0.06	1.00	0.16	0.16	10.00	178.56	28.79	28.8	251	91.55	91.38	0.80	21.7	53.81	1.09	0.33	54%
22	MH119	MH118	0.86	1.00	2.39	2.55	10.33	175.57	447.10	447.1	610	91.02	90.87	0.14	110.0	240.34	0.82	2.23	186%
21	MH118	MH117	0.47	1.00	1.30	3.85	12.56	158.10	608.30	608.3	686	90.79	90.70	0.12	78.7	304.32	0.82	1.59	200%
20	MH117	MH116	0.12	0.50	0.17	10.98	16.60	134.55	1477.18	*930.0*	762	90.62	90.53	0.16	56.7	465.03	1.02	0.93	200%
19	MH116	MH115	0.20	0.63	0.35	11.33	17.53	130.19	1474.81	*947.5*	762	90.53	90.42	0.16	66.9	465.03	1.02	1.09	204%
	MH115	POND	0.00	0.00	0.00	11.33	18.62	125.43	1420.91	*915.3*	762	90.39	90.33	0.16	40.1	465.03	1.02	0.66	197%
18	CB 18	MH114	0.06	1.00	0.17	0.17	10.00	178.56	29.78	29.8	201	91.31	91.08	0.80	28.4	29.76	0.94	0.50	100%
C1	BLDG	PIPE	0.54	1.00	1.50	1.50	10.00	178.56	267.56	*21.6*	201	91.46	91.01	2.00	22.5	47.05	1.48	0.25	46%
17	MH114	MH113	0.38	1.00	1.05	2.72	10.50	174.07	473.28	*234.0*	457	90.82	90.72	0.20	50.3	133.00	0.81	1.03	176%
C2	BLDG	PIPE	0.54	1.00	1.50	1.50	10.00	178.56	267.56	*21.6*	201	91.27	90.82	2.00	22.5	47.05	1.48	0.25	46%
C3	BLDG	PIPE	0.65	1.00	1.80	1.80	10.00	178.56	322.16	*26.0*	201	91.20	90.75	2.00	22.5	47.05	1.48	0.25	55%
16	MH113	MH112	0.32	1.00	0.88	6.90	11.54	165.62	1142.77	*416.7*	610	90.57	90.43	0.14	98.1	240.34	0.82	1.99	173%
15	CB13	MH112	0.21	1.00	0.58	0.58	10.00	178.56	102.75	102.8	201	90.90	90.84	2.00	3.0	47.05	1.48	0.03	218%
	MH112	POND	0.00	0.00	0.00	7.48	13.53	151.67	1133.80	*474.7*	686	90.35	90.33	0.12	20.5	304.32	0.82	0.41	156%
14	POND	DITCH	0.97	0.29	0.78	19.58	19.28	122.76	2403.68	*1389.9*	800	90.25	90.23	0.10	22.0	700	1.39	0.26	199%
			13.35																

Design Parameters

Notes:
1. Rainfall intensity calculated using City of Ottawa IDF curve equations.
2. C (100yr) = C + 25% (Max. 1.0)
3. Peak flows calculated using the Rational Method.
3. Manning's roughness coefficient = 0.013
5. Full flow velocity: MIN 0.8 m/s; MAX 3.0 m/s (City of Ottawa Sewer Design Guidelines, v.2012)
6. Building roofs are controlled, assumed at a typical 40 L/s/ha
7. Italicized "Cumulative Controlled Peak Flow " indicates the equivalent peak flow from the contributing roofs are assumed at the controlled flow rate
8. "Percent Full" based on "Controlled Peak Flow"
9. Refer to Culvert Sizing Sheets for capacity of Pond outlets

Robinson Consultants

Surface Storage Volume Calculations

Drainage Area = **Bldg A1 (2yr)**

2.78* AC = 1.49

Max Depth = 0.15

Ponding Area (m2) = 5950

Max Available Storage (m3) = 297.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	15	61.8	92.0	23.8	68.2	61.3	0.7
	20	52.0	77.5	23.8	53.7	64.4	0.8
	25	**45.2**	**67.2**	**23.8**	**43.4**	**65.2**	**0.8**
	30	40.0	59.6	23.8	35.8	64.5	0.8
	35	36.1	53.7	23.8	29.9	62.8	0.7
	40	32.9	48.9	23.8	25.1	60.3	0.7

*Controlled flow assumed based on 40 L/s/ha; @ 0.60ha = 23.8 L/s

Drainage Area = **Bldg A2 (2yr)**

2.78* AC = 0.97

Max Depth = 0.15

Ponding Area (m2) = 3870

Max Available Storage (m3) = 193.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	15	61.8	59.8	15.5	44.3	39.9	0.7
	20	52.0	50.4	15.5	34.9	41.9	0.8
	25	**45.2**	**43.7**	**15.5**	**28.3**	**42.4**	**0.8**
	30	40.0	38.8	15.5	23.3	41.9	0.8
	35	36.1	34.9	15.5	19.4	40.8	0.7
	40	32.9	31.8	15.5	16.3	39.2	0.7

*Controlled flow assumed based on 40 L/s/ha; @ 0.39ha = 15.5 L/s

Drainage Area = **Bldg A1 (100yr)**

2.78* AC = 1.65

Max Depth = 0.15

Ponding Area (m2) = 5950

Max Available Storage (m3) = 297.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	50	64.0	105.8	23.8	82.0	246.0	2.9
	55	59.6	98.6	23.8	74.8	246.9	2.9
	60	**55.9**	**92.5**	**23.8**	**68.7**	**247.2**	**2.9**
	65	52.6	87.1	23.8	63.3	246.8	2.9
	70	49.8	82.4	23.8	58.6	245.9	2.9
	75	47.3	78.2	23.8	54.4	244.6	2.9

*Controlled flow assumed based on 40 L/s/ha; @ 0.60ha = 23.8 L/s

Drainage Area = **Bldg A2 (100yr)**

2.78* AC = 1.08

Max Depth = 0.15

Ponding Area (m2) = 3870

Max Available Storage (m3) = 193.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	50	64.0	68.8	15.5	53.3	160.0	2.9
	55	59.6	64.1	15.5	48.7	160.6	2.9
	60	**55.9**	**60.1**	**15.5**	**44.7**	**160.8**	**2.9**
	65	52.6	56.6	15.5	41.2	160.5	2.9
	70	49.8	53.6	15.5	38.1	160.0	2.9
	75	47.3	50.8	15.5	35.4	159.1	2.9

*Controlled flow assumed based on 40 L/s/ha; @ 0.39ha = 15.5 L/s

Drainage Area = **Bldg B1 (2yr)** Ponding Area (m2) = 5390

2.78* AC = 1.35 Max Depth = 0.15 Max Available Storage (m3) = 269.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	15	61.8	83.3	21.6	61.7	55.6	0.7
	20	52.0	70.2	21.6	48.6	58.3	0.8
	25	**45.2**	**60.9**	**21.6**	**39.4**	**59.0**	**0.8**
	30	40.0	54.0	21.6	32.4	58.4	0.8
	35	36.1	48.6	21.6	27.1	56.8	0.7
	40	32.9	44.3	21.6	22.8	54.6	0.7

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg B2 (2yr)** Ponding Area (m2) = 5410

2.78* AC = 1.35 Max Depth = 0.15 Max Available Storage (m3) = 270.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	15	61.8	83.6	21.6	62.0	55.8	0.7
	20	52.0	70.4	21.6	48.8	58.5	0.8
	25	**45.2**	**61.1**	**21.6**	**39.5**	**59.2**	**0.8**
	30	40.0	54.2	21.6	32.6	58.6	0.8
	35	36.1	48.8	21.6	27.2	57.1	0.7
	40	32.9	44.5	21.6	22.8	54.8	0.7

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg B1 (100yr)** Ponding Area (m2) = 5390

2.78* AC = 1.50 Max Depth = 0.15 Max Available Storage (m3) = 269.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	50	64.0	95.8	21.6	74.3	222.8	2.9
	55	59.6	89.3	21.6	67.8	223.7	2.9
	60	**55.9**	**83.8**	**21.6**	**62.2**	**223.9**	**2.9**
	65	52.6	78.9	21.6	57.3	223.6	2.9
	70	49.8	74.6	21.6	53.0	222.8	2.9
	75	47.3	70.8	21.6	49.2	221.6	2.9

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg B2 (100yr)** Ponding Area (m2) = 5410

2.78* AC = 1.50 Max Depth = 0.15 Max Available Storage (m3) = 270.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	50	64.0	96.2	21.6	74.5	223.6	2.9
	55	59.6	89.7	21.6	68.0	224.5	2.9
	60	**55.9**	**84.1**	**21.6**	**62.4**	**224.7**	**2.9**
	65	52.6	79.2	21.6	57.5	224.4	2.9
	70	49.8	74.9	21.6	53.2	223.6	2.9
	75	47.3	71.1	21.6	49.4	222.4	2.9

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg C1 (2yr)** Ponding Area (m2) = 5390

2.78* AC = 1.35 Max Depth = 0.15 Max Available Storage (m3) = 269.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	15	61.8	83.3	21.6	61.7	55.6	0.7
	20	52.0	70.2	21.6	48.6	58.3	0.8
	25	**45.2**	**60.9**	**21.6**	**39.4**	**59.0**	**0.8**
	30	40.0	54.0	21.6	32.4	58.4	0.8
	35	36.1	48.6	21.6	27.1	56.8	0.7
	40	32.9	44.3	21.6	22.8	54.6	0.7

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg C2 (2yr)** Ponding Area (m2) = 5410

2.78* AC = 1.35 Max Depth = 0.15 Max Available Storage (m3) = 270.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	15	61.8	83.3	21.6	61.7	55.5	0.7
	20	52.0	70.2	21.6	48.5	58.2	0.7
	25	**45.2**	**60.9**	**21.6**	**39.3**	**58.9**	**0.8**
	30	40.0	54.0	21.6	32.4	58.3	0.7
	35	36.1	48.6	21.6	27.0	56.7	0.7
	40	32.9	44.3	21.6	22.7	54.4	0.7

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.5 L/s

Drainage Area = **Bldg C3 (2yr)** Ponding Area (m2) = 6490

2.78* AC = 1.62 Max Depth = 0.15 Max Available Storage (m3) = 324.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	15	61.8	100.3	26.0	74.3	66.9	0.7
	20	52.0	84.5	26.0	58.5	70.2	0.8
	25	**45.2**	**73.3**	**26.0**	**47.4**	**71.1**	**0.8**
	30	40.0	65.0	26.0	39.1	70.3	0.8
	35	36.1	58.6	26.0	32.6	68.4	0.7
	40	32.9	53.4	26.0	27.4	65.8	0.7

*Controlled flow assumed based on 40 L/s/ha; @ 0.65ha = 26.0 L/s

Drainage Area = **Bldg C1 (100yr)** Ponding Area (m2) = 5390

2.78* AC = 1.50 Max Depth = 0.15 Max Available Storage (m3) = 269.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	50	64.0	95.8	21.6	74.3	222.8	2.9
	55	59.6	89.3	21.6	67.8	223.7	2.9
	60	**55.9**	**83.8**	**21.6**	**62.2**	**223.9**	**2.9**
	65	52.6	78.9	21.6	57.3	223.6	2.9
	70	49.8	74.6	21.6	53.0	222.8	2.9
	75	47.3	70.8	21.6	49.2	221.6	2.9

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg C2 (100yr)** Ponding Area (m2) = 5410

2.78* AC = 1.50 Max Depth = 0.15 Max Available Storage (m3) = 270.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	50	64.0	95.8	21.6	74.2	222.6	2.9
	55	59.6	89.3	21.6	67.7	223.4	2.9
	60	**55.9**	**83.8**	**21.6**	**62.1**	**223.6**	**2.9**
	65	52.6	78.9	21.6	57.2	223.3	2.9
	70	49.8	74.6	21.6	53.0	222.5	2.9
	75	47.3	70.8	21.6	49.2	221.3	2.8

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg C3 (100yr)** Ponding Area (m2) = 6490

2.78* AC = 1.80 Max Depth = 0.15 Max Available Storage (m3) = 324.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	50	64.0	115.4	26.0	89.4	268.3	2.9
	55	59.6	107.6	26.0	81.6	269.3	2.9
	60	**55.9**	**100.8**	**26.0**	**74.9**	**269.6**	**2.9**
	65	52.6	95.0	26.0	69.0	269.2	2.9
	70	49.8	89.8	26.0	63.9	268.3	2.9
	75	47.3	85.3	26.0	59.3	266.8	2.9

*Controlled flow assumed based on 40 L/s/ha; @ 0.65ha = 26.0 L/s

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Drainage Area = **Bldg D1 (2yr)** | Ponding Area (m2) = 5400

2.78* AC = 1.35 | Max Depth = 0.15 | Max Available Storage (m3) = 270.0

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	15	61.8	83.5	21.6	61.9	55.7	0.7
	20	52.0	70.3	21.6	48.7	58.4	0.8
	25	**45.2**	**61.0**	**21.6**	**39.4**	**59.1**	**0.8**
	30	40.0	54.1	21.6	32.5	58.5	0.8
	35	36.1	48.7	21.6	27.1	56.9	0.7
	40	32.9	44.4	21.6	22.8	54.7	0.7

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg D2 (2yr)** | Ponding Area (m2) = 5390

2.78* AC = 1.35 | Max Depth = 0.15 | Max Available Storage (m3) = 269.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	15	61.8	83.3	21.6	61.7	55.6	0.7
	20	52.0	70.2	21.6	48.6	58.3	0.8
	25	**45.2**	**60.9**	**21.6**	**39.4**	**59.0**	**0.8**
	30	40.0	54.0	21.6	32.4	58.4	0.8
	35	36.1	48.6	21.6	27.1	56.8	0.7
	40	32.9	44.3	21.6	22.8	54.6	0.7

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg D3 (2yr)** | Ponding Area (m2) = 5590

2.78* AC = 1.40 | Max Depth = 0.15 | Max Available Storage (m3) = 279.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	15	61.8	86.4	22.4	64.0	57.6	0.7
	20	52.0	72.8	22.4	50.4	60.5	0.8
	25	**45.2**	**63.2**	**22.4**	**40.8**	**61.2**	**0.8**
	30	40.0	56.0	22.4	33.6	60.6	0.8
	35	36.1	50.4	22.4	28.1	59.0	0.7
	40	32.9	46.0	22.4	23.6	56.7	0.7

*Controlled flow assumed based on 40 L/s/ha; @ 0.56ha = 22.4 L/s

Drainage Area = **Bldg D1 (100yr)** | Ponding Area (m2) = 5400

2.78* AC = 1.50 | Max Depth = 0.15 | Max Available Storage (m3) = 270.0

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	50	64.0	96.0	21.6	74.4	223.2	2.9
	55	59.6	89.5	21.6	67.9	224.1	2.9
	60	**55.9**	**83.9**	**21.6**	**62.3**	**224.3**	**2.9**
	65	52.6	79.0	21.6	57.4	224.0	2.9
	70	49.8	74.7	21.6	53.1	223.2	2.9
	75	47.3	70.9	21.6	49.3	222.0	2.9

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg D2 (100yr)** | Ponding Area (m2) = 5390

2.78* AC = 1.50 | Max Depth = 0.15 | Max Available Storage (m3) = 269.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	50	64.0	95.8	21.6	74.3	222.8	2.9
	55	59.6	89.3	21.6	67.8	223.7	2.9
	60	**55.9**	**83.6**	**21.6**	**62.2**	**223.9**	**2.9**
	65	52.6	78.9	21.6	57.3	223.6	2.9
	70	49.8	74.6	21.6	53.0	222.8	2.9
	75	47.3	70.8	21.6	49.2	221.6	2.9

*Controlled flow assumed based on 40 L/s/ha; @ 0.54ha = 21.6 L/s

Drainage Area = **Bldg D3 (100yr)** | Ponding Area (m2) = 5590

2.78* AC = 1.55 | Max Depth = 0.15 | Max Available Storage (m3) = 279.5

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	50	64.0	99.4	22.4	77.0	231.1	2.9
	55	59.6	92.7	22.4	70.3	232.0	2.9
	60	**55.9**	**86.9**	**22.4**	**64.5**	**232.2**	**2.9**
	65	52.6	81.8	22.4	59.5	231.9	2.9
	70	49.8	77.4	22.4	55.0	231.1	2.9
	75	47.3	73.4	22.4	51.1	229.8	2.9

*Controlled flow assumed based on 40 L/s/ha; @ 0.56ha = 22.4 L/s

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Drainage Area =	**1-13 (2yr)**	Base El. (m)	90.03	Ponding Area (m2) =	4320
2.78* AC =	10.15	2yr Ponding El. (m)	90.25	Max Available Storage (m3) =	971.7
		Average Width (m)	52.7	**Average Velocity (m/s) =**	**0.002**

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	190	10.2	103.4	20.8	82.6	941.1	12.6
	195	10.0	101.3	20.8	80.5	941.5	12.6
	200	**9.8**	**99.3**	**20.8**	**78.5**	**941.7**	**12.6**
	205	9.6	97.4	20.8	76.6	941.7	12.6
	210	9.4	95.6	20.8	74.7	941.7	12.6
	215	9.2	93.8	20.8	73.0	941.5	12.6

*Controlled flow for storage calculation at 50% max rate for average flow rate. See ICD Sizing sheet
*Inflow includes controlled flow from building roof drains (A1, A2, B1, B2)

Drainage Area =	**1-13 (5yr)**	Base El. (m)	90.03	Ponding Area (m2) =	4320
2.78* AC =	10.15	5yr Ponding El. (m)	90.34	Max Available Storage (m3) =	1381.6
		Average Width (m)	52.7	**Average Velocity (m/s) =**	**0.001**

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	230	11.7	118.6	23.4	95.1	1313.0	15.6
	235	11.5	116.6	23.4	93.1	1313.3	15.6
	240	**11.3**	**114.6**	**23.4**	**91.2**	**1313.4**	**15.6**
	245	11.1	112.8	23.4	89.3	1313.4	15.6
	250	10.9	111.0	23.4	87.6	1313.3	15.6
	255	10.8	109.2	23.4	85.8	1313.0	15.6

*Controlled flow for storage calculation at 50% max rate for average flow rate. See ICD Sizing sheet
*Inflow includes controlled flow from building roof drains (A1, A2, B1, B2)

Drainage Area =	**1-13 (100yr)**	Ditch 100yr HGL (m)	90.58	Ponding Area (m2) =	4320
2.78* AC =	11.59	100yr Ponding El. (m)	91.20	Max Available Storage (m3) =	2847.9
		Average Width (m)	52.7	**Average Velocity (m/s) =**	**0.001**

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	390	12.9	149.0	28.1	120.9	2829.6	27.9
	395	12.7	147.5	28.1	119.4	2829.7	27.9
	400	**12.6**	**146.0**	**28.1**	**117.9**	**2829.8**	**27.9**
	405	12.5	144.6	28.1	116.4	2829.7	27.9
	410	12.4	143.1	28.1	115.0	2829.5	27.9
	415	12.2	141.8	28.1	113.6	2829.3	27.9

*Controlled flow for storage calculation at 50% max rate for average flow rate. See ICD Sizing sheet
*Inflow includes controlled flow from building roof drains (A1, A2, B1, B2)

Drainage Area =	**14-28 (2yr)**	Base El. (m)	90.33	Ponding Area (m2) =	4720
2.78* AC =	17.22	2yr Ponding El. (m)	90.68	Max Available Storage (m3) =	1697.9
		Average Width (m)	65.6	**Average Velocity (m/s) =**	**0.001**

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
2 Year	235	8.6	148.4	30.2	118.2	1666.6	15.3
	240	8.5	145.9	30.2	115.8	1666.8	15.3
	245	**8.3**	**143.6**	**30.2**	**113.4**	**1666.9**	**15.3**
	250	8.2	141.3	30.2	111.1	1666.8	15.3
	255	8.1	139.1	30.2	108.9	1666.5	15.3
	260	8.0	137.0	30.2	106.8	1666.1	15.3

*Controlled flow for storage calculation at 50% max rate for average flow rate. See ICD Sizing sheet
*Inflow includes controlled flow from building roof drains (C1, C2, C3, D1, D2, D3)

Drainage Area =	**14-28 (5yr)**	Base El. (m)	90.33	Ponding Area (m2) =	4720
2.78* AC =	17.22	5yr Ponding El. (m)	90.81	Max Available Storage (m3) =	2352.0
		Average Width (m)	65.6	**Average Velocity (m/s) =**	**0.001**

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	275	10.1	174.5	34.4	140.1	2311.4	18.6
	280	10.0	172.0	34.4	137.6	2311.6	18.6
	285	**9.9**	**169.6**	**34.4**	**135.2**	**2311.7**	**18.6**
	290	9.7	167.3	34.4	132.9	2311.6	18.6
	295	9.6	165.0	34.4	130.6	2311.4	18.6
	300	9.5	162.8	34.4	128.4	2311.0	18.6

*Controlled flow for storage calculation at 50% max rate for average flow rate. See ICD Sizing sheet
*Inflow includes controlled flow from building roof drains (C1, C2, C3, D1, D2, D3)

Drainage Area =	**14-28 (100yr)**	Ditch 100yr HGL (m)	90.81	Ponding Area (m2) =	4720
2.78* AC =	19.58	100yr Ponding El. (m)	91.77	Max Available Storage (m3) =	4876.8
		Average Width (m)	65.6	**Average Velocity (m/s) =**	**0.001**

Return Period	Time of Concentration (min)	Intensity, i (mm/hr)	Flow In, Q (L/s)	Controlled Flow (L/s)*	Net Runoff to be Stored (L/s)	Storage Required (m^3)	Drawdown Time (hr)
100 Year	415	12.2	239.5	45.1	194.4	4841.5	29.8
	420	12.1	237.2	45.1	192.1	4841.6	29.8
	425	**12.0**	**235.0**	**45.1**	**189.9**	**4841.7**	**29.8**
	430	11.9	232.8	45.1	187.7	4841.6	29.8
	435	11.8	230.6	45.1	185.5	4841.3	29.8
	440	11.7	228.5	45.1	183.4	4841.0	29.8

*Controlled flow for storage calculation at 50% max rate for average flow rate. See ICD Sizing sheet
*Inflow includes controlled flow from building roof drains (C1, C2, C3, D1, D2, D3)

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ICD Sizing

Pond 1

Bot. El.	89.91	m
2yr El.	90.25	m
Max. Head (2yr)	0.34	m
Max Flow (2yr)	41.66	L/s
5yr El.	90.34	m
Max. Head (5yr)	0.43	m
Max Flow (5yr)	46.85	L/s
Ditch 100yr HGL	90.58	m
100yr El.	91.20	m
Max. Head (100yr)	0.62	m
Max Flow (100yr)	56.25	L/s
Orifice Plate	**185**	**mm**

Pond 2

Bot. El.	90.25	m
2yr El.	90.68	m
Max. Head (2yr)	0.43	m
Max Flow (2yr)	60.36	L/s
5yr El.	90.81	m
Max. Head (5yr)	0.56	m
Max Flow (5yr)	68.88	L/s
Ditch 100yr HGL	90.81	m
100yr El.	91.77	m
Max. Head (100yr)	0.96	m
Max Flow (100yr)	90.19	L/s
Orifice Plate	**210**	**mm**

Total Flow (2yr)	**102.02 L/s**
Total Flow (5yr)	**115.73 L/s**
Total Flow (100yr)	**146.44 L/s**

Note: Max. flow during 2- and 5-yr storm based on head from invert of discharge pipe to respective ponding elevation
Note: Max. flow during 100-yr storm based on head from ditch 100-yr HGL to 100-yr ponding elevation
Note: Maximum allowable flow from site 159.72 L/s

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Ditch Calculation (100-yr Capacity)

Open Channel Flow - Triangle
Manning's Equation

Realigned Leitrim ROW North Ditch

Slope (m/m)	0.0015
Side slope (run for 1m rise)	3
Bottom width (m)	0
Manning's n	0.03 based on OSDG App. 6-C.1

Depth of flow (m)	Flow Capacity (L/s)	Velocity (m/s)	
0.10	1.8	0.06	
0.20	14.7	0.12	
0.30	49.6	0.18	
0.40	117.6	0.24	
0.50	229.6	0.31	
0.58	358.4	0.36	
0.59	**377.3**	**0.36**	east of site entrance
0.60	396.8	0.37	
0.67	552.5	0.41	
0.68	**577.6**	**0.42**	west of site entrance
0.70	630.1	0.43	
0.80	940.6	0.49	
0.90	1339.3	0.55	
1.00	1837.1	0.61	

Notes:
1. Maximum flow east of Leitrim site entrance = 250.39 L/s (controlled upstream lands) + 96.30 L/s (apportioned controlled flow from Pond 2, Drainage Areas 14-28) + 26.95 L/s (100yr runoff from Leitrim Drainage Area OFF1)
Maximum Q = 373.64 L/s
2. Maximum flow west of Leitrim site entrance = 250.39 L/s (controlled upstream lands) + 159.72 L/s (maximum site discharge) + 145.10 L/s (100yr runoff from Leitrim Drainage Area OFF1-OFF3)
Maximum Q = 555.21 L/s

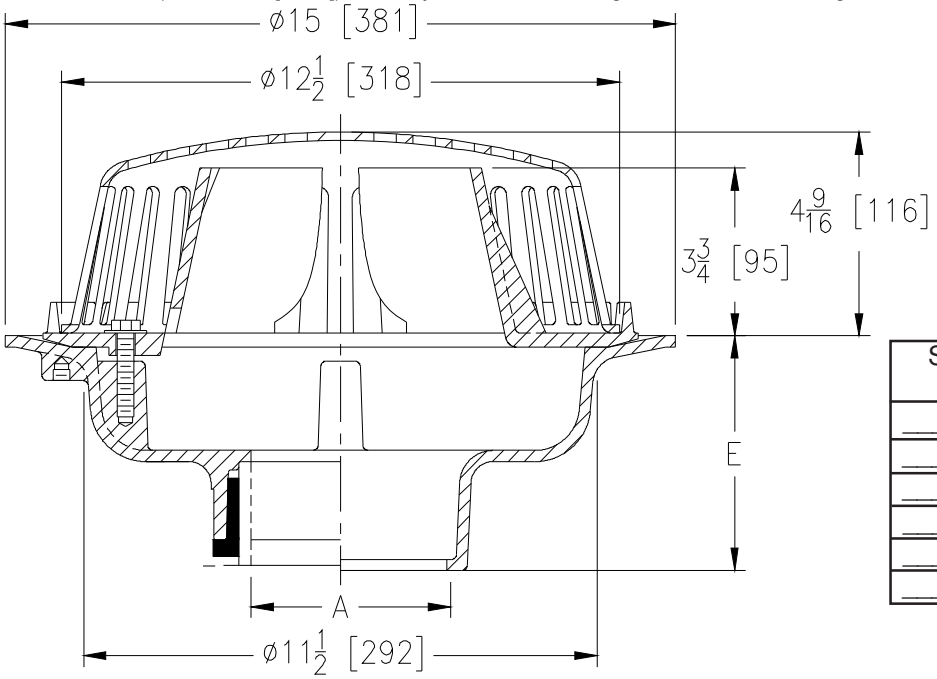
Z105

CONTROL-FLO ROOF DRAIN
W/ PARABOLIC WEIR

SPECIFICATION SHEET

TAG _____

Dimensional Data (inches and [mm]) are Subject to Manufacturing Tolerances and Change Without Notice



Specify Number of Notches in Weir	
___-N1	One Notch
___-N2	Two Notches
___-N3	Three Notches
___-N4	Four Notches
___-N5	Five Notches
___-N6	Six Notches

A- Pipe Size In.[mm]	Approx. Wt. Lbs. [kg]	Dome Open Area Sq. In. [cm²]
2,3,4 [51,76,102]	34 [15]	103 [665]

ENGINEERING SPECIFICATION: ZURN Z105
15" [381mm] Diameter Control-Flo roof drain for dead-level roof construction, Dura-Coated cast iron body, Control-Flo weir shall be linear functioning with integral membrane flashing clamp/gravel guard and Poly-Dome. All data shall be verified proportional to flow rates. Each notch will allow 10 GPM [LPM] of flow per 1" [25mm] of rain water build up above the drain.

OPTIONS (Check/specify appropriate options)

PIPE SIZE
3, 4 [76, 102]
2 , 3, 4 [51, 76, 102]
2 , 3, 4 [51, 76, 102]

(Specify size/type) **OUTLET**
_____ IC Inside Caulk
_____ NH No-Hub
_____ NL Neo-Loc

E BODY HT. DIM.
5-1/4 [133]
5-1/4 [133]
4-9/16 [116]

PREFIXES
_____ Z D.C.C.I. Body with Poly-Dome*
_____ ZA D.C.C.I. Body with Aluminum Dome
_____ ZC D.C.C.I. Body with Cast Iron Dome

SUFFIXES
_____ -C Underdeck Clamp
_____ -DP Top-Set® Deck Plate (Replaces both -C & -R)
_____ -E Static Extension 1 [25] thru 4 [102] (Specify Ht.)
_____ -EA Adjustable Extension Assembly 2-1/8 [54] thru 3-1/2 [89]
_____ -G Galvanized Cast Iron
_____ -R Roof Sump Receiver
_____ -TC Neo-Loc Test Cap Gasket (2,3,4 [51,76,102] NL Bottom Outlet Only)
_____ -VP Vandal Proof Secured Top
_____ -10 6 [152] High Parabolic Weir for Sloped Roof (ZC or ZA)

* Regularly furnished unless otherwise specified.

Zurn Industries, LLC | **Specification Drainage Operation**
1801 Pittsburgh Avenue, Erie, PA U.S.A. 16502 · Ph. 855-663-9876, Fax 814-454-7929
In Canada | **Zurn Industries Limited**
3544 Nashua Drive, Mississauga, Ontario L4V 1L2 · Ph. 905-405-8272, Fax 905-405-1292
www.zurn.com

Rev. K
Date: 09/25/17
C.N. No. 137793
Prod. | Dwg. No. Z105

Stormceptor EF Sizing Report

STMMH101

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/06/2024

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	

Drainage Area (ha):	1.0
Runoff Coefficient 'c':	0.87

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Project Name:	4101 Limebank
Project Number:	65650
Designer Name:	Stephen McCaughey
Designer Company:	Robinson Consultants
Designer Email:	smccaughey@rcii.com
Designer Phone:	613-592-6060
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	28.08
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	158.20
Influent TSS Concentration (mg/L):	150
Estimated Average Annual Sediment Load (kg/yr):	601
Estimated Average Annual Sediment Volume (L/yr):	489

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	49
EFO6	57
EFO8	62
EFO10	65
EFO12	67

Recommended Stormceptor EFO Model: EFO8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 62

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

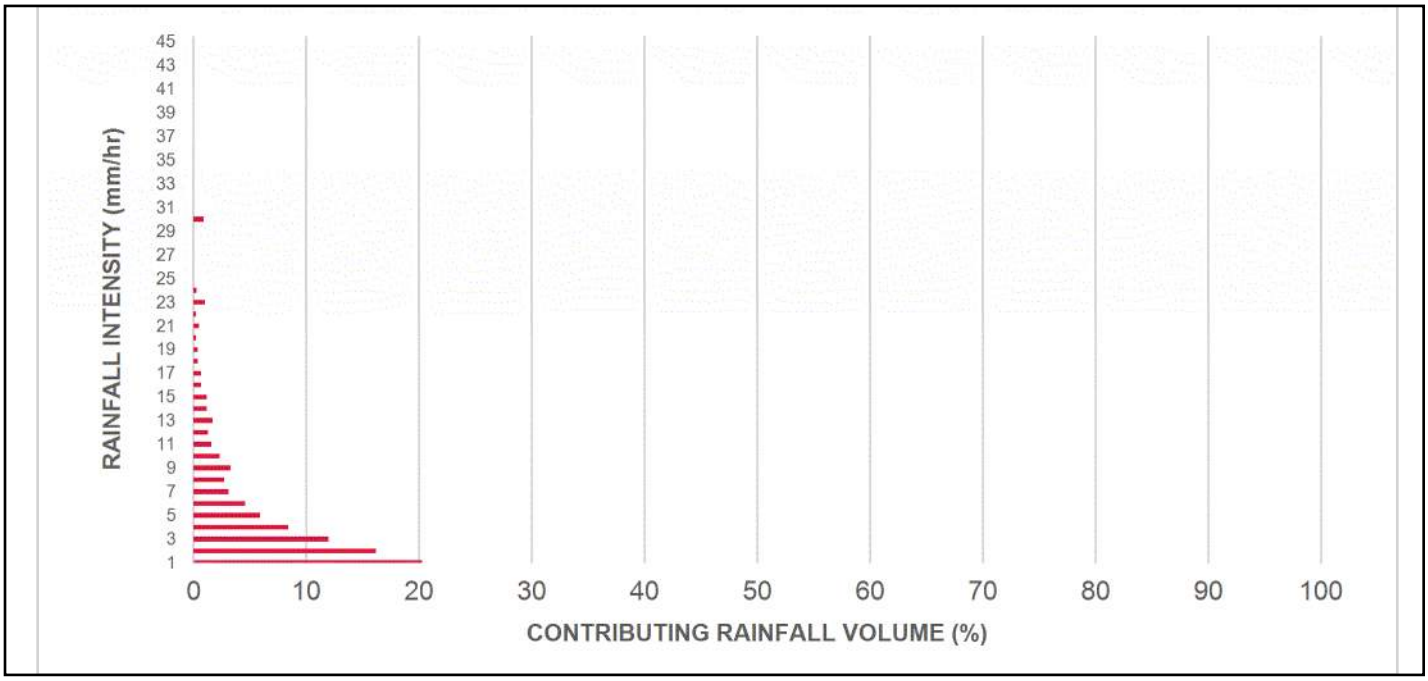
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

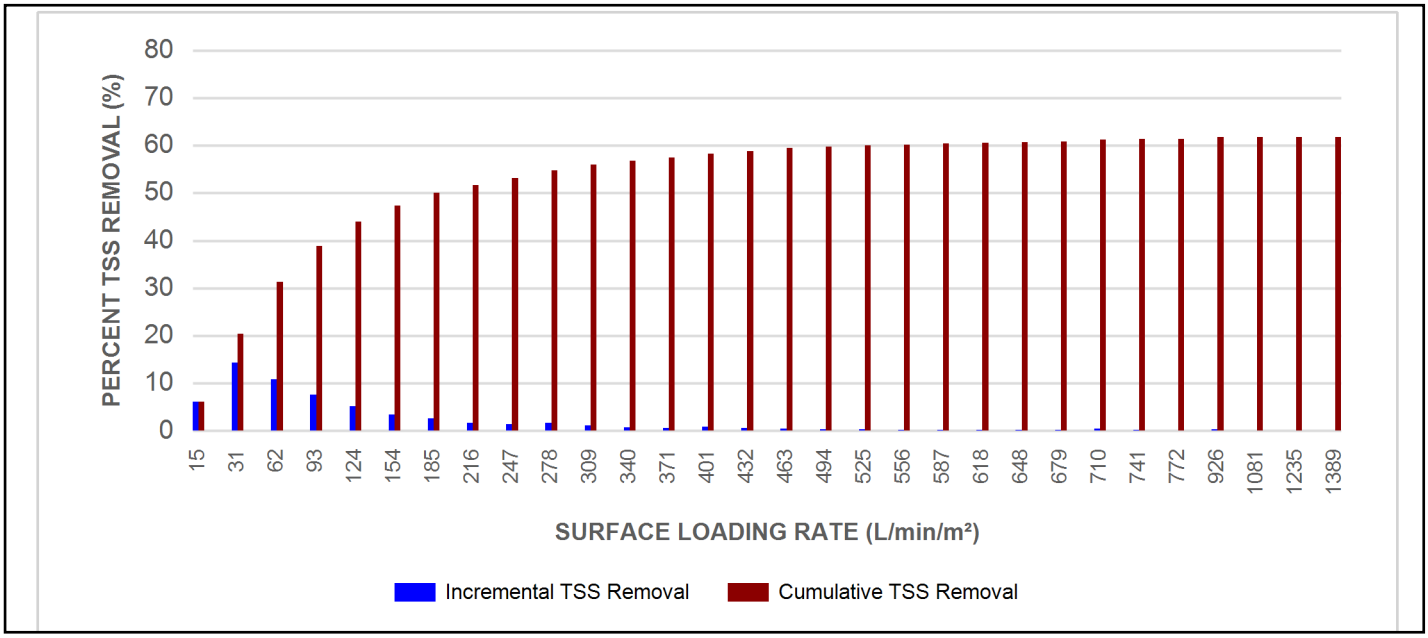
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	1.21	73.0	15.0	70	6.1	6.1
1.00	20.3	29.0	2.42	145.0	31.0	70	14.3	20.4
2.00	16.2	45.2	4.84	290.0	62.0	67	10.9	31.3
3.00	12.0	57.2	7.26	435.0	93.0	63	7.6	38.9
4.00	8.4	65.6	9.67	580.0	124.0	61	5.1	44.0
5.00	5.9	71.6	12.09	726.0	154.0	58	3.5	47.4
6.00	4.6	76.2	14.51	871.0	185.0	56	2.6	50.0
7.00	3.1	79.3	16.93	1016.0	216.0	54	1.6	51.7
8.00	2.7	82.0	19.35	1161.0	247.0	53	1.4	53.1
9.00	3.3	85.3	21.77	1306.0	278.0	52	1.7	54.8
10.00	2.3	87.6	24.19	1451.0	309.0	51	1.2	56.0
11.00	1.6	89.2	26.60	1596.0	340.0	50	0.8	56.8
12.00	1.3	90.5	29.02	1741.0	371.0	49	0.6	57.4
13.00	1.7	92.2	31.44	1887.0	401.0	48	0.8	58.3
14.00	1.2	93.5	33.86	2032.0	432.0	47	0.6	58.8
15.00	1.2	94.6	36.28	2177.0	463.0	46	0.5	59.4
16.00	0.7	95.3	38.70	2322.0	494.0	45	0.3	59.7
17.00	0.7	96.1	41.12	2467.0	525.0	44	0.3	60.0
18.00	0.4	96.5	43.53	2612.0	556.0	44	0.2	60.2
19.00	0.4	96.9	45.95	2757.0	587.0	43	0.2	60.4
20.00	0.2	97.1	48.37	2902.0	618.0	42	0.1	60.5
21.00	0.5	97.5	50.79	3047.0	648.0	42	0.2	60.7
22.00	0.2	97.8	53.21	3193.0	679.0	42	0.1	60.8
23.00	1.0	98.8	55.63	3338.0	710.0	41	0.4	61.2
24.00	0.3	99.1	58.05	3483.0	741.0	41	0.1	61.3
25.00	0.0	99.1	60.47	3628.0	772.0	41	0.0	61.3
30.00	0.9	100.0	72.56	4353.0	926.0	40	0.4	61.7
35.00	0.0	100.0	84.65	5079.0	1081.0	39	0.0	61.7
40.00	0.0	100.0	96.74	5805.0	1235.0	37	0.0	61.7
45.00	0.0	100.0	108.84	6530.0	1389.0	34	0.0	61.7
Estimated Net Annual Sediment (TSS) Load Reduction =								**62 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

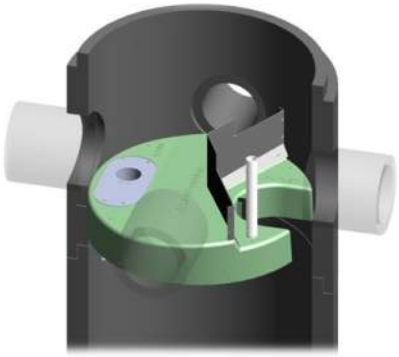
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

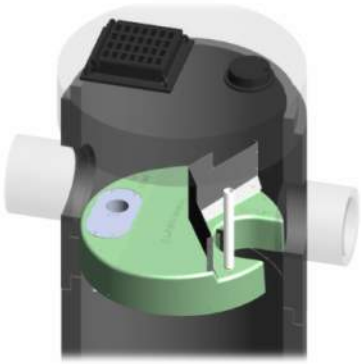
DESIGN FLEXIBILITY

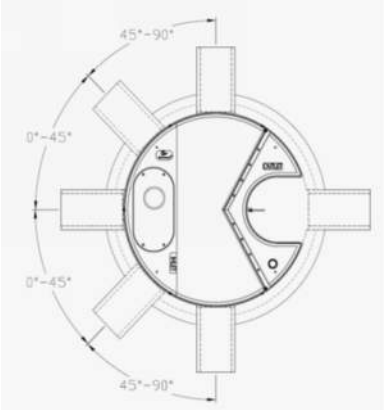
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit** S**eparators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Stormceptor EF Sizing Report

STMMH107

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/06/2024

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	

Drainage Area (ha):	0.79
Runoff Coefficient 'c':	0.87

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Project Name:	4101 Limebank
Project Number:	65650
Designer Name:	Stephen McCaughey
Designer Company:	Robinson Consultants
Designer Email:	smccaughey@rcii.com
Designer Phone:	613-592-6060
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	22.18
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	199.40
Influent TSS Concentration (mg/L):	150
Estimated Average Annual Sediment Load (kg/yr):	490
Estimated Average Annual Sediment Volume (L/yr):	399

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	51
EFO6	59
EFO8	64
EFO10	66
EFO12	68

Recommended Stormceptor EFO Model: EFO8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 64

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

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PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

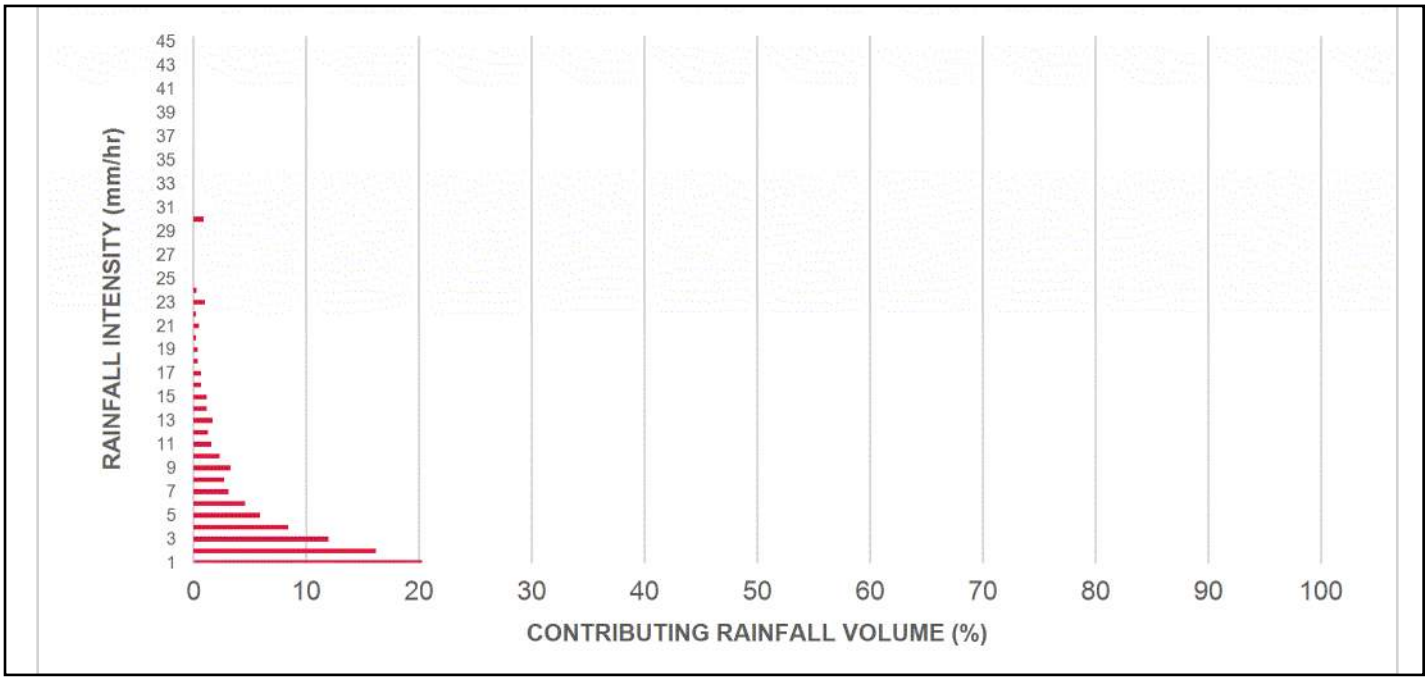
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

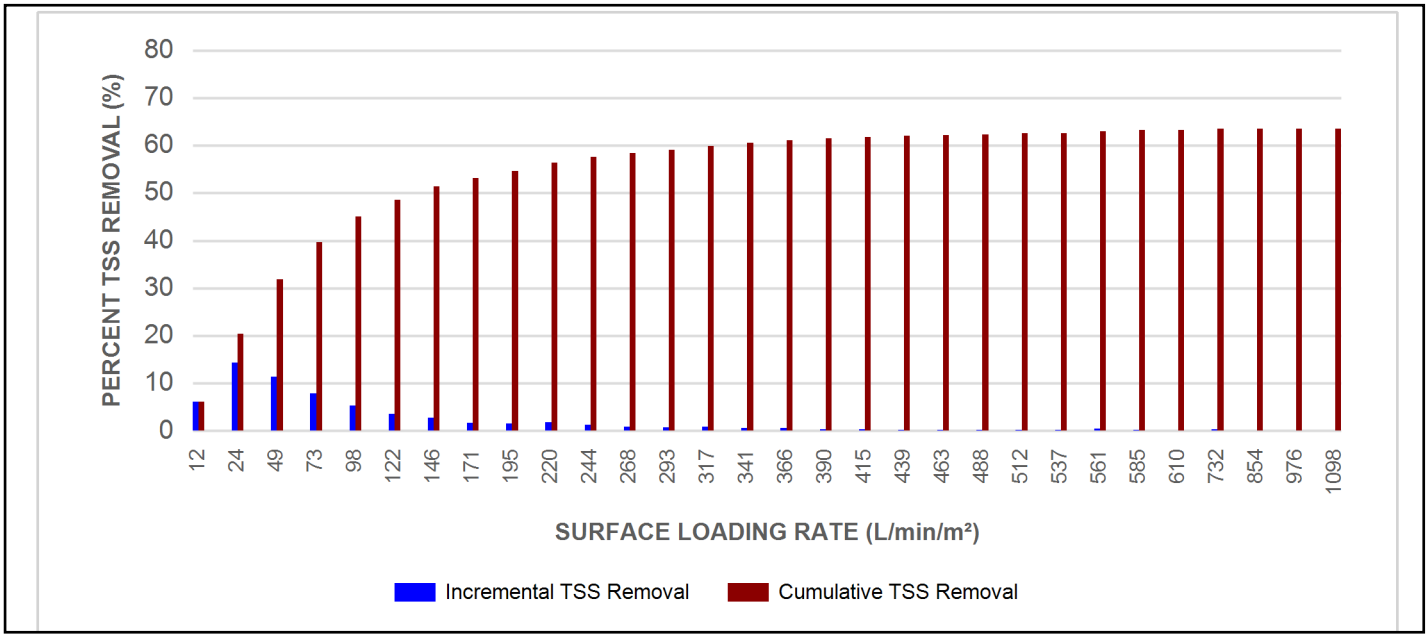
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	0.96	57.0	12.0	70	6.1	6.1
1.00	20.3	29.0	1.91	115.0	24.0	70	14.3	20.4
2.00	16.2	45.2	3.82	229.0	49.0	70	11.4	31.8
3.00	12.0	57.2	5.73	344.0	73.0	66	7.9	39.7
4.00	8.4	65.6	7.64	459.0	98.0	63	5.3	45.0
5.00	5.9	71.6	9.55	573.0	122.0	61	3.6	48.6
6.00	4.6	76.2	11.46	688.0	146.0	59	2.7	51.4
7.00	3.1	79.3	13.37	802.0	171.0	57	1.7	53.1
8.00	2.7	82.0	15.29	917.0	195.0	55	1.5	54.6
9.00	3.3	85.3	17.20	1032.0	220.0	53	1.8	56.4
10.00	2.3	87.6	19.11	1146.0	244.0	53	1.2	57.6
11.00	1.6	89.2	21.02	1261.0	268.0	52	0.8	58.4
12.00	1.3	90.5	22.93	1376.0	293.0	51	0.7	59.1
13.00	1.7	92.2	24.84	1490.0	317.0	51	0.9	59.9
14.00	1.2	93.5	26.75	1605.0	341.0	50	0.6	60.6
15.00	1.2	94.6	28.66	1720.0	366.0	49	0.6	61.1
16.00	0.7	95.3	30.57	1834.0	390.0	48	0.3	61.5
17.00	0.7	96.1	32.48	1949.0	415.0	48	0.4	61.8
18.00	0.4	96.5	34.39	2064.0	439.0	47	0.2	62.0
19.00	0.4	96.9	36.30	2178.0	463.0	46	0.2	62.2
20.00	0.2	97.1	38.21	2293.0	488.0	46	0.1	62.3
21.00	0.5	97.5	40.12	2407.0	512.0	45	0.2	62.5
22.00	0.2	97.8	42.04	2522.0	537.0	44	0.1	62.6
23.00	1.0	98.8	43.95	2637.0	561.0	43	0.4	63.0
24.00	0.3	99.1	45.86	2751.0	585.0	43	0.1	63.2
25.00	0.0	99.1	47.77	2866.0	610.0	42	0.0	63.2
30.00	0.9	100.0	57.32	3439.0	732.0	41	0.4	63.5
35.00	0.0	100.0	66.87	4012.0	854.0	41	0.0	63.5
40.00	0.0	100.0	76.43	4586.0	976.0	40	0.0	63.5
45.00	0.0	100.0	85.98	5159.0	1098.0	39	0.0	63.5
Estimated Net Annual Sediment (TSS) Load Reduction =								**64 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

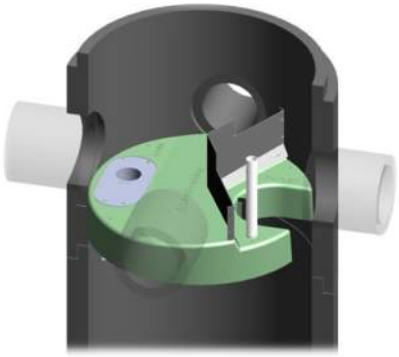
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

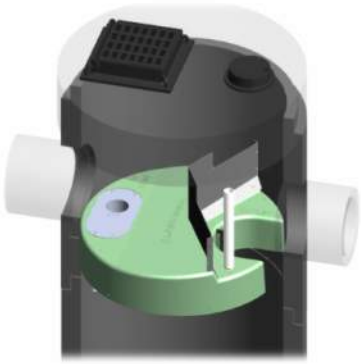
DESIGN FLEXIBILITY

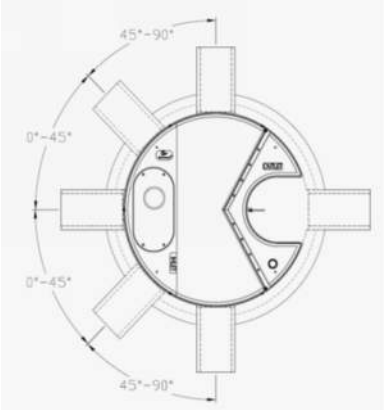
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit** S**eparators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Stormceptor EF Sizing Report

STMMH112

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/06/2024

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	

Drainage Area (ha):	0.96
Runoff Coefficient 'c':	0.90

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	27.89
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	224.30
Influent TSS Concentration (mg/L):	150
Estimated Average Annual Sediment Load (kg/yr):	607
Estimated Average Annual Sediment Volume (L/yr):	494

Project Name:	4101 Limebank
Project Number:	65650
Designer Name:	Stephen McCaughey
Designer Company:	Robinson Consultants
Designer Email:	smccaughey@rcii.com
Designer Phone:	613-592-6060
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	49
EFO6	57
EFO8	62
EFO10	65
EFO12	67

Recommended Stormceptor EFO Model: EFO8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 62

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

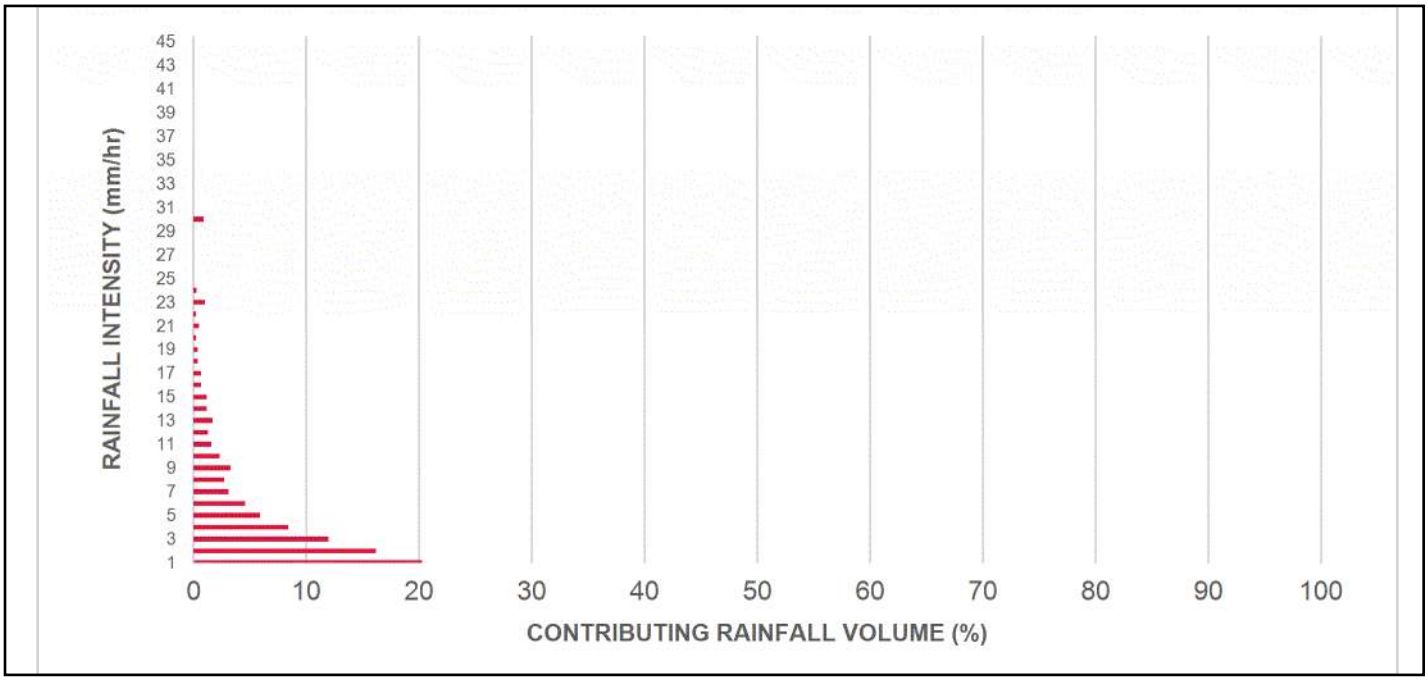
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Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

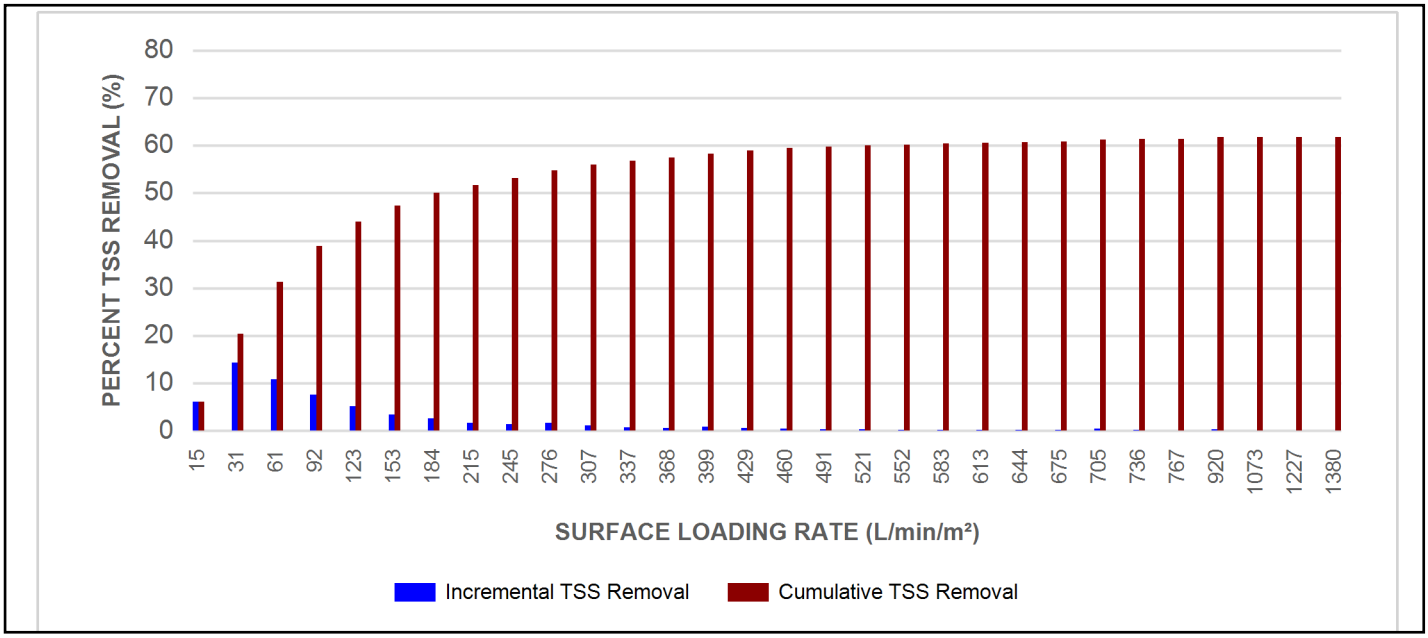
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	1.20	72.0	15.0	70	6.1	6.1
1.00	20.3	29.0	2.40	144.0	31.0	70	14.3	20.4
2.00	16.2	45.2	4.80	288.0	61.0	67	10.9	31.3
3.00	12.0	57.2	7.21	432.0	92.0	63	7.6	38.9
4.00	8.4	65.6	9.61	576.0	123.0	61	5.1	44.0
5.00	5.9	71.6	12.01	721.0	153.0	58	3.5	47.4
6.00	4.6	76.2	14.41	865.0	184.0	56	2.6	50.0
7.00	3.1	79.3	16.81	1009.0	215.0	54	1.6	51.7
8.00	2.7	82.0	19.22	1153.0	245.0	53	1.4	53.1
9.00	3.3	85.3	21.62	1297.0	276.0	52	1.7	54.8
10.00	2.3	87.6	24.02	1441.0	307.0	51	1.2	56.0
11.00	1.6	89.2	26.42	1585.0	337.0	50	0.8	56.8
12.00	1.3	90.5	28.82	1729.0	368.0	49	0.6	57.5
13.00	1.7	92.2	31.22	1873.0	399.0	48	0.8	58.3
14.00	1.2	93.5	33.63	2018.0	429.0	47	0.6	58.9
15.00	1.2	94.6	36.03	2162.0	460.0	46	0.5	59.4
16.00	0.7	95.3	38.43	2306.0	491.0	45	0.3	59.7
17.00	0.7	96.1	40.83	2450.0	521.0	44	0.3	60.0
18.00	0.4	96.5	43.23	2594.0	552.0	44	0.2	60.2
19.00	0.4	96.9	45.64	2738.0	583.0	43	0.2	60.4
20.00	0.2	97.1	48.04	2882.0	613.0	42	0.1	60.5
21.00	0.5	97.5	50.44	3026.0	644.0	42	0.2	60.7
22.00	0.2	97.8	52.84	3171.0	675.0	42	0.1	60.8
23.00	1.0	98.8	55.24	3315.0	705.0	42	0.4	61.2
24.00	0.3	99.1	57.65	3459.0	736.0	41	0.1	61.3
25.00	0.0	99.1	60.05	3603.0	767.0	41	0.0	61.3
30.00	0.9	100.0	72.06	4323.0	920.0	40	0.4	61.7
35.00	0.0	100.0	84.07	5044.0	1073.0	39	0.0	61.7
40.00	0.0	100.0	96.08	5765.0	1227.0	37	0.0	61.7
45.00	0.0	100.0	108.09	6485.0	1380.0	34	0.0	61.7
Estimated Net Annual Sediment (TSS) Load Reduction =								**62 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

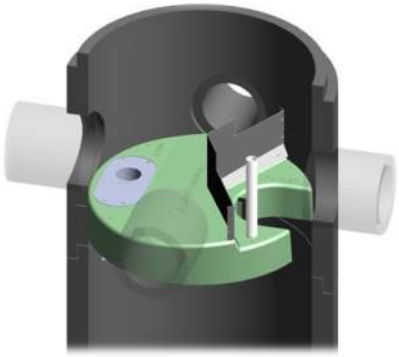
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

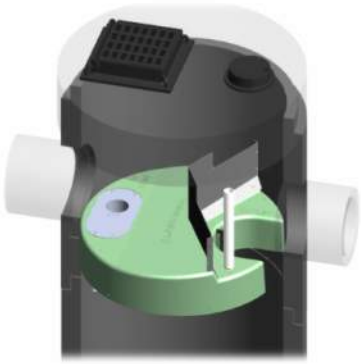
DESIGN FLEXIBILITY

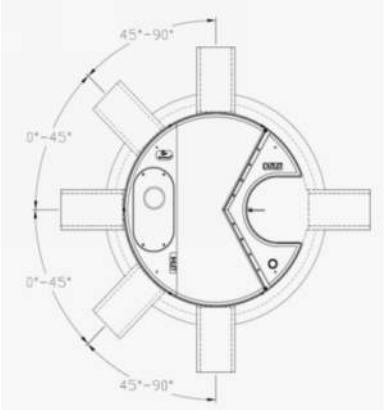
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit** S**eparators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Stormceptor EF Sizing Report

STMMH115

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/06/2024

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	

Drainage Area (ha):	2.74
Runoff Coefficient 'c':	0.81

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	71.63
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	380.30
Influent TSS Concentration (mg/L):	150
Estimated Average Annual Sediment Load (kg/yr):	1450
Estimated Average Annual Sediment Volume (L/yr):	1179

Project Name:	4101 Limebank
Project Number:	65650
Designer Name:	Stephen McCaughey
Designer Company:	Robinson Consultants
Designer Email:	smccaughey@rcii.com
Designer Phone:	613-592-6060
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	37
EFO6	47
EFO8	54
EFO10	58
EFO12	61

Recommended Stormceptor EFO Model: EFO12

Estimated Net Annual Sediment (TSS) Load Reduction (%): 61

Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

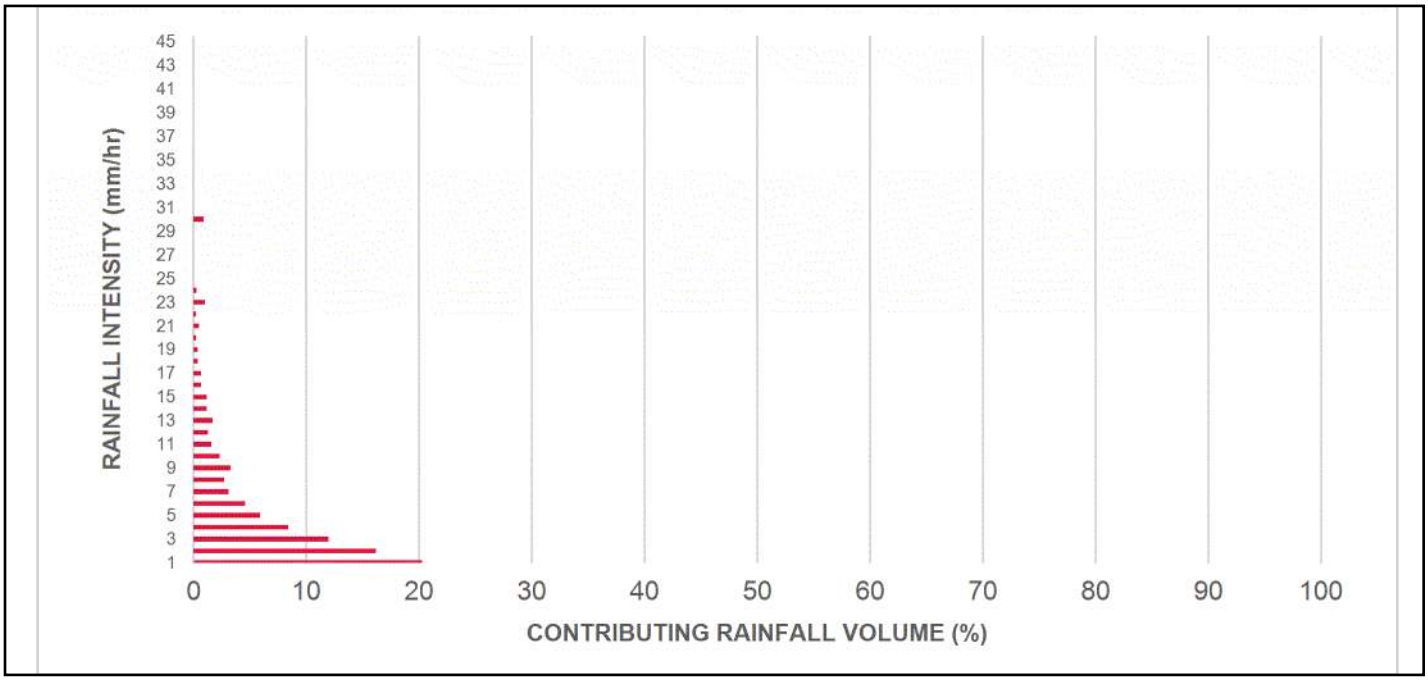
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

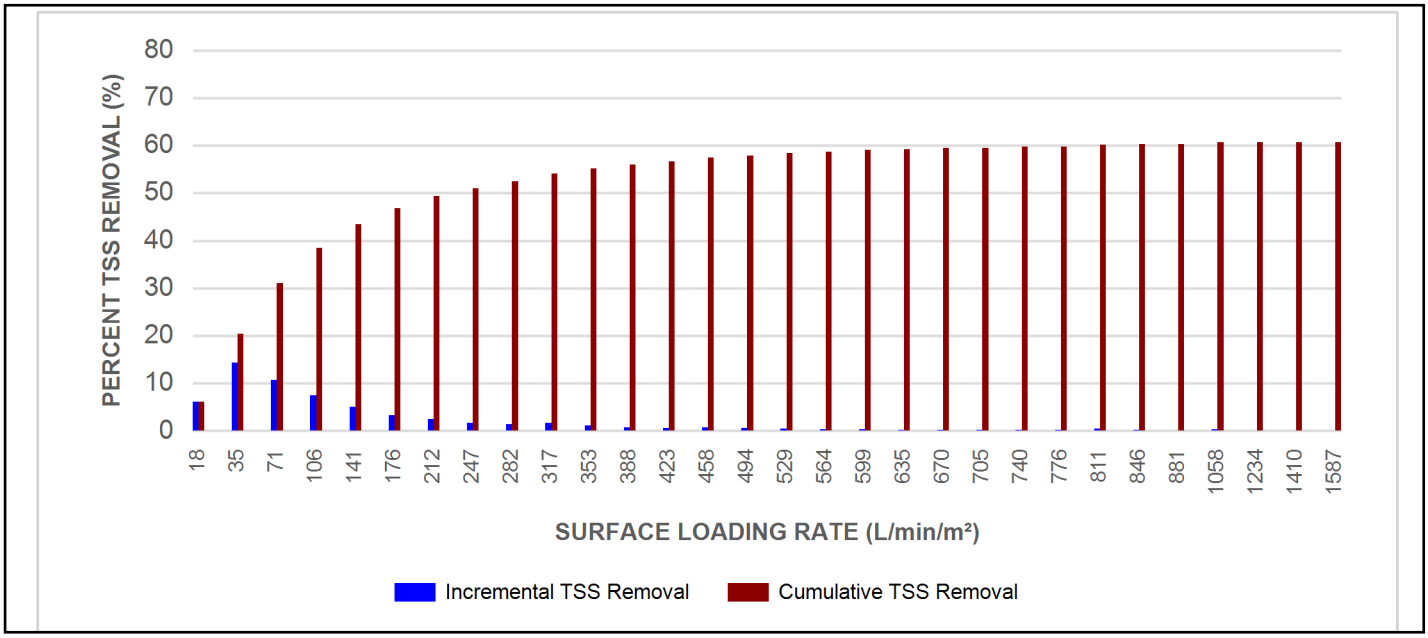
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	3.08	185.0	18.0	70	6.1	6.1
1.00	20.3	29.0	6.17	370.0	35.0	70	14.3	20.4
2.00	16.2	45.2	12.34	740.0	71.0	66	10.6	31.0
3.00	12.0	57.2	18.51	1111.0	106.0	62	7.5	38.5
4.00	8.4	65.6	24.68	1481.0	141.0	59	5.0	43.5
5.00	5.9	71.6	30.85	1851.0	176.0	57	3.4	46.8
6.00	4.6	76.2	37.02	2221.0	212.0	54	2.5	49.3
7.00	3.1	79.3	43.19	2591.0	247.0	53	1.6	51.0
8.00	2.7	82.0	49.36	2962.0	282.0	52	1.4	52.4
9.00	3.3	85.3	55.53	3332.0	317.0	51	1.7	54.1
10.00	2.3	87.6	61.70	3702.0	353.0	50	1.1	55.2
11.00	1.6	89.2	67.87	4072.0	388.0	49	0.8	56.0
12.00	1.3	90.5	74.04	4442.0	423.0	47	0.6	56.6
13.00	1.7	92.2	80.21	4813.0	458.0	47	0.8	57.4
14.00	1.2	93.5	86.38	5183.0	494.0	45	0.6	57.9
15.00	1.2	94.6	92.55	5553.0	529.0	44	0.5	58.4
16.00	0.7	95.3	98.72	5923.0	564.0	43	0.3	58.7
17.00	0.7	96.1	104.89	6293.0	599.0	42	0.3	59.1
18.00	0.4	96.5	111.06	6664.0	635.0	42	0.2	59.2
19.00	0.4	96.9	117.23	7034.0	670.0	42	0.2	59.4
20.00	0.2	97.1	123.40	7404.0	705.0	42	0.1	59.5
21.00	0.5	97.5	129.57	7774.0	740.0	41	0.2	59.7
22.00	0.2	97.8	135.74	8144.0	776.0	41	0.1	59.8
23.00	1.0	98.8	141.91	8515.0	811.0	41	0.4	60.2
24.00	0.3	99.1	148.08	8885.0	846.0	41	0.1	60.3
25.00	0.0	99.1	154.25	9255.0	881.0	41	0.0	60.3
30.00	0.9	100.0	185.10	11106.0	1058.0	39	0.4	60.7
35.00	0.0	100.0	215.95	12957.0	1234.0	37	0.0	60.7
40.00	0.0	100.0	246.80	14808.0	1410.0	34	0.0	60.7
45.00	0.0	100.0	277.65	16659.0	1587.0	30	0.0	60.7
Estimated Net Annual Sediment (TSS) Load Reduction =								**61 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

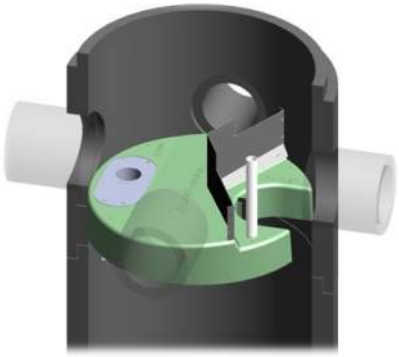
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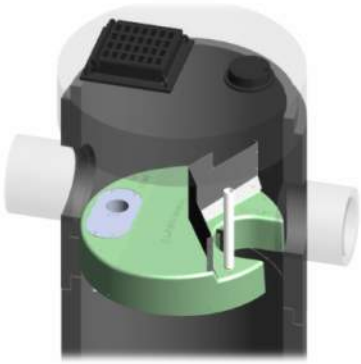
DESIGN FLEXIBILITY

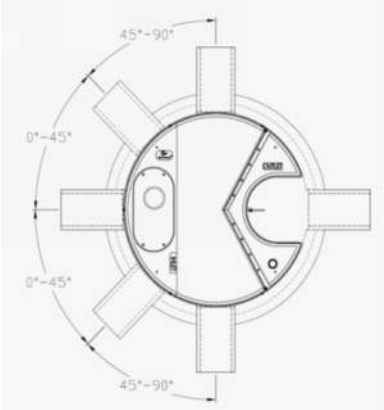
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OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit** S**eparators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

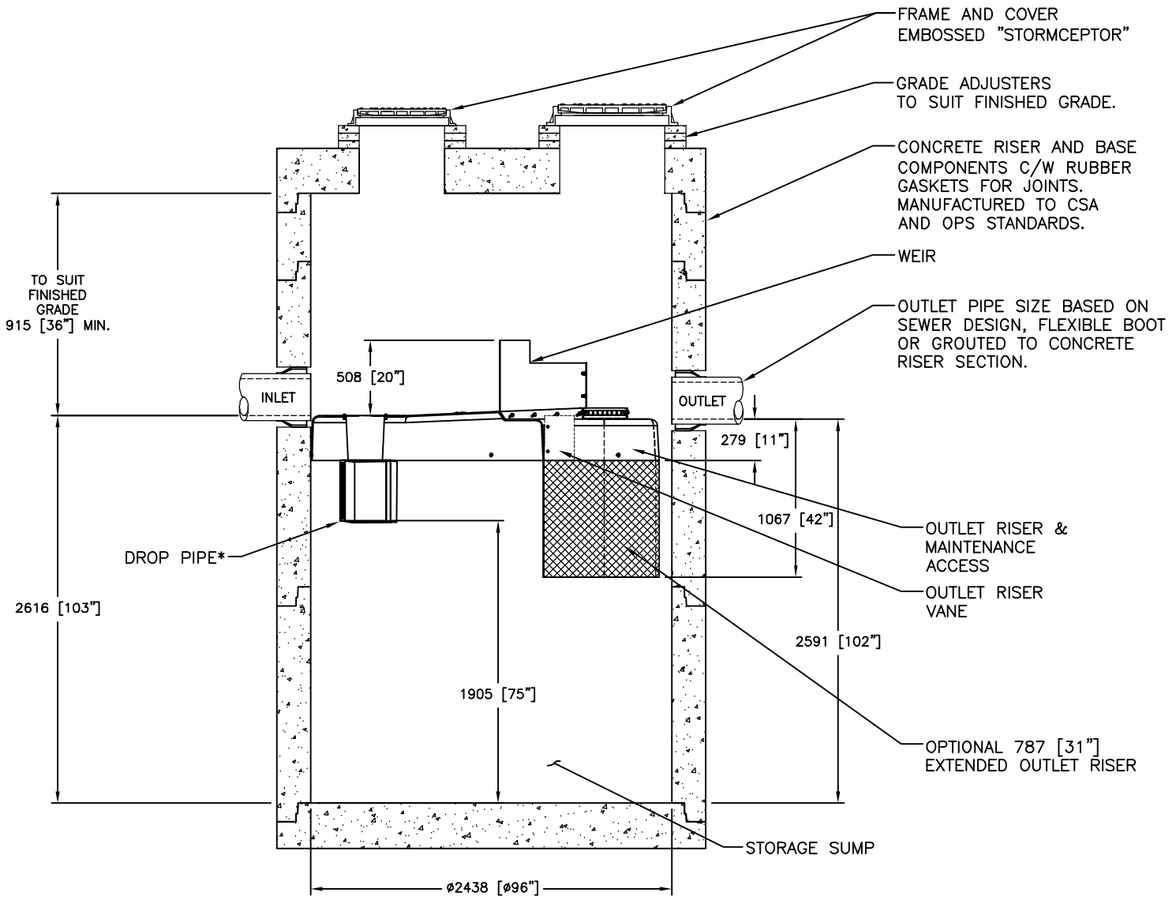
3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

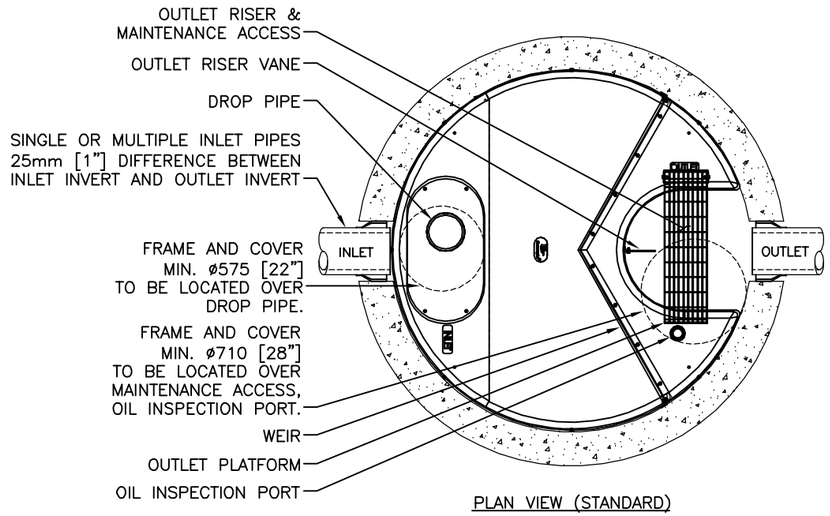
assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

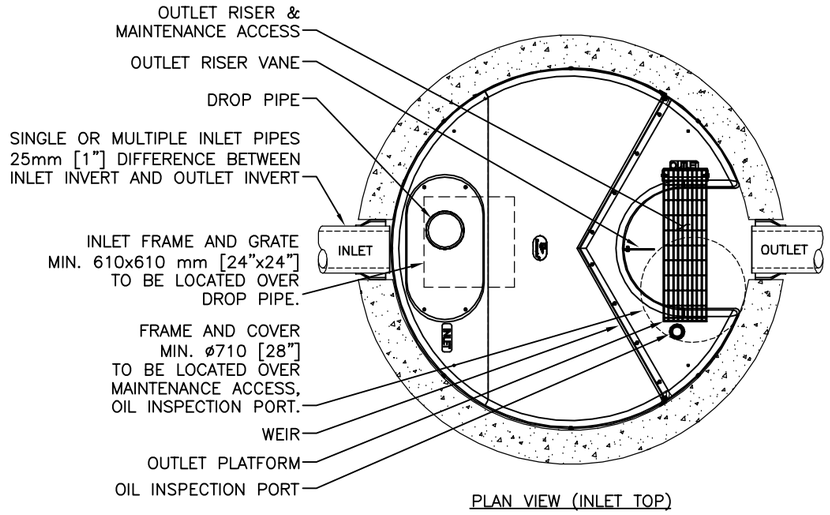
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF8 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO8 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO8				
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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MARK	DATE	REVISION DESCRIPTION	BY
1	6/8/18	OUTLET PLATFORM	JSK
0	5/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

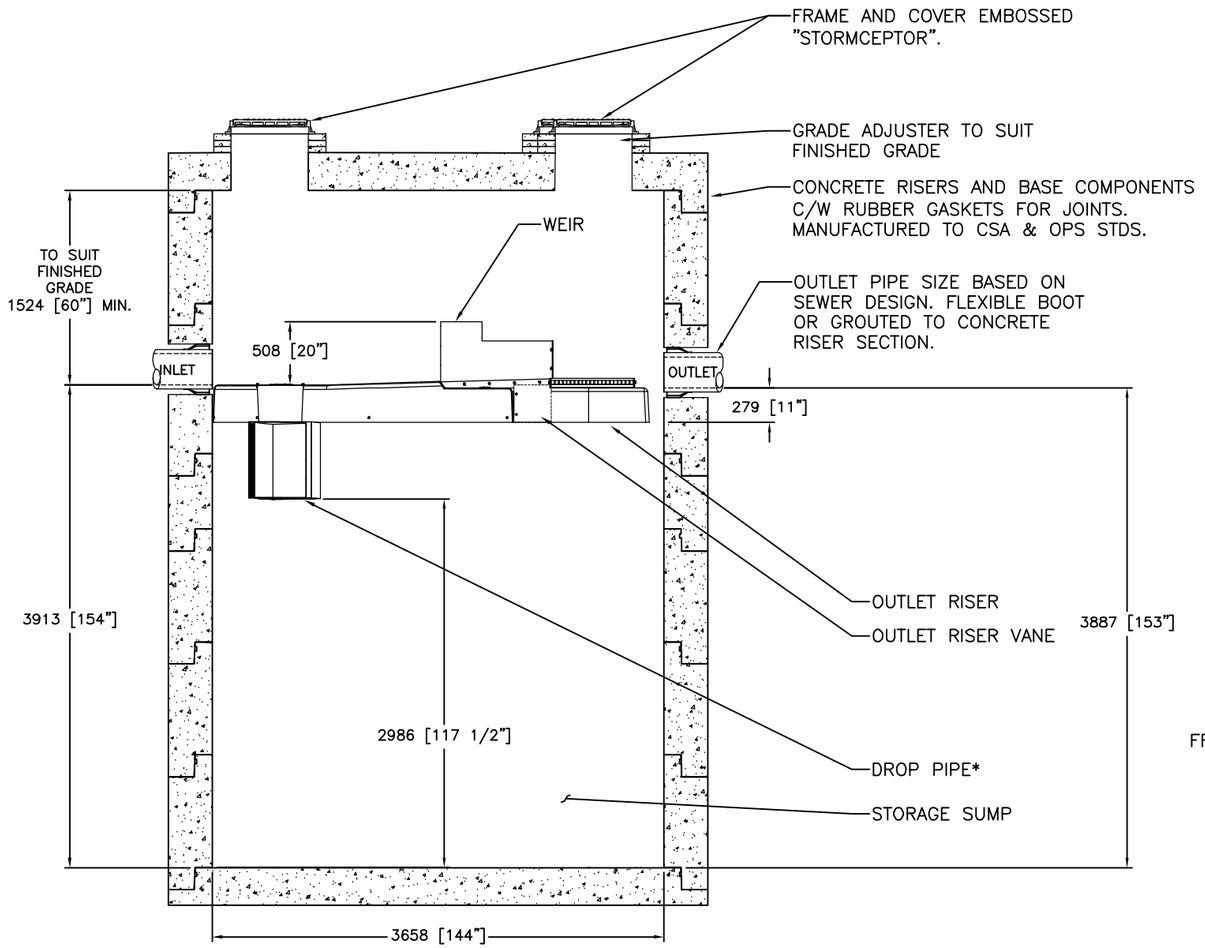
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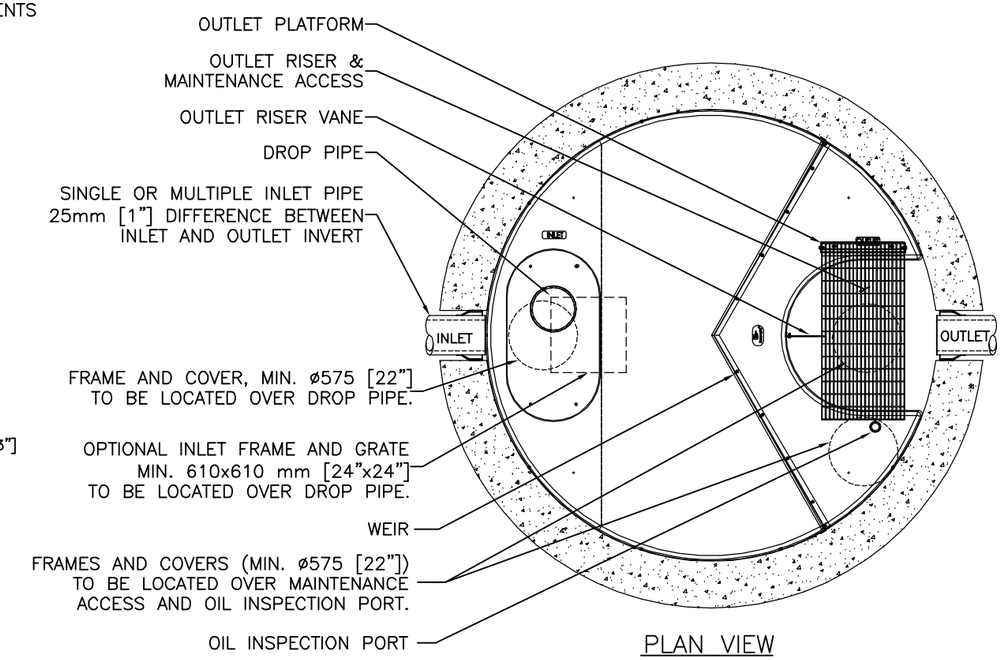
DATE:	10/13/2017
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: *
PROJECT No.: EFO8	SEQUENCE No.: *
SHEET:	1 OF 1

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DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF12 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO12 (OIL CAPTURE CONFIGURATION).

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STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO12
STRUCTURE ID	*
HYDROCARBON STORAGE REQ'D (L)	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
DRAINAGE AREA (HA)	*
DRAINAGE AREA IMPERVIOUSNESS (%)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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1	6/8/18	OUTLET PLATFORM	JSK
0	5/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

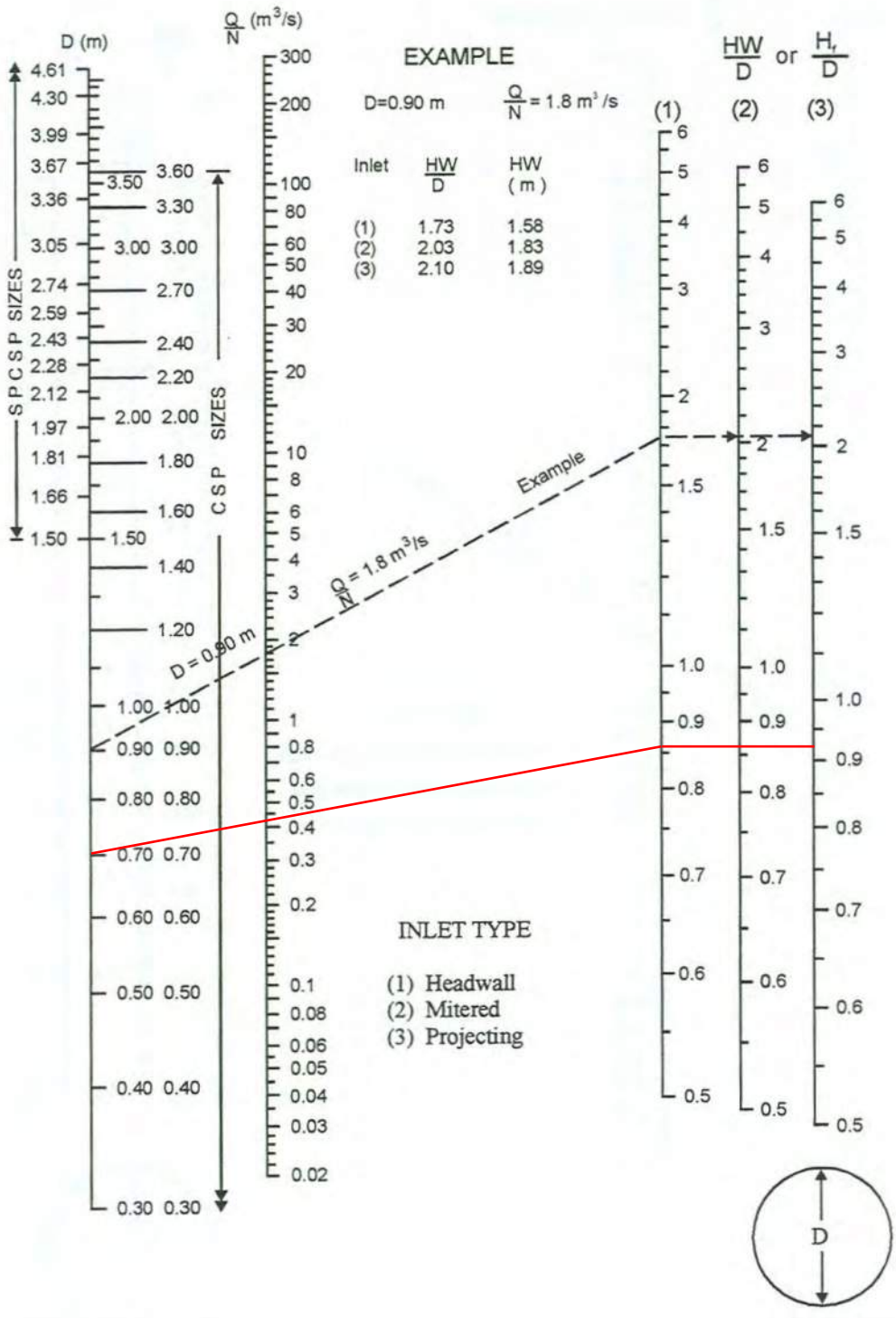
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DATE:	10/24/2017
DESIGNED:	JSK
DRAWN:	JSK
CHECKED:	BSF
APPROVED:	SP
PROJECT No.:	EFO12
SEQUENCE No.:	*
SHEET:	1 OF 1

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Culvert #3 - Leitrim ROW Ditch crossing TNP Easement
100-yr Flow

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts

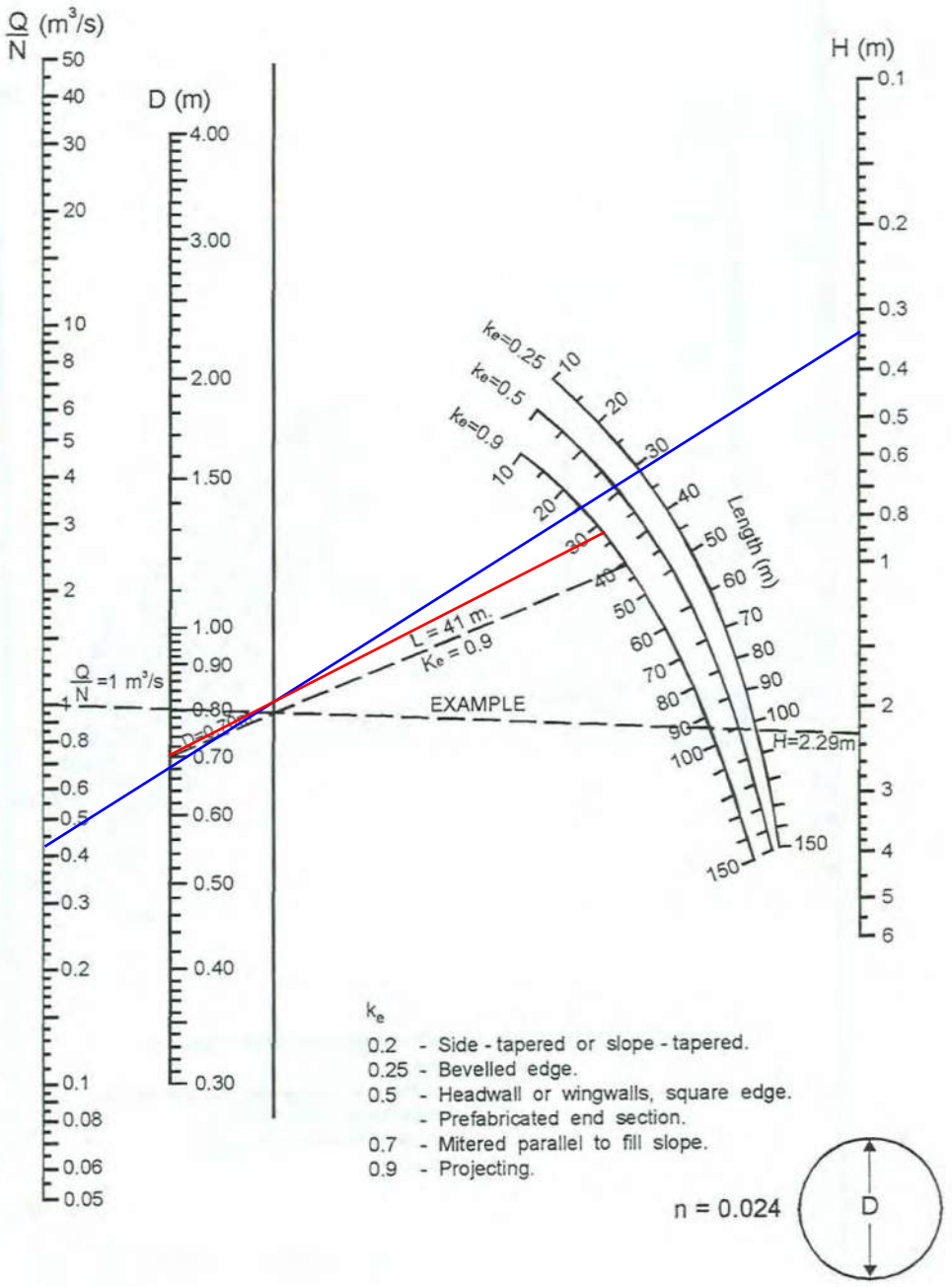


Source: Herr (1977)

Maximum Q = 250.39 L/s (controlled upstream lands) + 96.30 L/s (apportioned controlled flow from Pond 2, Drainage Areas 14-28) + 66.72 L/s (100yr runoff from Leitrim, Drainage Areas OFF1-OFF2)
Maximum Q = 413.41 L/s

Culvert #3 - Leitrim ROW Ditch crossing TNP Easement
100-yr Flow

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

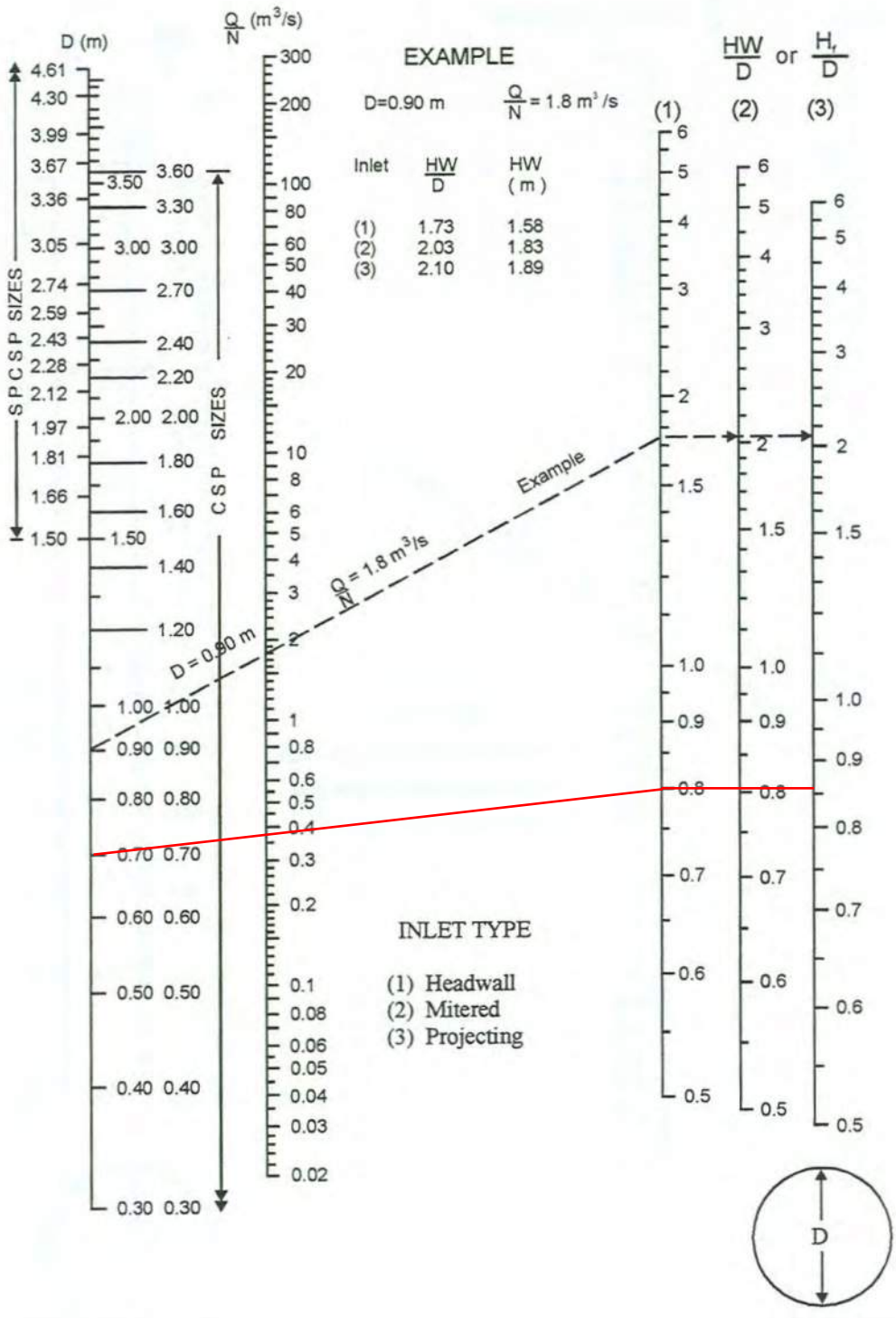


Source: Herr (1977)

Maximum Q = 250.39 L/s (controlled upstream lands) + 96.30 L/s (apportioned controlled flow from Pond 2, Drainage Areas 14-28) + 66.72 L/s (100yr runoff from Leitrim, Drainage Areas OFF1-OFF2)
Maximum Q = 413.41 L/s

Culvert #4 - 4101 Limebank Rd Driveway Crossing
100-yr Flow

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts

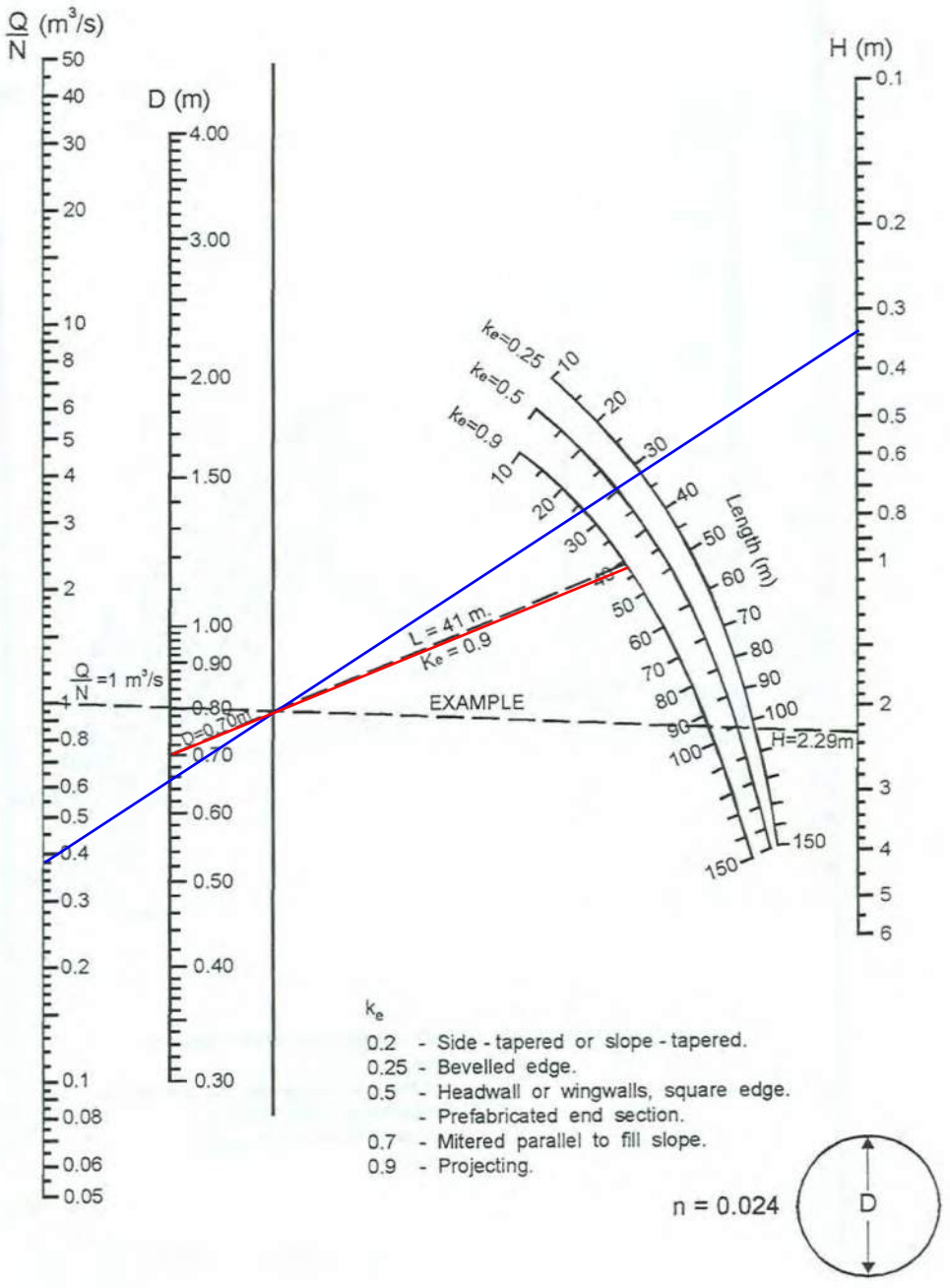


Source: Herr (1977)

Maximum Q = 250.39 L/s (controlled upstream lands) + 96.30 L/s (apportioned controlled flow from Pond 2, Drainage Areas 14-28) + 26.95 L/s (100yr runoff from Leitrim, Drainage Areas OFF1)
Maximum Q = 373.64 L/s

Culvert #4 - 4101 Limebank Rd Driveway Crossing
100-yr Flow

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

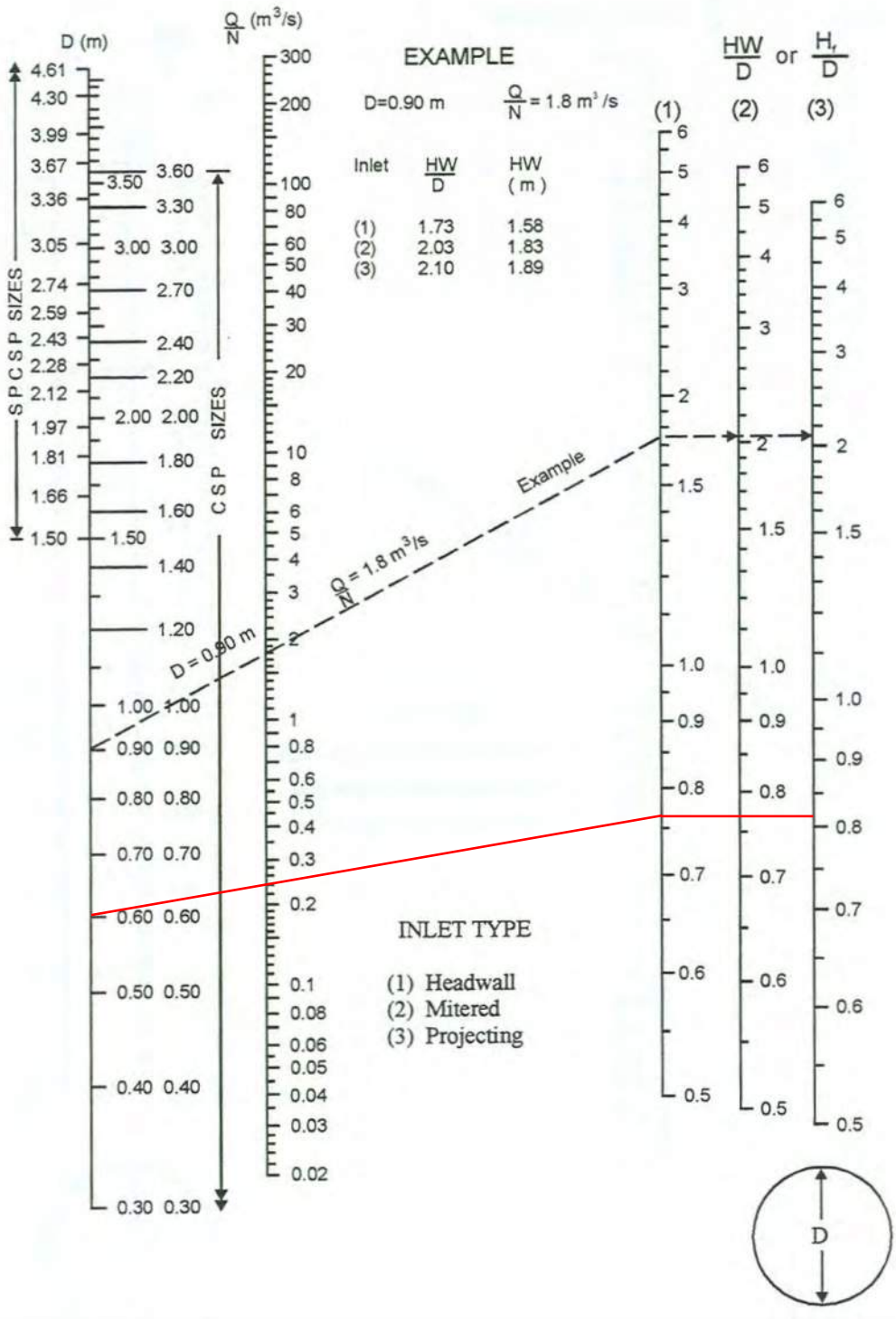


Source: Herr (1977)

Maximum Q = 250.39 L/s (controlled upstream lands) + 96.30 L/s (apportioned controlled flow from Pond 2, Drainage Areas 14-28) + 26.95 L/s (100yr runoff from Leitrim, Drainage Areas OFF1)
Maximum Q = 373.64 L/s

Culvert #1 - Pond 1 Culvert 1
100-yr Flow

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts

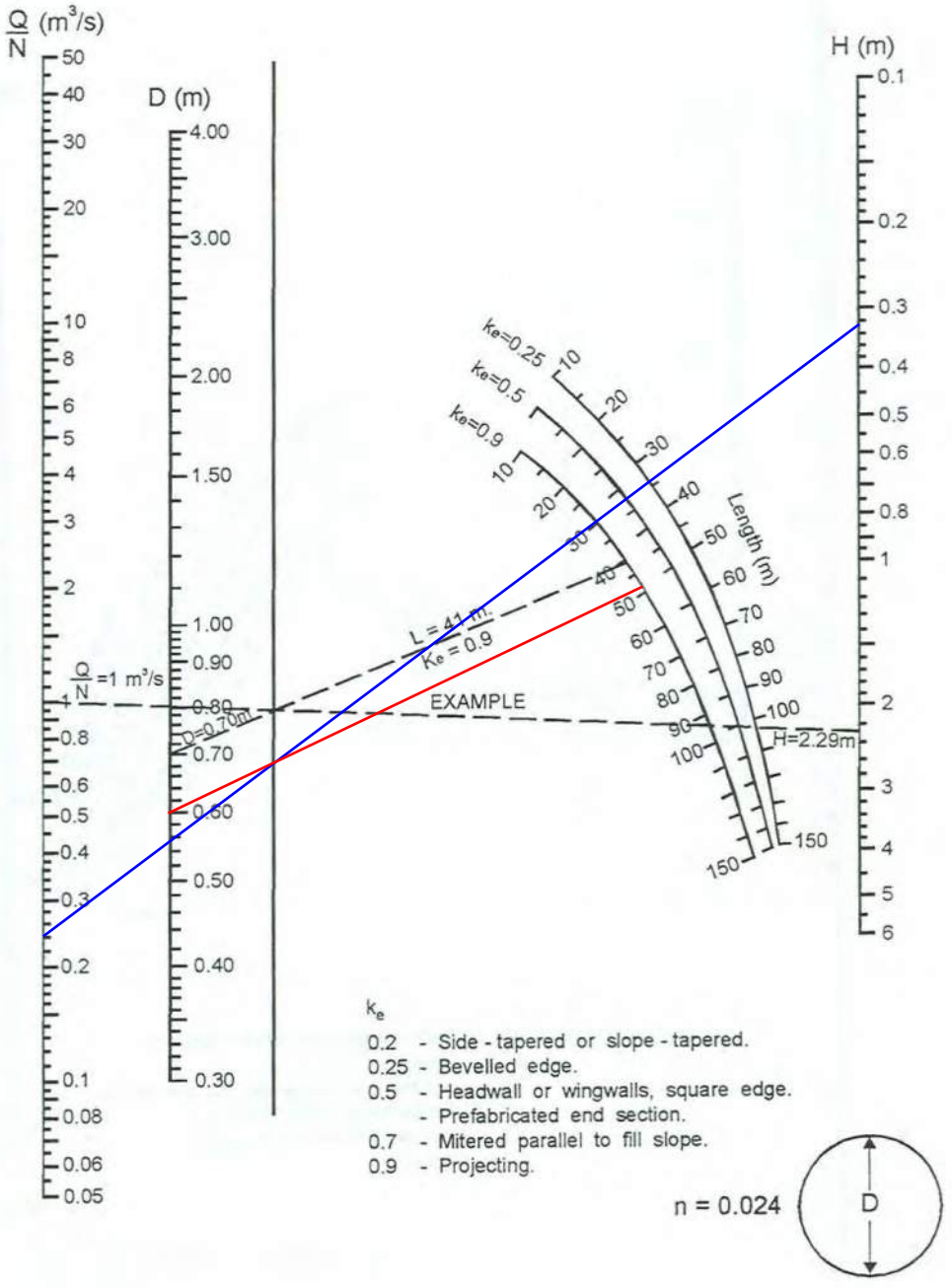


Source: Herr (1977)

Maximum Q = 242.68 L/s (100yr runoff from Drainage Areas 2-4)

Culvert #1 - Pond 1 Culvert 1
100-yr Flow

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

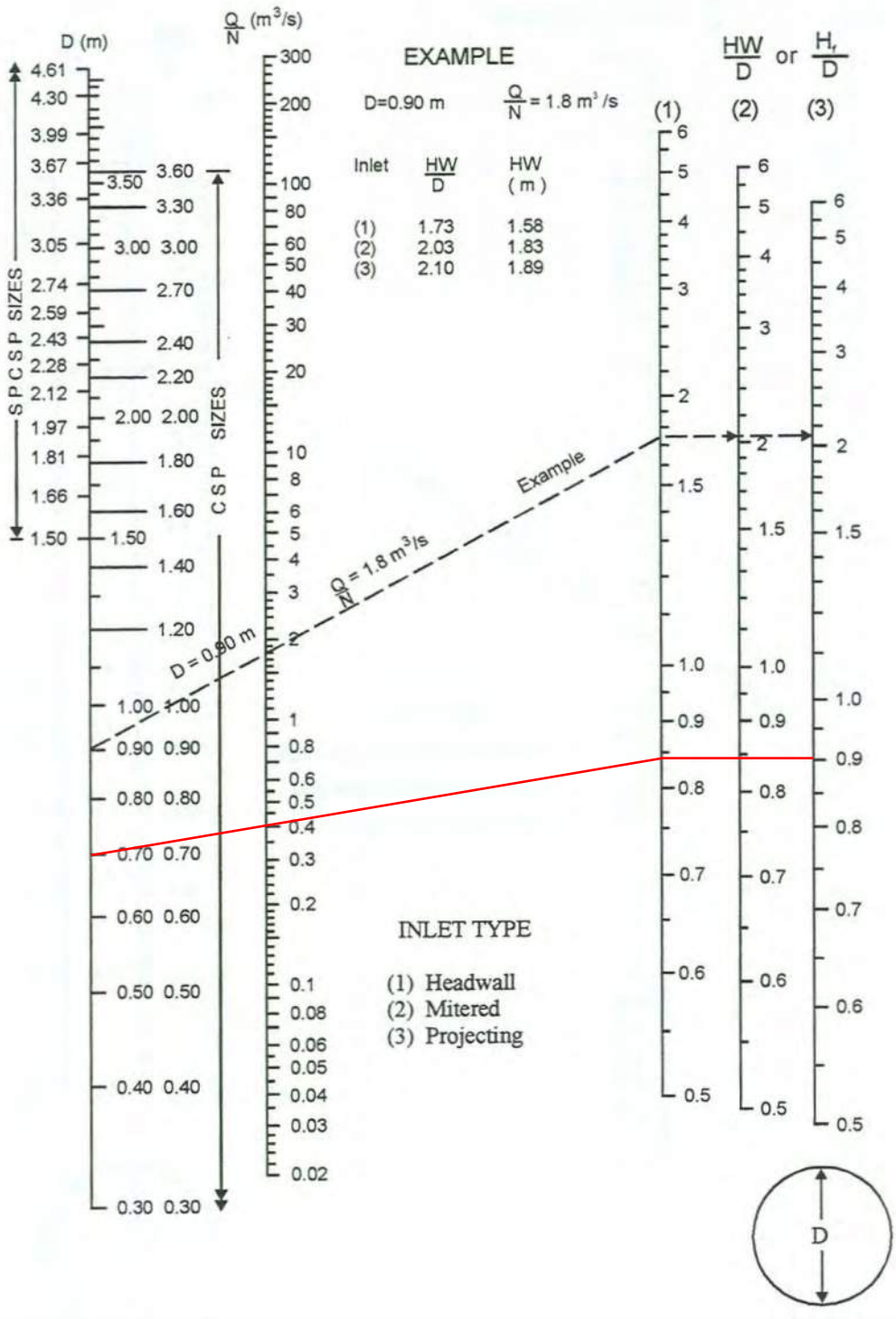


Source: Herr (1977)

Maximum Q = 242.68 L/s (100yr runoff from Drainage Areas 2-4)

Culvert #2 - Pond 1 Culvert 2
100-yr Flow

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts

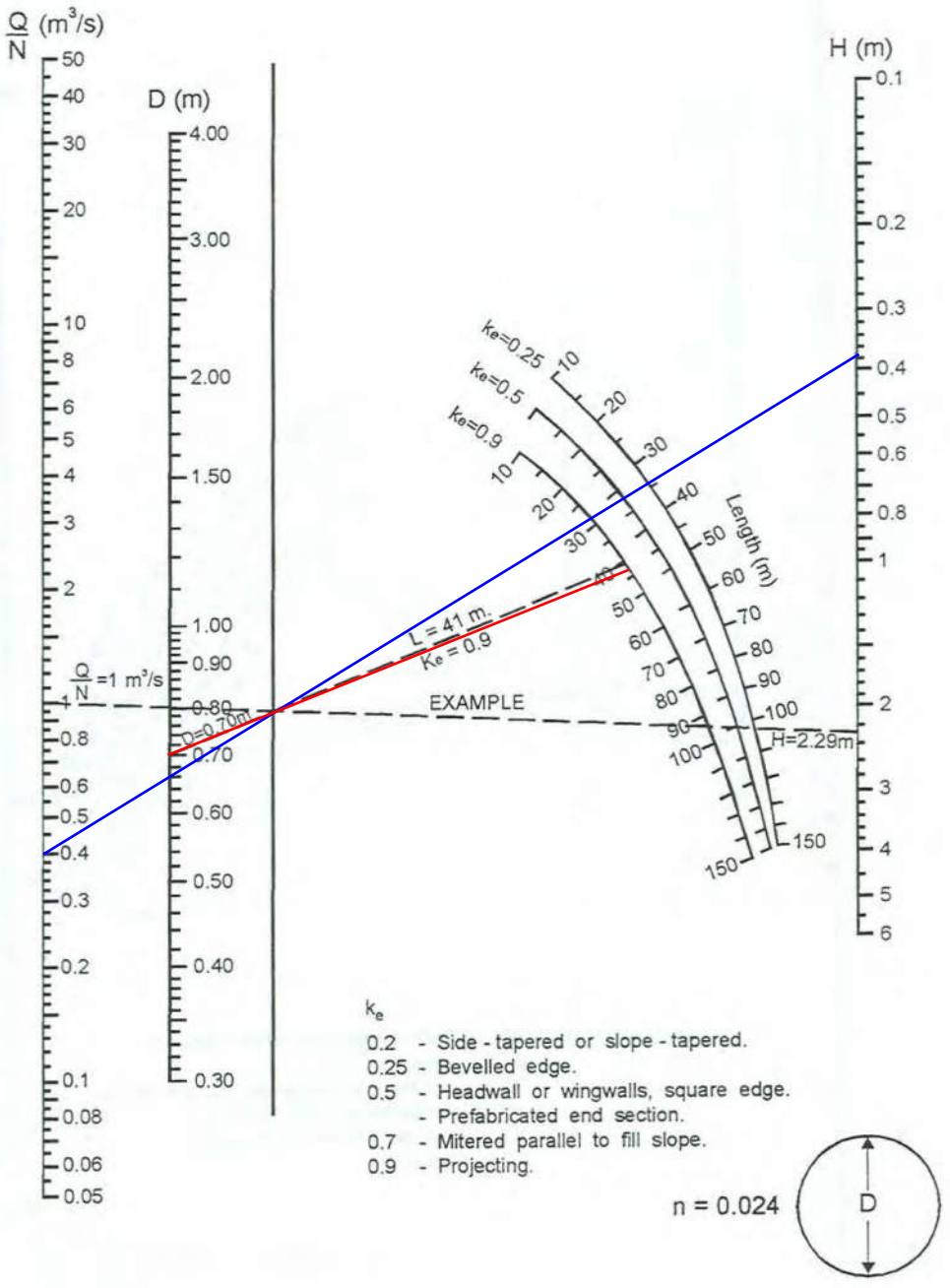


Source: Herr (1977)

Maximum Q = 403.5 L/s (100yr runoff from Drainage Areas 8-13; and controlled flow from Buildings A1, A2, B1, B2)

Culvert #2 - Pond 1 Culvert 2
100-yr Flow

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

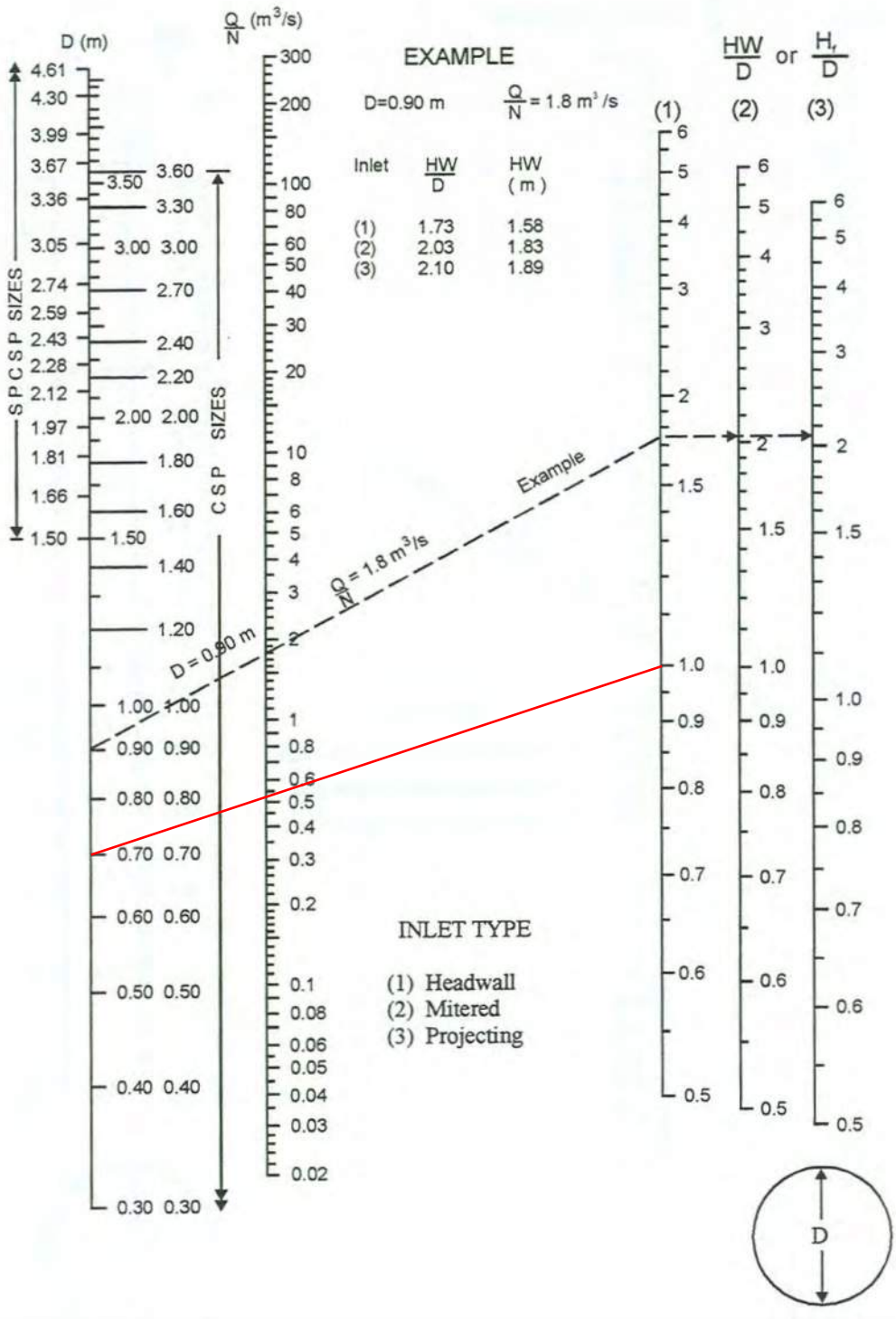


Source: Herr (1977)

Maximum Q = 403.5 L/s (100yr runoff from Drainage Areas 8-13; and controlled flow from Buildings A1, A2, B1, B2)

Culvert #5 - Pond 1 Outlet
Full-Flow Capacity

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts

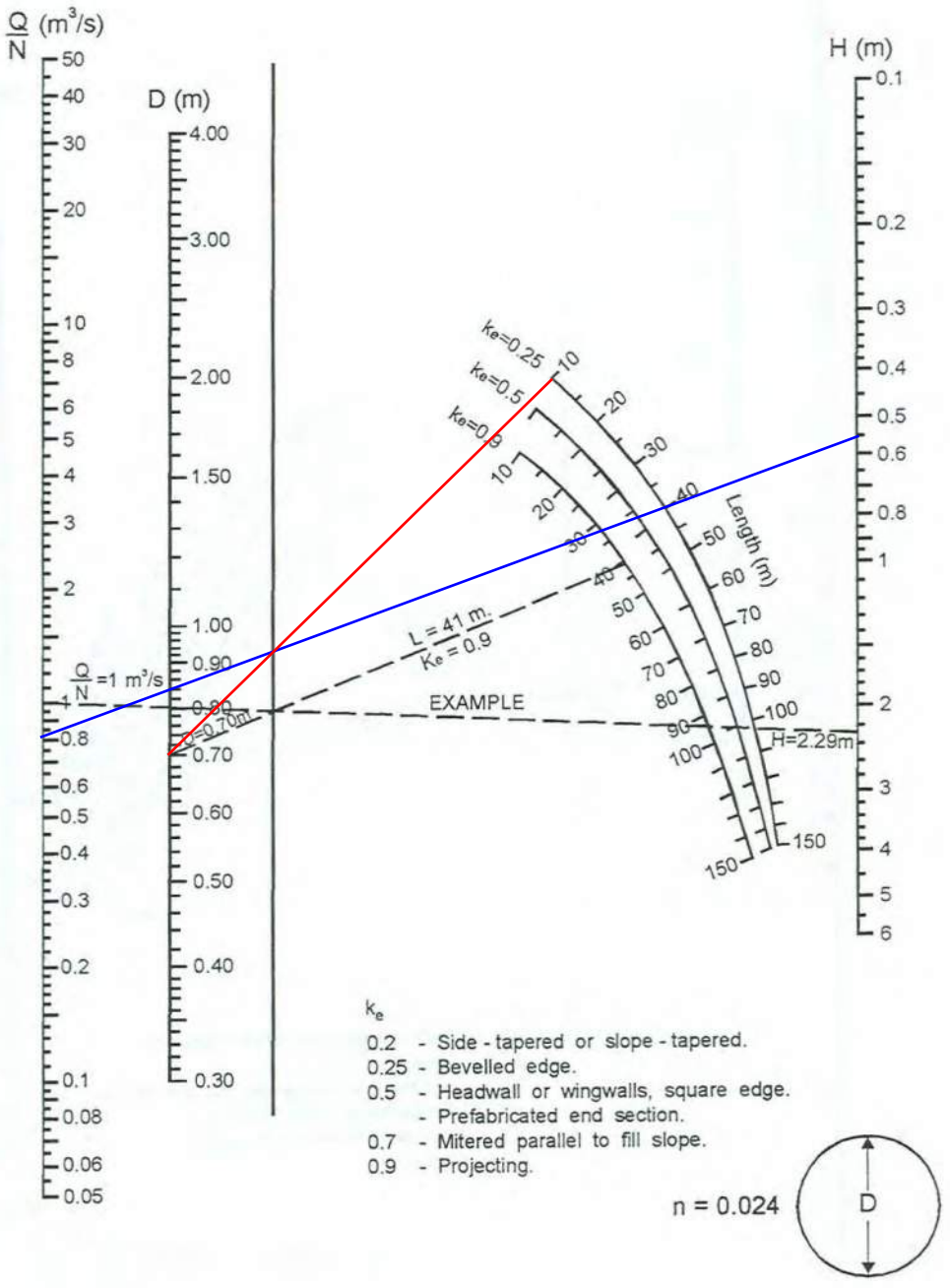


Source: Herr (1977)

Maximum Q requiring free-flow = 400.3 L/s (2yr runoff from Drainage Areas 1-13; and controlled flow from Buildings A1, A2, B1, B2)

Culvert #5 - Pond 1 Outlet
Full-Flow Capacity

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full

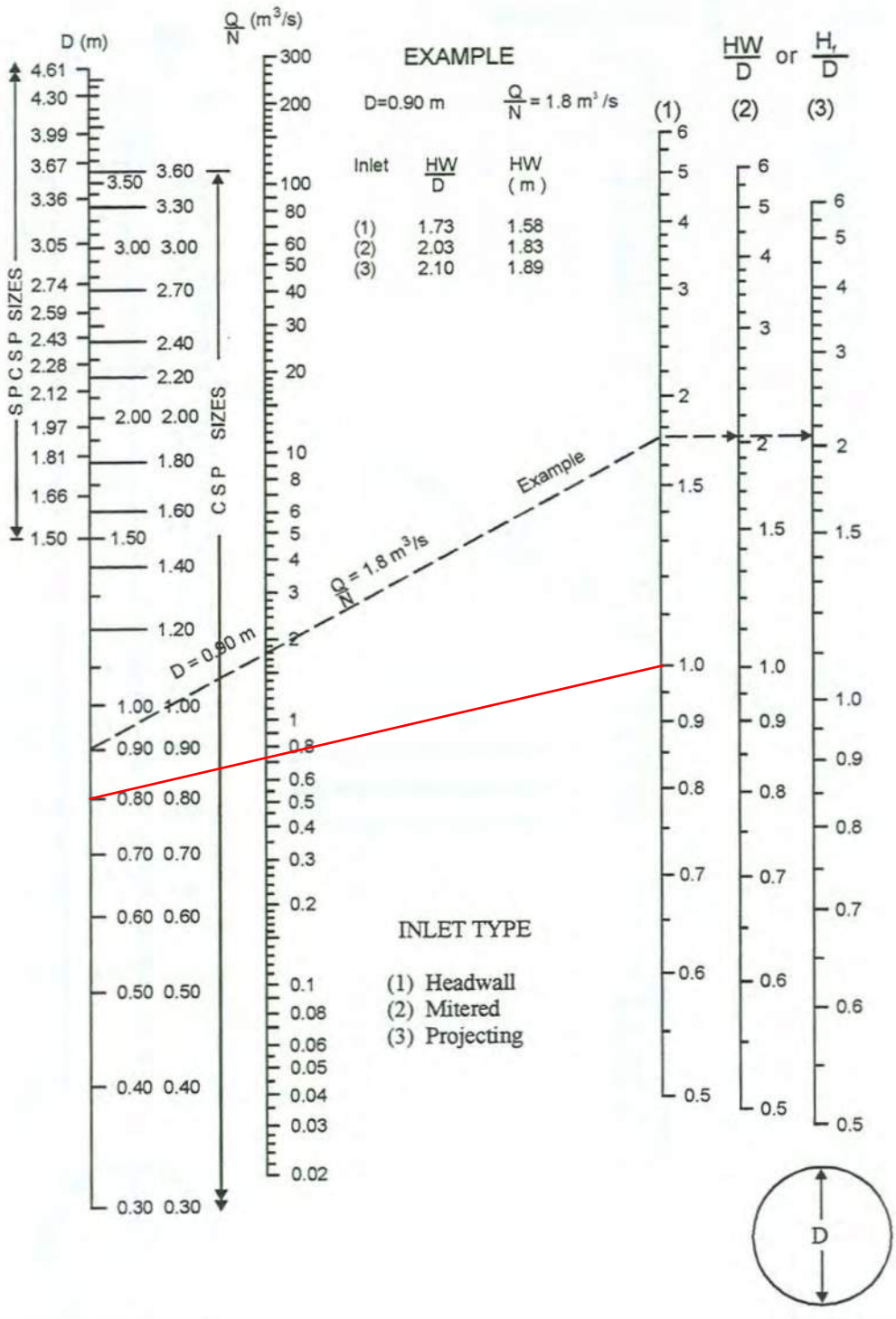


Source: Herr (1977)

Maximum Q requiring free-flow = 400.3 L/s (2yr runoff from Drainage Areas 1-13; and controlled flow from Buildings A1, A2, B1, B2)

Culvert #6 - Pond 2 Outlet
Full-Flow Capacity

Design Chart 2.32: Inlet Control: Circular CSP and SPCSP Culverts

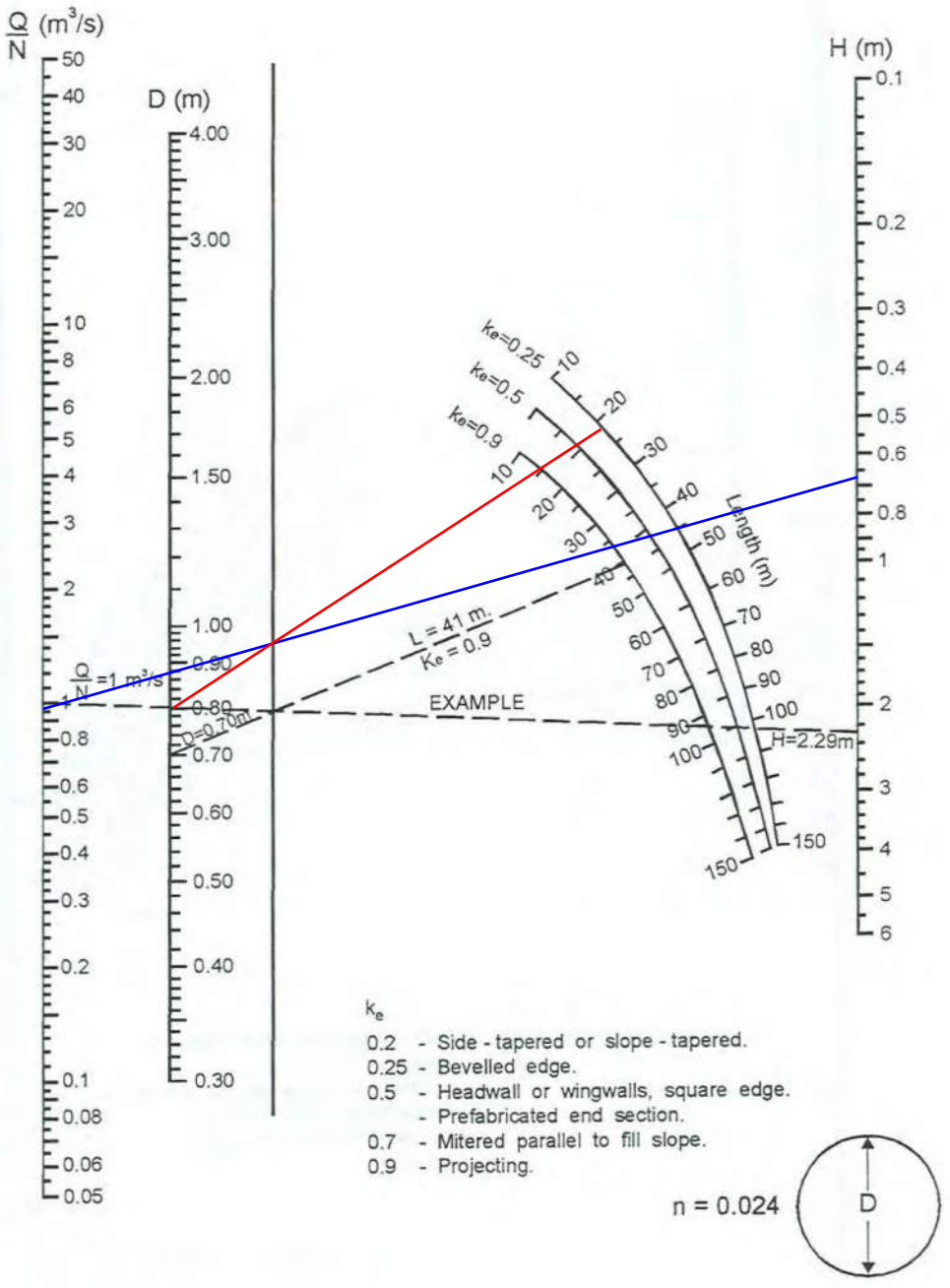


Source: Herr (1977)

Maximum Q requiring free-flow = 601.9 L/s (2yr runoff from Drainage Areas 14; and controlled flow from Buildings C1, C2, C3, D1, D2, D3)

Culvert #6 - Pond 2 Outlet
Full-Flow Capacity

Design Chart 2.35: Outlet Control: CSP Culvert - Flowing Full



Source: Herr (1977)

Maximum Q requiring free-flow = 601.9 L/s (2yr runoff from Drainage Areas 14; and controlled flow from Buildings C1, C2, C3, D1, D2, D3)