SERVICING AND STORMWATER MANAGEMENT REPORT

Project No.: 0CP-17-0381

6776 Rothbourne Road – Metro Towing Warehouse

Prepared for:

Metro Towing
2759 Lancaster Road
Ottawa, ON K1B 4V8

Prepared by:

McIntosh Perry Consulting Engineers
115 Walgreen Road
Carp ON K0A 1L0

Revision 2: December 17, 2019

McINTOSH PERRY

Executive Summary

Developing a site within the City of Ottawa requires meeting a predefined set of requirements outlined in the City of Ottawa Sewer Design Guidelines (SDG) - 2012 along with meeting the local conservation authority requirements (Mississippi Valley Conservation Authority - MVCA) and provincial requirements (Ministry of Environmental, Conservation and Parks - MECP). Site specific requirements are discussed and outlined in the pre-consultation meeting with the City of Ottawa before the detailed design process is initiated.

This report describes an innovative and cost-efficient design solution for the stormwater management (SWM) requirements in order to develop this site. The Mississippi Valley Conservation Authority (MVCA) requires an enhanced level of treatment for runoff. Quality treatment units have been proposed to provide the required amount of quality control requested.

Evaluation of the proposed site plan in addition to a review of the site grading and soil characteristics was completed. Our review identified that grassed swales and ponding areas with restricted flows provided the optimal design solution to meet the stormwater management requirements. During storm events the stormwater will be retained within the enhanced grassed swales and ponding areas until the storm event subsides and flows reduce. These design elements will ensure that water quality and quantity concerns are addressed at all stages of development.

It is our professional opinion that this site located at 6776 Rothbourne Road is able to be developed to accommodate the proposed Metro Towing building and parking area.

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1.0 PROJECT DESCRIPTION

1.1 Purpose

McIntosh Perry (MP) has been retained by Metro Towing to prepare this Servicing and Stormwater Management Report in support of the Site Plan Control process for the proposed development located at 6776 Rothbourne Road within the City of Ottawa.

The main purpose of this report is to present a servicing design for the development in accordance with the recommendations and guidelines provided by the City of Ottawa (City), the Mississippi Valley Conservation Authority (MVCA), and the Ministry of the Environment, Conservation and Parks (MECP). It should be noted that a stormwater management plan had been previously approved for the existing development on the south portion of the site, however there are currently no existing measures in place. As such, this report will include a comprehensive stormwater management design that will be completed to address the existing and proposed development on the site.

This report should be read in conjunction with site drawings and reports.

1.2 Site Description

The property is located at 6776 Rothbourne Road. It is described as Part of Lot 18, Concession 12, City of Ottawa, Ontario (see Appendix 'A' for Key Plan). The land in question covers approximately 10.08 ha. The property currently has an existing wetland in addition to Hazeldean Municipal Drain running through the site. The northern portion of the site is currently developed with a building fronting Rothbourne Road and a gravel parking area. There is an existing berm currently constructed at the south side of the existing development area and north of the wetland area. The wetland and drain are located within the middle section of the site. The rear portion of the site is currently undeveloped.

The proposed development consists of a 969 m², one-storey warehouse with gravel parking at the rear portion of the site. An access road will be constructed through the middle wetland portion of the site. Swales are proposed adjacent to existing berms at the south side of the site for stormwater management purposes.

2.0 BACKGROUND STUDIES

Background studies that have been completed for the site include review of a topographical survey of the site, a geotechnical report, a Phase I Environmental Site Assessment (ESA) and a Servicing Brief for the existing development.

A topographic survey of the site was completed on June 17, 2019 by MPSI and can be found under separate cover.

The following reports have previously been completed and are available under separate cover:

- Geotechnical Investigation completed by McIntosh Perry dated June 2019.

- Phase I ESA completed by McIntosh Perry dated July 2019.
- Servicing Brief completed by McIntosh Perry dated May 2, 2007.

3.0 PRE-CONSULTATION SUMMARY

City of Ottawa Staff and MVCA have been pre-consulted regarding this proposed development. Specific design parameters to be incorporated within this design include the following:

- Pre-development and post-development flows shall be calculated using the FAA method.
- Control 5 through 100-year post-development flows to the 5 and 100-year pre-development flows with a combined C value to 0.20.
- Update stormwater management calculations and facilities for the existing development.
- Enhanced (80% TSS removal) is required.

Correspondence can be found in Appendix 'B'.

4.0 EXISTING SERVICES

There are no underground services available within the Rothbourne Road right-of-way though overhead wires are present along the frontage of the site. There is a well and septic located near the existing building.

The existing Servicing Brief completed for the existing development at the south of the site indicates there were proposed stormwater management facilities (swale and ponding area), however after a review of the topographic survey it appears there are currently no stormwater management measures in place.

5.0 SERVICING PLAN

5.1 Proposed Servicing Overview

The proposed building will not require water and sanitary services. Fire tanks are proposed within 90m of the building for firefighting.

The stormwater for the northern area of the site (existing development) will continue to be conveyed by sheet flow towards the south and into proposed swales along the north side of the existing berm prior to being discharged.

The stormwater for the south area of the site (proposed development) will be conveyed by sheet flow towards the north and into proposed ponding area along the south side of the proposed berm prior to being discharged.

5.2 Proposed Water Design

Fire protection will be provided on site via concrete water storage tanks. The minimum supply of water was calculated per the Ontario Building Code and is 135,000L (35,663 gal). Four 10,000gal concrete water tanks

have been proposed for the fire protection water supply for the proposed building. It as anticipated that the tanks will be filled via water trucks. Refer to Appendix 'C' for calculations.

5.3 Proposed Storm Design (Conveyance and Management)

The site has been described as three areas. The south area being the proposed development, the middle area being the wetland, and the north area being the existing development. For calculation purposes, it will be assumed that the north area is currently undeveloped. There will be an increase in stormwater runoff due to the change in impermeable surface area. To manage the increase in stormwater runoff, grassed swales, ponds, and outlets equipped with orifice plates and earth weirs have been designed to convey and restrict stormwater runoff.

Stormwater runoff will be conveyed to the swales and pond via overland flow. The storage during the 5 through 100-year storm events shall be provided by swales. The combined restricted flow from the swales will not exceed the pre-development flows for the respective storm events. The outlet pipes have been sized for 5-year flows and equipped with orifice plates to control the flows. The stormwater management design will be further detailed in Section 6.0.

6.0 PROPOSED STORMWATER MANAGEMENT

6.1 Design Criteria and Methodology

The northern portion of the site is currently developed however no stormwater management facilities are currently in place. Swales with an orifice at the outlet will be proposed to provide the required restriction and storage for the developed area. The drainage pattern for this portion of the site will remain as it currently is in its developed state. Emergency overland flow will be directed towards the adjacent ditch and ultimately the wetland area.

Stormwater management for the south portion will be maintained through positive drainage away from the proposed building and be conveyed by way of overland sheet flow to the north where a ponding area equipped with an earth weir and orifice are proposed to restrict the runoff and provide storage. The emergency overland flow will be directed towards the wetland area. The quantitative and qualitative properties of the storm runoff for both the pre- and post-development flows are further detailed below.

Stormwater Best Management Practices (SWM BMP's) will be implemented at the "Lot level", "Conveyance" and "End of Pipe" locations. These concepts will be explained further in Section 6.3.

6.2 Runoff Calculations

Runoff calculations presented in this report are derived using the Rational Method, given as:

$$Q = 2.78CIA \text{ (L/s)}$$

Where C = Runoff coefficient

I = Rainfall intensity in mm/hr (City of Ottawa IDF curves)

A = Drainage area in hectares

It is recognized that the rational method tends to overestimate runoff rates. As a by-product of using extremely conservative prediction method, any facilities that are sized using these results are expected to function as intended in real world conditions.

The following coefficients were used to develop an average C for each area:

Table 1: Average Runoff Coefficients (C)

Roofs/Concrete/Asphalt	0.90
Gravel	0.70
Undeveloped and Grass	0.20

As per the City of Ottawa Sewer Design Guidelines, the 5-year balanced 'C' value must be increased by 25% for a 100-year storm event to a maximum of 1.0.

The time of concentration (Tc) used for pre-development and post-development flows shall be calculated using the FAA method (refer to Appendix 'F').

6.2.1 Pre-Development Drainage

The existing site has been demonstrated as drainage areas A1, A2, and A3. Drainage area A1 represents the north site area that is currently developed. Pre-development calculations will assume the area is vegetated as it was prior to development. Drainage area A2 is the middle portion of the site consisting of a wetland and the Hazeldean Municipal Drain. Drainage area A3 is the south portion of the site and is currently undeveloped with vegetation. Drawing CP-17-0381 PRE (Appendix 'D') indicates the limits of the drainage areas. Table 2 demonstrates the existing flow rates in pre-development conditions.

Table 2: Pre-Development Runoff Summary

Area ID	Drainage Area (ha)	Runoff Coefficient (5-year)	Runoff Coefficient (100-year)	T_c (min)	Unrestricted 5-year Peak Flow (L/s)	Unrestricted 100-year Peak Flow (L/s)
A1	2.87	0.20	0.25	36	76.42	162.58
A2	2.95	0.20	0.25	36	78.46	166.92
A3	4.27	0.20	0.25	36	113.68	241.83
Total	**10.08**				268.57	571.33

(See Appendix 'F' for Calculations)

6.2.2 Post-Development Drainage

The post-development drainage plan was designed to retain runoff generated by a 5 and 100-year storm event onsite. Stormwater exceeding this amount is directed to the wetland area. The post-development flows have been restricted to match the pre-development flows for the entire site. The proposed drainage and overland flow directions are indicated on drawing CP-17-0381 POST (Appendix 'E'). Table 3 below displays the post-development runoff generated by the proposed site.

Table 3: Post-Development Runoff Summary

Area ID	Drainage Area (ha)	Runoff Coefficient (5-year)	Runoff Coefficient (100-year)	T_c (min)	Unrestricted 5-year Peak Flow (L/s)	Unrestricted 100-year Peak Flow (L/s)
B1	2.27	0.70	0.88	35	215.23	457.34
B2	0.60	0.44	0.55	35	35.72	75.65
B3	0.72	0.29	0.35	35	27.86	57.88
B4	3.55	0.65	0.81	35	310.69	659.63
B5	2.95	0.23	0.29	36	90.02	191.49
Total	10.08				679.52	1441.99

(See Appendix 'F' for Calculations)

Areas B1 and B2 make up the front northern portion of the site that is currently developed. Area B5 is the middle portion of the site consisting of the wetland and Hazelden Municipal Drain. Area B3 and B4 make up the rear southern portion of the site which will be the new development. Areas B2, B3, and B5 will be unrestricted areas. Runoff from areas B1 and B4 will be restricted before outletting to the wetland area. The restrictions will make up for the increased impermeable surface of the site as well as the unrestricted runoff leaving the site. See Appendix 'F' for calculations. This restriction and quality runoff control will be further detailed in Sections 6.3 and 6.4.

6.3 Quantity Control

The post-development runoff for this site has been restricted to match the 5 and 100-year pre-development flow rates with a calculated C value of 0.20 and 0.25, respectively. Reducing site flows will be achieved using flow restrictions and will create the need for onsite storage. Runoff from areas B1 and B4 will be restricted as detailed in Table 4 below.

Table 4: Post-Development Restricted Runoff Calculations

Area ID	Post-Development Unrestricted (L/s)		Post-Development (Restricted) (L/s)		
	5-yr	100-yr	5-yr	100-yr	
B1	215.23	457.34	52.03	67.42	Restricted
B2	35.72	75.65	35.72	75.65	Unrestricted
B3	27.86	57.88	27.86	57.88	Unrestricted
B4	310.69	659.63	61.88	88.96	Restricted
B5	90.02	191.49	90.02	191.49	Unrestricted Wetland
Total	**679.52**	1441.99	267.51	481.41	

(See Appendix 'F' for Calculations)

Runoff from Area B1 will be restricted at the outlet by a 175mm diameter orifice plug within the 600mm diameter outlet pipe. This orifice plug will restrict the 5 and 100-year storm event flows to 52.03 L/s and 67.42 L/s creating a water surface elevations (WSEL) of 131.45 and 131.90. The storage for this area will be provided within the grassed swale before being outlet to the adjacent ditch and ultimately to the wetland.

Runoff from area B4 will be restricted at the outlet by a 250mm diameter orifice plug within the 750mm diameter outlet pipe. This orifice plug will restrict the 5 and 100-year storm event flows to 61.88 L/s and 88.96 L/s creating a water surface elevations (WSEL) of 130.90 and 131.14. The storage for this area will be provided within the grassed ponding area. Table 5 below details the amount of required and provided storage before outletting to the wetland.

Table 5: Site Storage Summary

Area	Depth of Ponding (m) for 5-yr storm	5-year required storage (m^3)	5-year available storage (m^3)	Depth of Ponding (m) for 100-yr storm	100-year required storage (m^3)	100-year available storage (m^3)
B1	0.60	345.3	355.0	1.05	873.2	875.8
B4	0.35	536.7	583.8	0.59	1296.8	724.10

(See Appendix 'F' for Calculations)

6.4 Infiltration Areas

In addition to the required ponding volume noted above for SWM, infiltration volumes are also required. Infiltration volumes of 197m³ and 275m³ for the north and south portions of the site are required in order to meet mitigation requirements. Refer to the Hydrologic Impact Assessment for details. In the north portion of the site, infiltration trenches have been placed adjacent to the swales. The trench will accept runoff from the site. Once the trench is full it will overflow to the swale. An infiltration area has been provided within the

bottom of the south swale. The areas have been designed with 50mm diameter clear stone and a void ratio of 40%. In addition, geotextile is proposed around the areas and 0.30m sand filter layer has also been provided. Refer to Appendix 'F' for details.

6.5 Quality Control

The development of this lot will employ Best Management Practices (BMP's) wherever possible. The intent of implementing stormwater BMP's is to ensure that water quality and quantity concerns are addressed at all stages of development. Lot level BMP's typically include temporary retention of the parking lot runoff, minimizing ground slopes and maximizing landscaped areas. Some of these BMP's cannot be provided for this site due to site constraints and development requirements. The grassed swale and ponding area have a variant cross-slope and a drainage conveyance slope of 0.5% to slow down the stormwater which creates an opportunity for infiltration and removal of total suspended solids. It is suggested that the grassed swale be evaluated yearly to determine if the amount of suspended solid accumulation requires removal. The site requires enhanced quality control (80% TSS removal). Hydro International First Defence units have been proposed within MH1 and MH2.

7.0 SEDIMENT EROSION CONTROL

The site-grading contractor is responsible for ensuring sediment control structures are installed in accordance with the Erosion and Sediment Control Plan as indicated. Silt fences shall be installed on site before construction or earth-moving operations begin.

The Contractor, at their discretion or at the instruction of the City, the Conservation Authority or the Contract Administrator shall increase the quantity of erosion and sediment controls on-site to ensure that the site is operating as intended and no additional sediment finds its way into the ditches on site. The straw bales & silt fences shall be inspected weekly and after rainfall events. Care shall be taken to properly remove sediment from the fences and check dams as required.

Work through winter months shall be closely monitored for erosion along sloped areas. Should erosion be noted, the Contractor shall be alerted and shall take all necessary steps to rectify the situation. Should the Contractor's efforts fail at remediating the eroded areas, the Contractor shall contact the Conservation Authority to review the site conditions and determine the appropriate course of action.

8.0 SUMMARY

- A new 969 m^2 warehouse and gravel parking will be constructed within the rear portion of the site located at 6776 Rothbourne Road.
- The existing development at the front portion of the site will remain with proposed stormwater management features applied.
- A new access roadway will be constructed through the wetland portion of the site to access the rear property development.
- The proposed building will not require water and sanitary services. Fire tanks are proposed within 90m of the building for firefighting.
- Stormwater runoff for the existing development area will be directed by overland sheet flow to the proposed swale and will be restricted before outletting.
- Stormwater runoff for the new development area will be directed by overland sheet flow to the proposed ponding area and will be restricted before outletting.
- As discussed with the City of Ottawa staff, the stormwater management design will ensure that the post-development flow rates are restricted to the 5-year and 100-year pre-development flow rate respectively, with a calculated maximum C value of 0.50.
- The quality treatment units will account for 80% total suspended solid removal per the Mississippi Valley Conservation Authorities requirements.

9.0 RECOMMENDATIONS

Based on the information presented in this report, we recommend that City of Ottawa approve this Servicing and Stormwater Management Report in support of the proposed development on Rothbourne Road.

The sediment and erosion control plan outlined in Section 7.0 and detailed in the Grading and Drainage Plan notes are to be implemented by the contractor.

This report is respectfully being submitted for approval.

Ryan Kennedy, P.Eng.
Practice Area Lead, Land Development
McIntosh Perry Consulting Engineers
T: 613.903.5766
E: r.kennedy@mcintoshperry.com

Charissa Hampel, EIT
Engineering Intern, Land Development
McIntosh Perry Consulting Engineers
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10.0 STATEMENT OF LIMITATIONS

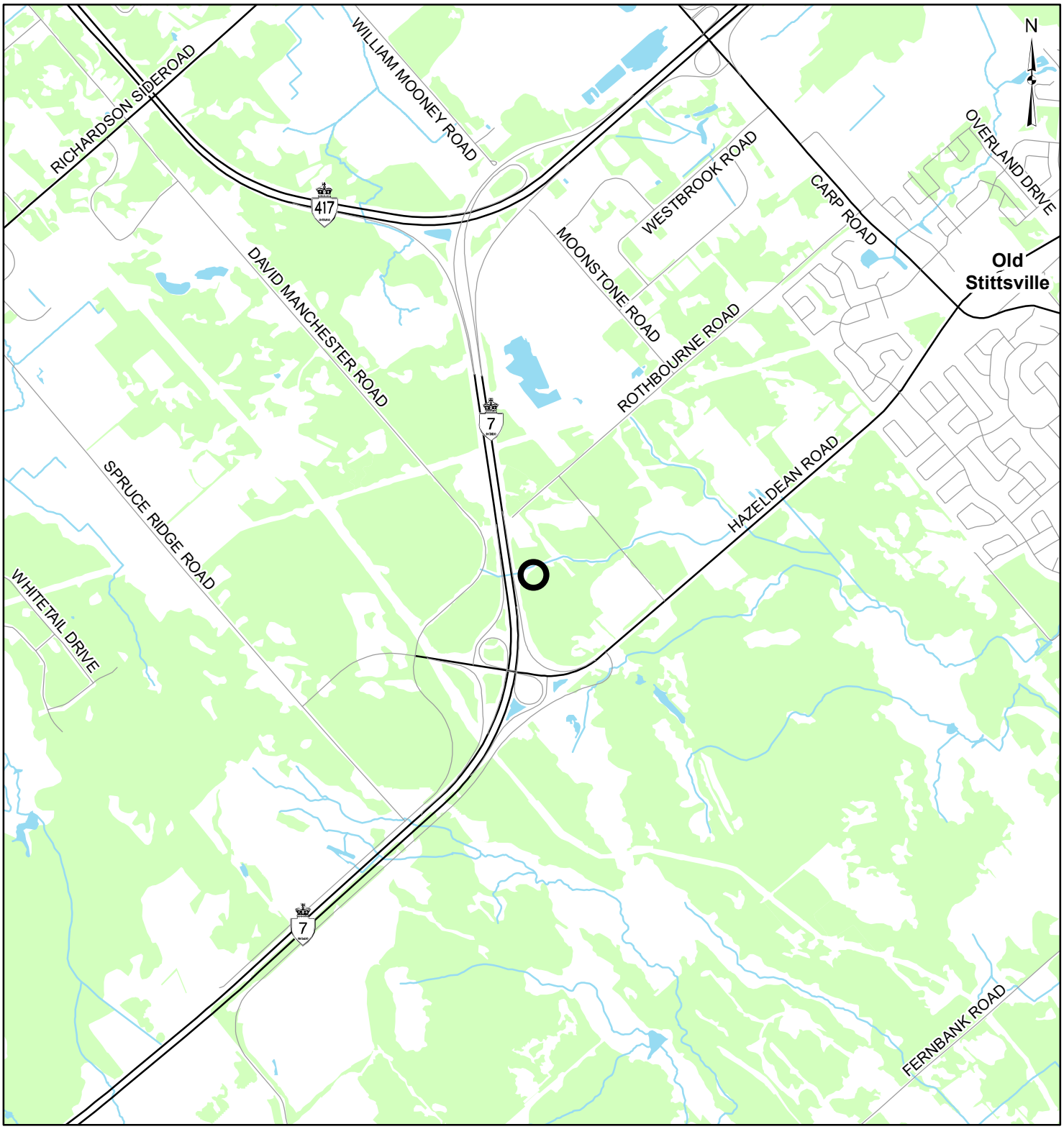
This report was produced for the exclusive use of Metro Towing. The purpose of the report is to assess the existing stormwater management system and provide recommendations and designs for the post-construction scenario that comply with the guidelines and standards from the Ministry of the Environment, Conservation and Parks, City of Ottawa and local approval agencies. McIntosh Perry reviewed the site information and background documents listed in Section 2.0 of this report. While the previous data was reviewed by McIntosh Perry and site visits were performed, no field verification/measures of any information were conducted.

Any use of this review by a third party, or any reliance on decisions made based on it, without a reliance report is the responsibility of such third parties. McIntosh Perry accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this review.

The findings, conclusions and/or recommendations of this report are only valid as of the date of this report. No assurance is made regarding any changes in conditions subsequent to this date. If additional information is discovered or becomes available at a future date, McIntosh Perry should be requested to re-evaluate the conclusions presented in this report, and provide amendments, if required.

APPENDIX A:
KEY PLAN

McINTOSH PERRY



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Scale 1:30,000 Metres

LEGEND

- Site Location
- Local Road
- Major Road
- Watercourse
- Waterbody
- Wooded Area

REFERENCE

GIS data provided by the Ontario Ministry of Natural Resources and Forestry, 2019.
Note: Property and severance boundaries are approximate.

CLIENT: METRO TOWING

PROJECT: 6776 ROTHBORNE ROAD

TITLE: SITE LOCATION

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

PROJECT NO: CP-17-0381		FIGURE:
Date	Jul., 09, 2019	1
GIS	LC	
Checked By	CH	

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APPENDIX B:
PRE-CONSULTATION NOTES

McINTOSH PERRY

Pre-Application Consultation Notes

Date:	August 30, 2017
Subject Address:	6776 Rothbourne Road
Attendees:	Natalie Persaud, City, Planner Matthew Hayley, City, Environmental Planner Amira Shehata, City, Transportation Kevin Hall, City, Infrastructure Cheryl McWilliams, City, Sr. Planner Nick Stow, City, Sr. Policy Planner (Natural Systems) Andy Moore, MVCA, Regulations Officer Benjamin Clare, McIntosh Perry, Planner Heather Lunn, McIntosh Perry, Biologist Ack Wehbe, Metro Towing
Existing Use:	Automobile Salvage Yard City of Ottawa, Emergency/Protective Services uses site for training purposes.

Existing Policies:

Zoning:	Dual zoned, RG1 and EP3 Rural General Industrial, Subzone 1, permits for storage yard EP3 does not permit this landuse
Official Plan:	Schedule A, Rural Policy Plan General Rural Area Significant Wetlands

Proposed Use:

It is proposed to construct a drive aisle across the portion of the lands zoned EP3 (Significant Wetlands), to access the rear section of the site zoned RG1, for the purpose of additional area for storage of salvaged vehicles.

No mechanic or body work is being conducted at the site nor is proposed, and the site is currently used by the City of Ottawa Emergency & Protective Services for training purposes, using vehicles on site.

Comments:

Planning Natalie.Persaud@ottawa.ca **(613) 580-2424 Ext. 12681**	At minimum, an application to revise the existing site plan and a zoning bylaw amendment will be required for the proposal. It is based on whether or not the lands affected are considered

wetlands. The City will not support alterations to the wetland. The notes that follow provide information pertaining to the preparation of plans and studies related to any application for the proposed development, however, do note, that it is provided on the basis that the lands are not wetlands.

Do confirm that first and then we can proceed. A full list of required plans is studies is not included. But can be should you wish to know generally what would be expected.

Engineering

Kevin.Hall@ottawa.ca
(613) 580-2424 Ext. 27824

Application submission will require,

- Updated engineering drawings showing what has changed from what has been approved. Drawings for the new area as well.
- Updated stormwater report for existing site and the new area.
- Geotechnical report
- Ministry of Environment and Climate Change (MOECC) application for Environment Compliance Approval will be required.

Environment

Matthew.Hayley@ottawa.ca
(613) 580-2424 Ext. 23358

Planning application in support of this development will require the submission of an Environmental Impact Statement (EIS).

The wetland boundary needs to be confirmed and is done so with a qualified Ontario Wetland Evaluation System evaluator. The wetland is the Goulbourn Wetland Complex.

With regards to the EIS:

- discuss the wetland boundary
- Blanding's turtle habitat mapping, and other Endangered and Threatened Species
- Consult with the Ministry of Natural Resources and Forestry (MNRF) for habitat and approvals.
- Watercourse setbacks and crossings
- Fish Habitat through the Department of Fisheries and Ocean (DFO) self-assessment process
- Terms of Reference (which the City can review ahead of time).

The watercourse is a municipal drain. Consult with the City's drain's group for further information (David Ryan, David.Ryan@ottawa.ca, 613-580-2424 ext. 25106).

Traffic
Amira.Shehata@ottawa.ca
(613) 580-2424 Ext. 27737

Consult with the Ministry of Transportation due to proximity of Highway 7.
No Traffic Impact Study will be required by the City.
The minimum width of a driveway is 6 metres

Mississippi Valley Conservation Authority
Andy Moore
amoore@mvc.on.ca

613 253 0006 ext. 257

History

- The wrecking yard was originally expanded sometime between 2008 & 2011 (differs from what is shown on the site plan, historical air photos below). This expansion was conducted within the 120 metre regulation limit of the PSW; however no action was taken by the MVCA at that time as it was not discovered by the MVCA until too late and we had no timeline of when the expansion actually occurred. A fence was also constructed along the southern edge of the expanded yard area

- In late 2013, we observed the further expansion of the wrecking yard to the south of the aforementioned fence on the property. This expansion encroached further into the 120m adjacent lands, and into the boundaries of the PSW itself. We laid charges for the unauthorized works in 2015. Through deliberations and working with the landowner, we agreed to have them remove all fill material from within the wetland and 20m of the wetland boundary. They also had to construct a clay berm along that setback to prevent contaminants from entering the wetland, but to also limit any future encroachment into the PSW. The landowners completed the works and we ended up withdrawing the charges in 2016.

New Proposal

- The MVCA would require that a wetland evaluator conduct an assessment of the currently mapped PSW on the property. This will ground truth the wetland boundaries, as Nick referred to in this morning's meeting, and determine the wetland's provincial significant designation. This in reality needs to be done before we can provide a clear direction as to how to proceed further. Should the wetland boundaries remain similar to what they currently are, we cannot support the proposal for crossing the wetland, either for a *Planning Act* application or at a staff level for a permit application under our regulation. In terms of our permit application and policies, proposals that cannot be approved at a staff level require a hearing of MVCA's Regulation Committee. The

Regulations Committee would make the decision as to whether or not the MVCA would grant approval.

- Beyond the wetland evaluation, an Environmental and Hydrologic Impact Assessment would also be required. The assessment would need to demonstrate the anticipated impacts on the ecological and hydrological function of the wetland and how these impacts are to be mitigated.

Submission Requirements To be provided upon determination of application types.

From: Hall, Kevin <Kevin.Hall@ottawa.ca>
Sent: June 20, 2019 10:23 AM
To: Sean Leflar
Cc: Tyler Ferguson; Benjamin Clare; Wang, Anne; McWilliams, Cheryl
Subject: RE: 6776 Rothbourne Road: SWM Criteria & Pre-Con Clarification

Sean

My answers are in red below.

Kevin Hall, C.E.T.
Project Manager, Infrastructure Approvals
Development Review - Rural Services
Gestionnaire de projet, Approbation des demandes d'infrastructure
Examen des demandes d'aménagement (Services ruraux)
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27824
Fax 613.580.2576
ottawa.ca/planning / ottawa.ca/urbanisme

From: Sean Leflar <s.leflar@mcintoshperry.com>
Sent: June 19, 2019 10:25 AM
To: Hall, Kevin <Kevin.Hall@ottawa.ca>
Cc: Tyler Ferguson <t.ferguson@mcintoshperry.com>; Benjamin Clare <b.clare@mcintoshperry.com>
Subject: 6776 Rothbourne Road: SWM Criteria & Pre-Con Clarification

G
M

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a

getting ready to start up the civil design for the site located at 6776 Rothbourne Road within the City of Ottawa (location map attached for your reference). Currently the site is occupied by Metro Towing & Recovery office and storage yard. The development consist of adding a new building in the southwest corner as well as a new gravel storage yard on the south portion of the site outside the environmental feature setback including a clay berm between the municipal drain and the gravel yard.

When you have a moment can you correct any of the assumptions regarding the SWM criteria below:

- 5&100-year post-development flows will be restricted to the 5&100-year pre-development flows, respectively. Yes
- Treated and restricted stormwater will discharge into the Municipal Drain that flows through the site. It depends on the topography of the site. What are the existing drainage patterns of the site?
- A calculated C value will be used to a maximum of 0.5 for Pre-development flows. The pre-development c values will have to go back to before the site was developed. C of 0.5 would be quite high.
- A time of concentration for pre-development flows shall be 20min or as calculated using the FAA Method. I would us the FAA method.
- A time of concentration for post-development flows shall be 10min. Sure unless you want to calculate the new value.
- The existing and new area shall be considered independent SWM areas for calculation of flows, discharge and quality control. Not exactly. We need a comprehensive SWM for the entire site. If the existing area is working as designed then the rear of the site can be designed independently.

Secondly, could you possibly clarify a few points from the pre-con notes from August 30, 2017:

- Comment: *"Updated engineering drawings showing what has changed from what has been approved. Drawings for the new area as well."*
  MP Question: We are aware that previous the SWM has been removed from the original approved plans. Will it suffice to propose remedial modification on the drawings for the new area that revert the SWM for the existing site to the previously approved criteria? Can you please confirm that the previously approved plan is by McIntosh Perry, revision 4 dated September 12, 2007? I can't confirm the report. As mentioned above, we need a comprehensive SWM design for the entire site.
- Comment: *"Updated stormwater report for existing site and the new area.*
  MP Question: Similar to the question above, are we able to provide a section within the new site servicing and stormwater management report illuminating the remedial works and the associated calculations? Can you please confirm that the previously approved report is by McIntosh Perry, Job# P-06-297, dated May 2, 2007, revised August 15, 2007? I can't confirm he reports at this time. I don't have access to the files. I think it would be best to provide a new report with sections in it to address any past issues as required.

Lastly, it has come to our attention that the property adjacent to the subject site (6736 Rothbourne Road) is to revert completed works regarding the municipal drain to its original state. Are you able to provide further details and how this would effect our site? The topographic survey conducted for this development was completed after the alteration to the municipal drain was applied. I don't have any information on this site.

If you have any questions or concerns, please feel free to get in contact.

Thank you for your time, I look forward to hearing from you.

Sean Leflar

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s.leflar@mcintoshperry.com | www.mcintoshperry.com

McINTOSH PERRY

From: Andy Moore <amoore@mvc.on.ca>
Sent: June 24, 2019 2:20 PM
To: Sean Leflar; Matt Craig
Cc: Tyler Ferguson; Benjamin Clare
Subject: RE: 6776 Rothbourne Road: Stormwater Quality Criteria

Hi Sean,

There should not be any impacts to the site at 6776 Rothbourne Road. They have essentially been ordered to return the property to the state that it was in prior to the works commencing in 2012.

Thanks,

Andy

From: Sean Leflar [mailto:s.leflar@mcintoshperry.com]
Sent: Monday, June 24, 2019 1:24 PM
To: Andy Moore <amoore@mvc.on.ca>; Matt Craig <mcraig@mvc.on.ca>
Cc: Tyler Ferguson <t.ferguson@mcintoshperry.com>; Benjamin Clare <b.clare@mcintoshperry.com>
Subject: RE: 6776 Rothbourne Road: Stormwater Quality Criteria

Hello Andy,

Thank you for your reply.

Just to make sure we are on the same page. The required wetlands to be restored by the adjacent property will not have any effects on our site and our topographic survey will suffice for the development of our site (attached for your reference).

Please let me know if any of the above is erroneous.

Regards,

Sean Leflar
Civil Engineering Technologist
115 Walgreen Road, R.R. 3, Carp, ON K0A 1L0
T. 613.903.5790 | **F.** 613.836.3742
s.leflar@mcintoshperry.com | www.mcintoshperry.com

From: Andy Moore <amoore@mvc.on.ca>
Sent: June 24, 2019 12:37 PM
To: Sean Leflar <s.leflar@mcintoshperry.com>; Matt Craig <mcraig@mvc.on.ca>
Cc: Tyler Ferguson <t.ferguson@mcintoshperry.com>; Benjamin Clare <b.clare@mcintoshperry.com>
Subject: RE: 6776 Rothbourne Road: Stormwater Quality Criteria

Hello Sean,

The restoration order that has been issued for 6736 Rothbourne Road applies to the wetlands that were removed from the property only. The realigned channel of the Municipal Drain was not included in the court ordered restoration and will remain in its current location. The said wetlands that are required to be restored are located to the north of the municipal drain.

Thanks,

Andy

Andy Moore | Regulations Officer | Mississippi Valley Conservation Authority
www.mvc.on.ca | t. 613 253 0006 ext. 257 | f. 613 253 0122 | amoore@mvc.on.ca

---

From: Sean Leflar [mailto:s.leflar@mcintoshperry.com]
Sent: Monday, June 24, 2019 9:03 AM
To: Matt Craig <mcraig@mvc.on.ca>; Andy Moore <amoore@mvc.on.ca>
Cc: Tyler Ferguson <t.ferguson@mcintoshperry.com>; Benjamin Clare <b.clare@mcintoshperry.com>
Subject: RE: 6776 Rothbourne Road: Stormwater Quality Criteria

Good Morning,

My apologies for my delayed response. Thank you for clarifying the quality control requirements.

One further question. It has come to our attention that the property adjacent to the subject site (6736 Rothbourne Road) is to revert completed works regarding the municipal drain to its original state. Are you able to provide further details and how this would effect our site? The topographic survey conducted for this development was completed after the alteration to the municipal drain was applied.

We look forward to hearing from you.

Thanks,

Sean Leflar
Civil Engineering Technologist
115 Walgreen Road, R.R. 3, Carp, ON K0A 1L0
T. 613.903.5790 | **F.** 613.836.3742
s.leflar@mcintoshperry.com | www.mcintoshperry.com

From: Matt Craig <mcraig@mvc.on.ca>
Sent: June 20, 2019 8:11 AM
To: Andy Moore <amoore@mvc.on.ca>
Cc: Tyler Ferguson <t.ferguson@mcintoshperry.com>; Benjamin Clare <b.clare@mcintoshperry.com>; Sean Leflar <s.leflar@mcintoshperry.com>
Subject: RE: 6776 Rothbourne Road: Stormwater Quality Criteria

Good Morning,

The Poole Creek and Upper Poole Creek Sub watershed study both state that enhanced level of treatment is required. Please call me if you would like to discuss.

Regards

Matt Craig | Manager of Planning and Regulations | Mississippi Valley Conservation Authority
www.mvc.on.ca |t. 613 253 0006 ext. 226| f. 613 253 0122 | mcraig@mvc.on.ca

---

From: Andy Moore
Sent: June 19, 2019 9:29 AM
To: Matt Craig <mcraig@mvc.on.ca>
Subject: Fwd: 6776 Rothbourne Road: Stormwater Quality Criteria

FYI

Sent from my iPhone

Begin forwarded message:

> From: Sean Leflar <s.leflar@mcintoshperry.com>
> Date: June 19, 2019 at 9:21:02 AM EDT
> To: "amoore@mvc.on.ca" <amoore@mvc.on.ca>
> Cc: Tyler Ferguson <t.ferguson@mcintoshperry.com>, Benjamin Clare <b.clare@mcintoshperry.com>
> Subject: 6776 Rothbourne Road: Stormwater Quality Criteria
>
> Good Morning,
>
> I am getting ready to start up the Civil design for the site located at 6776 Rothbourne Road within the City of Ottawa and would like to inquire about the quality control the MVCA would require. The development includes a new 969.4m^2 building in the southwest corner and a gravel storage yard outside of the wetland setback including a clay berm between the municipal drain and the new gravel yard.
>
> On other sites in the area we have provided 70% TSS removal for the stormwater runoff. Will this level of treatment be sufficient for this site?
>
> If you require any further information or have any questions or concerns, please feel free to get in contact.
>
> Thank you for your time,
>
> **Sean Leflar**
> **Civil Engineering Technologist**
> 115 Walgreen Road, R.R. 3, Carp, ON K0A 1L0
> **T.** 613.903.5790 | **F.** 613.836.3742
> s.leflar@mcintoshperry.com | www.mcintoshperry.com

APPENDIX C:
FIRE PROTECTION CALCULATIONS

McINTOSH PERRY

McINTOSH PERRY

July 17, 2019

Re: Rural Fire Protection Tank Calculations

1.0 BUILDING OCCUPANCY

From Table 3.1.2.1. Volume 1 of the National Building Code – Major Occupancy Classification:

- Group F Division 3

2.0 BUILDINGS REQUIRING ON-SITE WATER SUPPLY

From Div. B 3.2.5.7. of the Ontario Building Code. And the 'Fire Protection Water Supply Guideline':

Q=K*V*Stot Where:

K = 19 (from Table 1 pg 10 of the guideline)
V = 8,269 m^3 (NOTE: The volume was calculated using total final volume of the building)

S_{tot} = 1.00 (from Figure 1 pg 11 of the guideline)

- Therefore, Q = (19) * (8,269 m3) * (1.00) = 157,110 L (~ 41,504gal)

3.0 MINIMUM REQUIRED WATER SUPPLY

From Div. B 3.2.5.7., Table 2, Volume 2 of the 'Fire Protection Water Supply Guideline'– Required Minimum Water Supply Flow Rate (L/min)

- 4500 L/min (if Q > 135,000 L < 162,000 L)

  From 3. (c) 4500 L/min for 30 min = 135,000 L (~35,663 gal)

Due to the excessive amount of water required from the equation above, the minimum supply required for 30 minutes will be used for this site. Therefore the proposed underground fire protection tanks will be 4 – 37,854 L (10,000 gal) tanks.

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info@mcintoshperry.com | www.mcintoshperry.com

Fire Tank Design Sheet

McINTOSH PERRY

Project: Metro Towing
Project No.: CP-17-0381
Designed By: CDH
Checked By: RPK
Date: July 17, 2019

Tank Size (10,000 L)

Mac Gregor Concrete

= 20`X 10`X 10`4 1/2"

= 6.1m X 3.05m X 3.16m

132.4	m	Existing Top of Grade
133.8	m	Proposed Top of Grade
0.9	m	Groundwater Depth
6.1	m	Length
3.05	m	Height
3.16	m	Width
2400	Kg/m^3	Density of Concrete
1600	Kg/m3	Density of Soil
1000	Kg/m3	Density of water

Volume

	Length		Height		Width
Exterior					
$V_{EXTERIOR}$ = (6.1)	X	(3.05)	X	(3.16)	
= 58.79 m^3					
Interior					
$V_{INTERIOR}$ = (5.8)	X	(2.75)	X	(2.86)	
= 45.62 m^3					
Total					
V_{TOTAL} = (58.79)	-	(45.62)			
= 13.17 m^3					

Force Down

Tank

F_{TANK} = (13.17) X (2400) X (9.81)

= 310.19 kN ↓

Soil

V_{SOIL} = (6.1) X (3.16) X (0.6)

= 11.57 m^3

F_{SOIL} = (11.57) X (1600) X (9.81)

= 181.53 kN ↓

Total

F_{TOTAL} = (310.19) + (181.53)

= 491.72 kN ↓

Force Up

Tank Bottom T/G - (0.6) Width - (3.16) * Without 1' Concrete Slab

= (133.8) - (0.6) - (3.16)

= 130.04 m

Ground Water Elevation

= (132.4) - (0.9) * Per MP Geotechnical Report

= 131.50 m

Depth of Water

= (131.50) - (130.04)

= 1.46 m

Volume

= (1.46) X (3.16) X (6.1)

= 28.14 m^3

Force Up

= (28.14) X (1000) X (9.81)

= 276.08 kN ↑

= (276.08) X (1.5) Safety Factor

= 414.12 kN ↑

Force Comparison

= 414.12 kN ↑ - 491.72 kN ↓

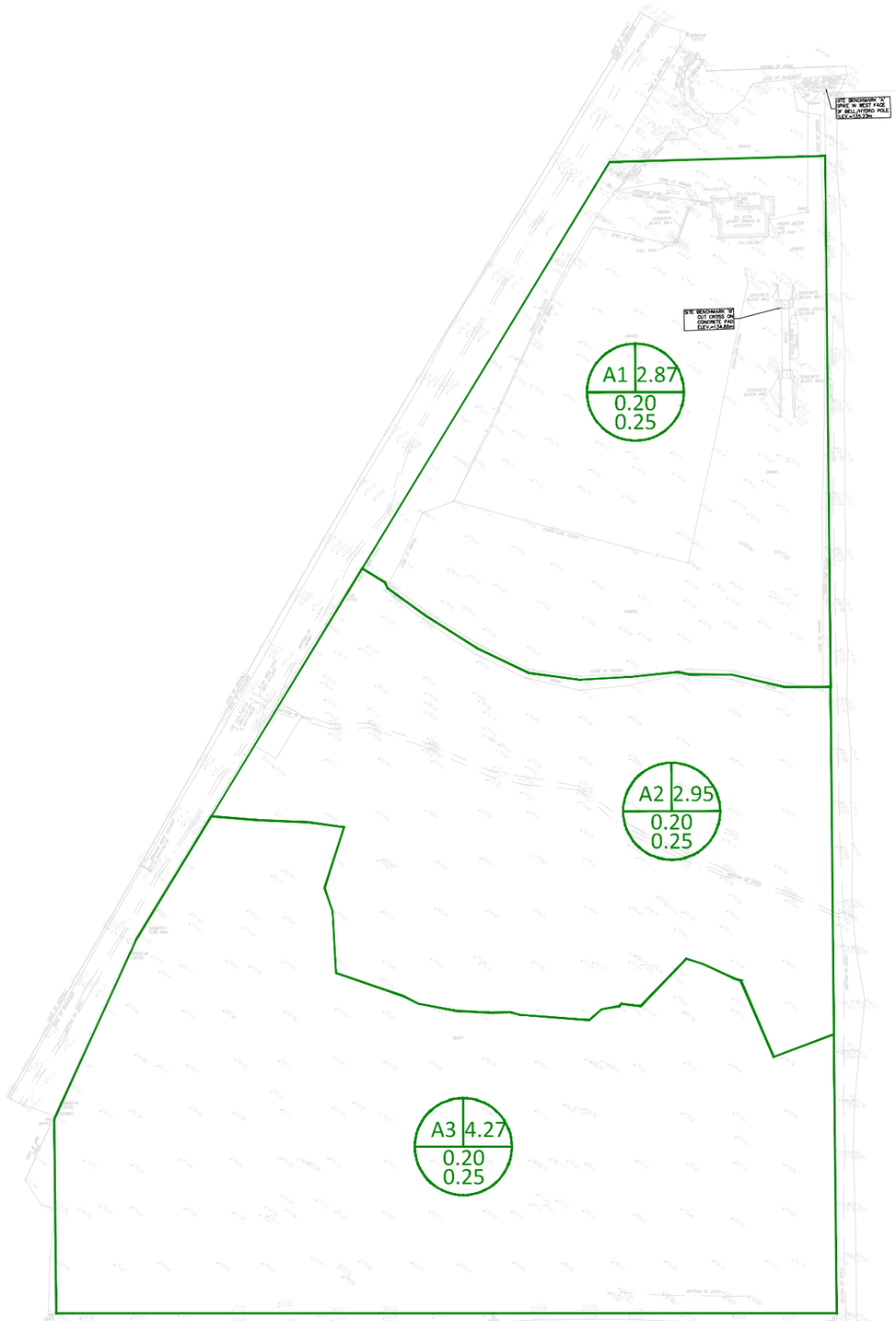
= -77.60 kN ↑

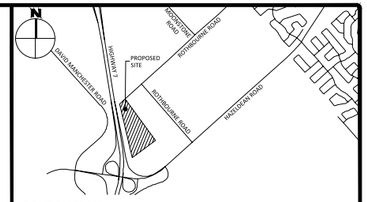
= 77.60 kN ↓

Therefore force down will be suffiecient without the use of a concrete slab

APPENDIX D:
PRE-DEVELOPMENT DRAINAGE PLAN

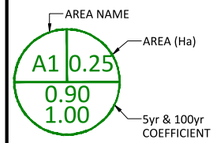
McINTOSH PERRY





LOCATION PLAN

LEGEND



FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revisions	Date
1	ISSUED FOR SITE PLAN CONTROL	JULY 17, 2019

Check and verify all dimensions before proceeding with the work

Do not scale drawings

SCALE 1 : 1000

0 25 50 75 100 Metres

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A 1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

Stamp:

Client:
METRO TOWING
2759 LANCASTER ROAD
OTTAWA, ON K1B 4V8

Project:
METRO TOW TRUCK
WAREHOUSE BUILDING
6776 ROTHBOURNE RD.
OTTAWA, ON

Drawing Title:
PRE-DEVELOPMENT
DRAINAGE AREA PLAN

Scale: 1:1000	Project Number: CP-17-0381
Drawn By: S.V.L.	
Checked By: R.P.K.	Drawing Number: PRE
Designed By: S.V.L.	

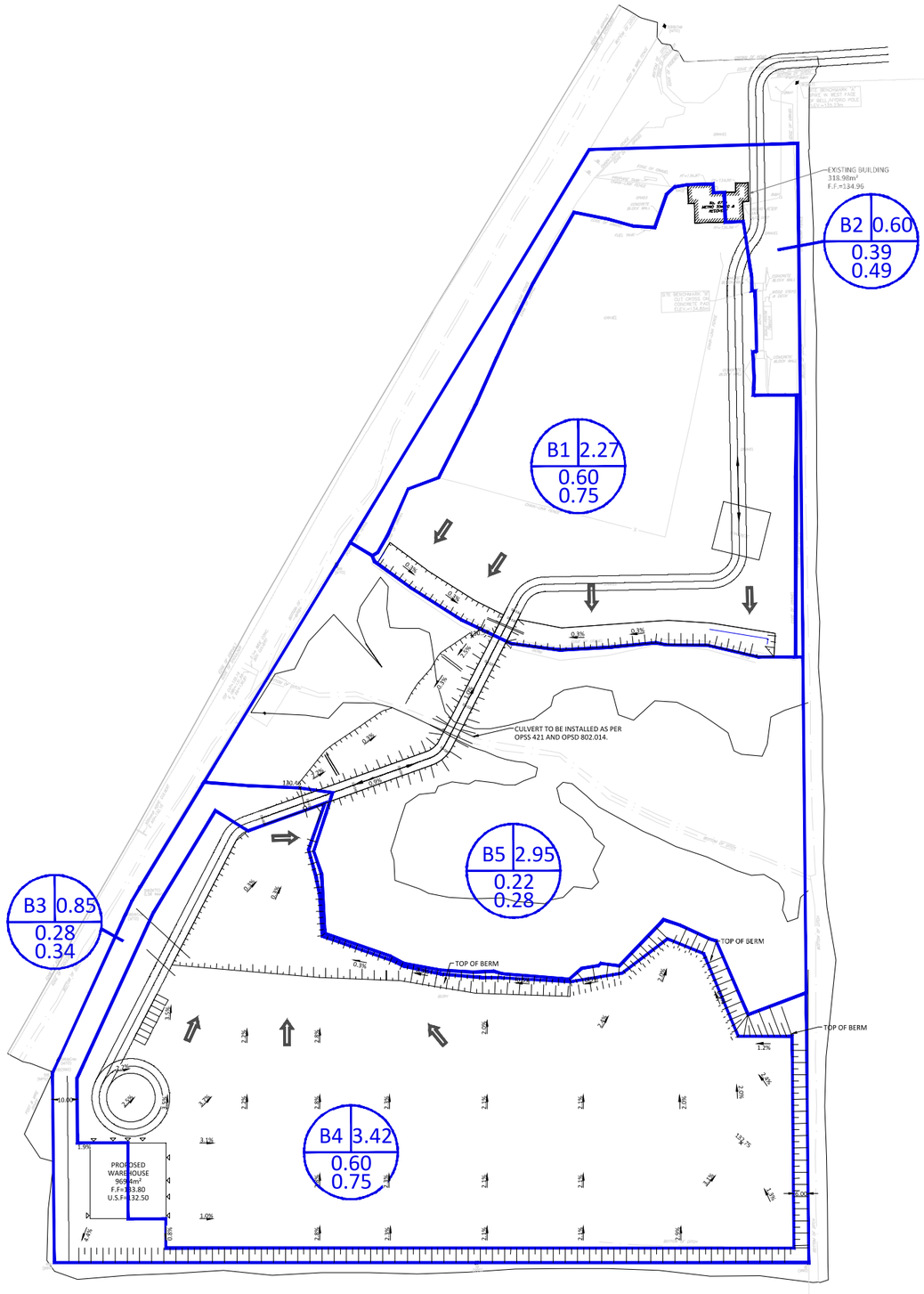
D07-12--XX-XXXX

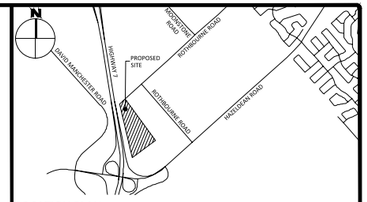
#XXXXX

FILENAME: \\192.168.1.3\mpdocument\01 Project - Proposals\2017 Jobs\CP\OCP-17-0381 Metro Towing, 6776 Rothbourne Road\15 - Drawings\OCP-17-0381 - Presentation.dwg
LAYOUT: PRE
LAST PLOTTED: Monday, July 22, 2019 01:19:11 PM by S.Lampel

APPENDIX E:
POST-DEVELOPMENT DRAINAGE PLAN

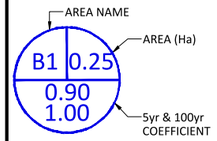
McINTOSH PERRY





LOCATION PLAN

LEGEND



FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revisions	Date
2	REVISED AS PER COMMENTS	DEC. 17, 2019
1	ISSUED FOR SITE PLAN CONTROL	JULY 17, 2019

Check and verify all dimensions before proceeding with the work

Do not scale drawings

SCALE 1 : 1000

0 25 50 75 100 Metres

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A 1L0
Tel: 613-836-2184 Fax: 613-836-3742
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Stamp:

Client:

METRO TOWING
2759 LANCASTER ROAD
OTTAWA, ON K1B 4V8

Project:

METRO TOW TRUCK
WAREHOUSE BUILDING
6776 ROTHBOURNE RD.
OTTAWA, ON

Drawing Title:

POST-DEVELOPMENT
DRAINAGE AREA PLAN

Scale: 1:1000	Project Number: CP-17-0381
Drawn By: S.V.L.	
Checked By: R.P.K.	Drawing Number: POST
Designed By: S.V.L.	

D07-12--XX-XXXX

#XXXXX

FILENAME: \\192.168.1.3\ynpdocuments\01-Project - Proposals\2017 Jobs\CP\OCP-17-0381 Metro Towing, 6776 Rothbourne Road\15 - Drawings\OCP-17-0381 - Presentation.dwg
LAYOUT: POST
LAST PLOTTED: Tuesday, December 17, 2019 - 8:19 AM by S.V.L. Charpet

APPENDIX F:
STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

Pre-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	Average C (5-Year)	Average C (100-Year)
A1	2.87	0.00	0.90	0.00	0.70	28696.12	0.20	0.20	0.25
A2	2.95	0.00	0.90	0.00	0.70	29462.50	0.20	0.20	0.25
A3	4.27	0.00	0.90	0.00	0.70	42685.37	0.20	0.20	0.25
	10.08								

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C (5-Year)	C (100-Year)	Tc (min)	I (mm/hr)		Q (L/s)		
					5-Year	100-Year	5-Year	100-Year	
A1	2.87	0.20	0.25	36	47.9	81.5	76.42	162.58	NORTH OF WETLAND
A2	2.95	0.20	0.25	36	47.9	81.5	78.46	166.92	EXISTING WETLAND
A3	4.27	0.20	0.25	36	47.9	81.5	113.68	241.83	SOUTH OF WETLAND
Total	10.08						268.57	571.33	

Post-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	Average C (5-Year)	Average C (100-Year)
B1	2.27	200.00	0.90	22497.23	0.70	0.00	0.20	0.70	0.88
B2	0.60	121.33	0.90	2706.80	0.70	3198.37	0.20	0.44	0.55
B3	0.72	484.70	0.90	575.00	0.70	6114.52	0.20	0.29	0.35
B4	3.55	484.70	0.90	31102.45	0.70	3924.00	0.20	0.65	0.81
B5	2.95	0.00	0.90	1735.00	0.70	27727.50	0.20	0.23	0.29

Post-Development Runoff Calculations

Drainage Area	Area (ha)	C (5-Year)	C (100-Year)	Tc (min)	I (mm/hr)		Q (L/s)		
					5-Year	100-Year	5-Year	100-Year	
B1	2.27	0.70	0.88	35	48.6	82.7	215.23	457.34	
B2	0.60	0.44	0.55	35	48.6	82.7	35.72	75.65	
B3	0.72	0.29	0.35	35	48.6	82.7	27.86	57.88	
B4	3.55	0.65	0.81	35	48.6	82.7	310.69	659.63	
B5	2.95	0.23	0.29	36	47.9	81.5	90.02	191.49	
Total	10.09						679.52	1441.99	

Post-Development Restricted Runoff Calculations

Drainage Area	Unrestricted Flow (L/s)		Restricted Flow (L/s)		Storage Required (m^3)		Storage Provided (m^3)		
	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	
B1	215.23	457.34	52.03	67.42	345.26	873.24	354.98	875.81	*RESTRICTED*
B2	35.72	75.65	35.72	75.65	-	-	-	-	*UNRESTRICTED*
B3	27.86	57.88	27.86	57.88	-	-	-	-	*UNRESTRICTED*
B4	310.69	659.63	61.88	88.96	536.67	1296.76	583.75	1298.75	*RESTRICTED*
B5	90.02	191.49	90.02	191.49					*EXISTING WETLAND*
Total	679.52	1441.99	267.51	481.41	881.92	2169.99	583.75	2174.56	

FAA METHOD OF CALCULATING Tc

PRE-DEVELOPMENT

FAA equation: $t = G\,(1.1 - c)\,L^{0.5} / (100\,S)^{1/3}$

t = Time of Travel (min)
C= Runoff Coefficient (dimensionless)
Lo= Overland Flow Length (ft)
So= Overland Slope (%)

t	=	35.6516664
Tc	=	35.6516664
Tc	=	35.65

G=	1.8
C=	0.20
Lo=	562
So=	1.25

POST-DEVELOPMENT

FAA equation: $t = G\,(1.1 - c)\,L^{0.5} / (100\,S)^{1/3}$

t= Time of Travel (min)
C= Runoff Coefficient (dimensionless)
Lo= Overland Flow Length (ft)
So= Overland Slope (%)

t	=	34.9077133
Tc	=	34.9077133
Tc	=	34.91

G=	1.8
C=	0.52
Lo=	1118
So=	1.00

Storage Requirements for Area B1

5-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	461.37	52.03	409.34	245.60
15	83.6	369.99	52.03	317.96	286.16
20	70.3	311.07	52.03	259.04	310.85
25	60.9	269.65	52.03	217.62	326.43
30	53.9	238.79	52.03	186.76	336.17
35	48.5	214.84	52.03	162.80	341.89
40	44.2	195.65	52.03	143.62	344.68
45	40.6	179.90	52.03	127.87	345.26
50	37.7	166.73	52.03	114.70	344.09
55	35.1	155.53	52.03	103.50	341.53
60	32.9	145.87	52.03	93.84	337.83

Maximum Storage Required 5-Year (m^3) =	345.26

100-Year Storm Event

Tc (min)	I (mm/hr)	B1 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	987.31	67.42	919.89	551.93
15	142.9	789.96	67.42	722.53	650.28
20	120.0	663.37	67.42	595.94	715.13
25	103.8	573.81	67.42	506.39	759.58
30	91.9	508.03	67.42	440.60	793.09
35	82.6	456.62	67.42	389.19	817.30
40	75.1	415.16	67.42	347.73	834.56
45	69.1	381.99	67.42	314.56	849.32
50	64.0	353.80	67.42	286.37	859.11
55	59.6	329.47	67.42	262.05	864.76
60	55.9	309.02	67.42	241.59	869.74
65	52.6	290.78	67.42	223.35	871.07
70	49.8	275.30	67.42	207.87	873.06
75	47.3	261.48	67.42	194.05	873.24

Maximum Storage Required 100-Year (m^3) =	873.24

5-Year Storm Event Storage Summary

Water Elev. (m) =		131.45	
INV. (out)	Area (m^2)	Depth (m)	Volume (m^3)
130.85		0.60	

Storage Available (m^3) =	355.0
Storage Required (m^3) =	345.3

100-Year Storm Event Storage Sumamry

Water Elev. (m) =		131.90	
INV. (out)	Area (m^2)	Depth (m)	Volume (m^3)
130.85		1.05	

Storage Available (m^3) =	875.8
Storage Required (m^3) =	873.2

LOCATION: NORTH

For Orifice Flow, C= 0.6
For Weir Flow, C= 3.33

	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	130.70			
center of crest elevation	130.79			
orifice width / weir length	175 mm			
orifice height				
orifice area (m^2)	0.024	0.000		

Elevation Discharge Table - Storm Routing

Elevation	Orifice 1		Orifice 2		Weir 1		Weir 2		Total
	H [m]	Q [m^3]	H [m]	Q [m^3]	H [m]	Q [m^3]	H [m]	Q [m^3]	Q [l/s]
130.70	x	x							0.00
130.75	x	x							0.00
131.30	0.51	0.046							45.76
131.31	0.52	0.046							46.21
131.32	0.53	0.047							46.65
131.33	0.54	0.047							47.08
131.34	0.55	0.048							47.52
131.35	0.56	0.048							47.94
131.36	0.57	0.048							48.37
131.37	0.58	0.049							48.79
131.38	0.59	0.049							49.21
131.39	0.60	0.050							49.62
131.40	0.61	0.050							50.03
131.41	0.62	0.050							50.44
131.42	0.63	0.051							50.84
131.43	0.64	0.051							51.24
131.44	0.65	0.052							51.64
131.45	0.66	0.052							52.03
131.46	0.67	0.052							52.42
131.47	0.68	0.053							52.81
131.48	0.69	0.053							53.20
131.49	0.70	0.054							53.58
131.50	0.71	0.054							53.96
131.51	0.72	0.054							54.34
131.52	0.73	0.055							54.71
131.53	0.74	0.055							55.08
131.54	0.75	0.055							55.45
131.55	0.76	0.056							55.82
131.56	0.77	0.056							56.18
131.57	0.78	0.057							56.55
131.58	0.79	0.057							56.91
131.59	0.80	0.057							57.27
131.60	0.81	0.058							57.62
131.61	0.82	0.058							57.97
131.62	0.83	0.058							58.33
131.63	0.84	0.059							58.67
131.64	0.85	0.059							59.02
131.65	0.86	0.059							59.37
131.66	0.87	0.060							59.71
131.67	0.88	0.060							60.05
131.68	0.89	0.060							60.39
131.69	0.90	0.061							60.73
131.70	0.91	0.061							61.06
131.71	0.92	0.061							61.40
131.72	0.93	0.062							61.73
131.73	0.94	0.062							62.06
131.74	0.95	0.062							62.39
131.75	0.96	0.063							62.71
131.76	0.97	0.063							63.04
131.77	0.98	0.063							63.36
131.78	0.99	0.064							63.68

131.79	1.00	0.064							64.00
131.80	1.01	0.064							64.32
131.81	1.02	0.065							64.64
131.82	1.03	0.065							64.96
131.83	1.04	0.065							65.27
131.84	1.05	0.066							65.58
131.85	1.06	0.066							65.89
131.86	1.07	0.066							66.20
131.87	1.08	0.067							66.51
131.88	1.09	0.067							66.82
131.89	1.10	0.067							67.12
131.90	1.11	0.067							67.42

Notes: 1. For Orifice Flow, User is to Input an Elevation Higher than Crown of Orifice.
2. Orifice Equation: $Q = cA(2gh)^{1/2}$
3. Weir Equation: $Q = CLH^{3/2}$
4. These Computations Do Not Account for Submergence Effects Within the Pond Riser.
5. H for orifice equations is depth of water above the centroide of the orifice.
6. H for weir equations is depth of water above the weir crest.

CP-17-0381 - 6776 ROTHBOURNE ROAD - STORAGE REQUIREMENTS

Storage Requirements for Area B4

5-Year Storm Event

Tc (min)	I (mm/hr)	B4 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	104.2	666.00	61.88	604.12	362.47
15	83.6	534.10	61.88	472.21	424.99
20	70.3	449.04	61.88	387.16	464.59
25	60.9	389.25	61.88	327.36	491.05
30	53.9	344.70	61.88	282.82	509.08
35	48.5	310.12	61.88	248.24	521.31
40	44.2	282.43	61.88	220.54	529.31
45	40.6	259.70	61.88	197.82	534.10
50	37.7	240.68	61.88	178.80	536.39
55	35.1	224.51	61.88	162.63	536.67
60	32.9	210.57	61.88	148.69	535.29
65	31.0	198.43	61.88	136.55	532.54
70	29.4	187.74	61.88	125.86	528.63

Maximum Storage Required 5-Year (m^3) =	536.67

100-Year Storm Event

Tc (min)	I (mm/hr)	B4 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	1424.00	88.96	1335.04	801.02
15	142.9	1139.36	88.96	1050.40	945.36
20	120.0	956.78	88.96	867.82	1041.38
25	103.8	827.61	88.96	738.65	1107.98
30	91.9	732.73	88.96	643.77	1158.79
35	82.6	658.58	88.96	569.62	1196.20
40	75.1	598.78	88.96	509.82	1223.57
45	69.1	550.94	88.96	461.98	1247.35
50	64.0	510.28	88.96	421.32	1263.96
55	59.6	475.20	88.96	386.24	1274.59
60	55.9	445.70	88.96	356.74	1284.26
65	52.6	419.39	88.96	330.43	1288.66
70	49.8	397.06	88.96	308.10	1294.03
75	47.3	377.13	88.96	288.17	1296.76
80	45.0	358.79	88.96	269.83	1295.19
85	43.0	342.84	88.96	253.88	1294.81
90	41.1	327.70	88.96	238.74	1289.17

Maximum Storage Required 100-Year (m^3) =	1296.76

5-Year Storm Event Storage Summary

Water Elev. (m) =		130.90	
INV. (out)	Area (m^2)	Depth (m)	Volume (m^3)
130.55		0.35	

Storage Available (m^3) =	583.8
Storage Required (m^3) =	536.7

100-Year Storm Event Storage Sumamry

Water Elev. (m) =		131.14	
INV. (out)	Area (m^2)	Depth (m)	Volume (m^3)
130.55		0.59	

Storage Available (m^3) =	1298.8
Storage Required (m^3) =	1296.8

LOCATION: SOUTH

For Orifice Flow, C= 0.6

For Weir Flow, C= 3.33

	Orifice 1	Orifice 2	Weir 1	Weir 2
invert elevation	130.55			
center of crest elevation	130.68			
orifice width / weir length	250 mm			
orifice height				
orifice area (m^2)	0.049	0.000		

Elevation Discharge Table - Storm Routing

Elevation	Orifice 1		Orifice 2		Weir 1		Weir 2		Total
	H [m]	Q [m^3]	H [m]	Q [m^3]	H [m]	Q [m^3]	H [m]	Q [m^3]	Q [l/s]
130.55	x	x							0.00
130.60	x	x							0.00
130.65	x	x							0.00
130.66	x	x							0.00
130.67	x	x							0.00
130.68	0.00	0.009							9.22
130.69	0.01	0.016							15.98
130.70	0.02	0.021							20.63
130.71	0.03	0.024							24.41
130.72	0.04	0.028							27.67
130.73	0.05	0.031							30.60
130.74	0.06	0.033							33.26
130.75	0.07	0.036							35.73
130.76	0.08	0.038							38.03
130.77	0.09	0.040							40.21
130.78	0.10	0.042							42.27
130.79	0.11	0.044							44.24
130.80	0.12	0.046							46.12
130.81	0.13	0.048							47.93
130.82	0.14	0.050							49.68
130.83	0.15	0.051							51.36
130.84	0.16	0.053							52.99
130.85	0.17	0.055							54.57
130.86	0.18	0.056							56.11
130.87	0.19	0.058							57.61
130.88	0.20	0.059							59.07
130.89	0.21	0.060							60.49
130.90	0.22	0.062							61.88
130.91	0.23	0.063							63.24
130.92	0.24	0.065							64.57
130.93	0.25	0.066							65.88
130.94	0.26	0.067							67.16
130.95	0.27	0.068							68.41
130.96	0.28	0.070							69.65
130.97	0.29	0.071							70.86
130.98	0.30	0.072							72.05
130.99	0.31	0.073							73.22
131.00	0.32	0.074							74.37
131.01	0.33	0.076							75.51
131.02	0.34	0.077							76.63
131.03	0.35	0.078							77.73
131.04	0.36	0.079							78.82
131.05	0.37	0.080							79.89
131.06	0.38	0.081							80.95
131.07	0.39	0.082							81.99
131.08	0.40	0.083							83.02
131.09	0.41	0.084							84.04
131.10	0.42	0.085							85.05
131.11	0.43	0.086							86.04
131.12	0.44	0.087							87.03

131.13	0.45	0.088							88.00
131.14	0.46	0.089							88.96
131.15	0.47	0.090							89.91
131.16	0.48	0.091							90.85
131.17	0.49	0.092							91.79
131.18	0.50	0.093							92.71
131.19	0.51	0.094							93.62
131.20	0.52	0.095							94.53

Notes: 1. For Orifice Flow, User is to Input an Elevation Higher than Crown of Orifice.

2. Orifice Equation: $Q = cA(2gh)^{1/2}$
3. Weir flow calculated in Bentley's FlowMaster - Trapezoidal Channel at 0.1%, 3:1 side slopes, roughness coeff. Of 0.035
4. These Computations Do Not Account for Submergence Effects Within the Pond Riser.
5. H for orifice equations is depth of water above the centroide of the orifice.
6. H for weir equations is depth of water above the weir crest.

CP-17-0381- Rothbourne Road

INFILTRATION TRENCH CALCULATION - NORTH AREA

Volume Reqruied to be Infiltrated			
Volume to be Infiltrated:	197.00	m^3	
Requried Storage Volume			
Required Storage Volume:	197.00	m^3	
Assumed Porosity (n):	40%		
Clearstone Volume:	492.50	m^3	Storage Volume/n
Infiltration Trench Volume			
Depth:	1.00	m	
Area:	498.00	m^2	
Volume:	498.00	m^3	(depth x area)

INFILTRATION TRENCH CALCULATION - SOUTH AREA

Volume Reqruied to be Infiltrated			
Volume to be Infiltrated:	275.00	m^3	
Requried Storage Volume			
Required Storage Volume:	275.00	m^3	
Assumed Porosity (n):	40%		
Clearstone Volume:	687.50	m^3	Storage Volume/n
Infiltration Trench Volume			
Depth:	0.30	m	
Area:	2385.00	m^2	
Volume:	715.50	m^3	(depth x area)

STORM SEWER DESIGN SHEET

PROJECT: 6776 ROTHBOURNE ROAD
LOCATION: OTTAWA, ONTARIO
CLIENT: METRO TOWING

McINTOSH PERRY

LOCATION				CONTRIBUTING AREA (ha)								RATIONAL DESIGN FLOW											SEWER DATA								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
STREET	AREA ID	FROM MH	TO MH	C-VALUE			AREA			INDIV AC	CUMUL AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm)			SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr)	
																									DIA	W	H			(L/s)	(%)
	B1			0.70			2.27			1.59	1.59	10.00	0.03	10.03	104.19	122.14	178.56	460.21				460.21	640.56	4.21	600			1.00	2.195	180.35	28.16%
										0.00	1.59	10.03	0.03	10.06	104.02	121.94	178.27	459.46				459.46	640.56	4.00	600			1.00	2.195	181.10	28.27%
				0.65			3.55			2.31	2.31	10.00	0.03	10.03	104.19	122.14	178.56	668.38				668.38	1,161.41	3.91	750			1.00	2.547	493.03	42.45%
	B4									0.00	2.31	10.03	0.06	10.08	104.06	121.98	178.33	667.52				667.52	1,161.41	8.67	750			1.00	2.547	493.90	42.53%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: C.D.H.
Checked: R.P.K.
Project No.: CP-17-0381

No.	Revision	Date
1	ISSUED FOR SITE PLAN CONTROL	2017-07-17
2	REVISED AS PER CITY COMMENTS	2019-12-17

Sheet No: 1 of 1

APPENDIX G:
QUALITY TREATMENT UNITS

McINTOSH PERRY

Hydro First Defense® - HC

Rev. 9.1

Project Name:	**6776 Rothbourne Road**	*Report Date:*	**12/17/2019**
Street:	**6776 Rothbourne Road**	*City:*	**Ottawa**
Province:	**Ontario**	*Country:*	
Designer:	**Charissa Hampel**	*email:*	**c.hampel@mcintoshperry.**

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Teatment Parameters:

Structure ID:	Area B1	
TSS Goal:	80	% Removal
TSS Particle Size:	Fine	
Area:	2.27	ha
Percent Impervious:	71%	
Rational C value:	0.68	Calc. Cn
Rainfall Station:	Ottawa, ONT	MAP
Peak Storm Flow:	260	L/s

RESULTS SUMMARY

Model	TSS	Volume
FD-3HC	67.4%	97.5%
FD-4HC	**80.0%**	**99.5%**
FD-5HC	83.7%	99.9%
FD-6HC	87.1%	100.0%
FD-8HC	91.4%	99.9%

Model Specification:

Model:	**FD-4HC**	
Diameter:	1200	mm
No Bypass Flow:	20.00	L/s
Peak Flow Capacity:	510.00	L/s
Sediment Storage:	0.54	m^3
Oil Storage:	723.00	L

Installation Configuration:

Placement:	Online		
Outlet Pipe Size:	600	mm	*OK*
Inlet Pipe 1 Size:	600	mm	*OK*
Inlet Pipe 2 Size:		mm	*OK*
Inlet Pipe 3 Size:		mm	*OK*

Rim Level:	132.350	m	Calc Invs.
Outlet Pipe Invert:	130.660	m	*Additional cover may be required*
Invert Pipe 1:	130.630	m	*OK!*
Invert Pipe 2:		m	
Invert Pipe 3:		m	

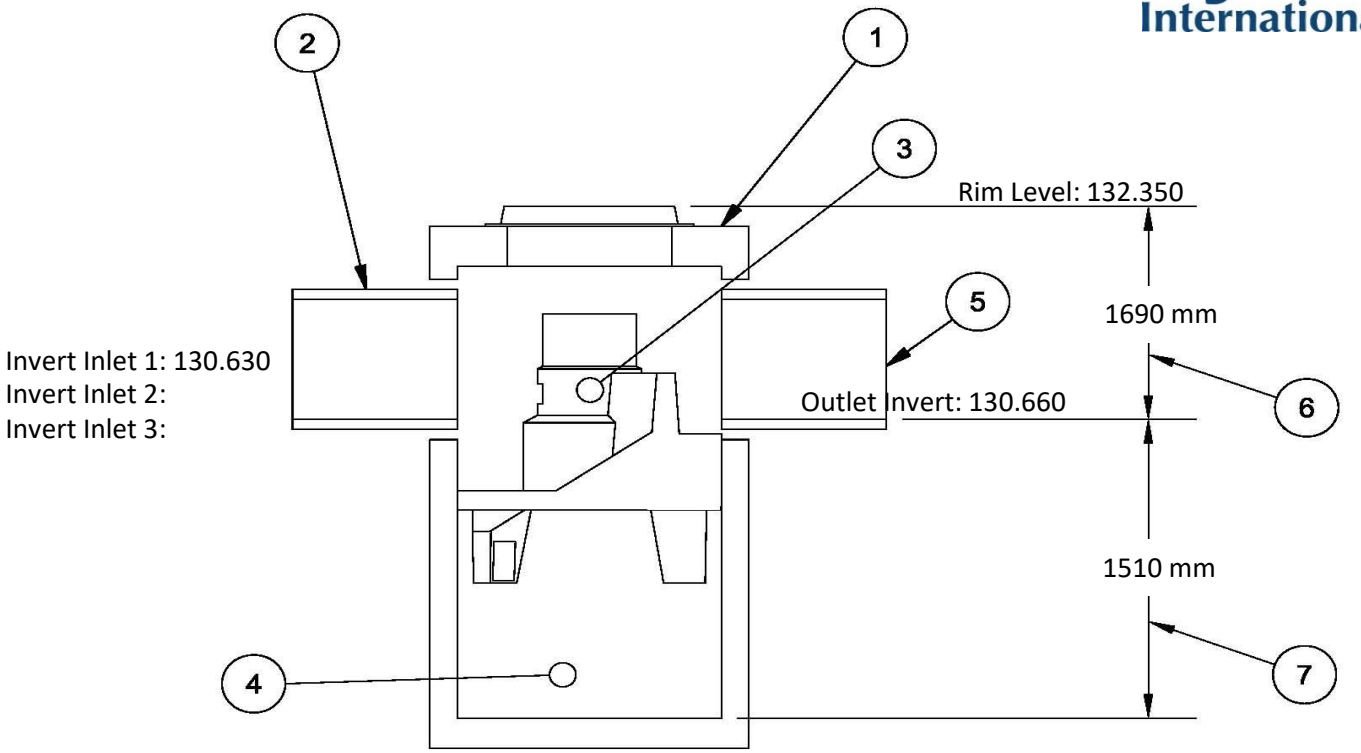
Net Annual Removal Model: FD-4HC

Intensity[1]	Fraction of Rainfall[1]	FD-4HC Removal Efficiency[2]	Weighted Net Annual Efficiency
(mm/hr)	(%)	(%)	(%)
0.50	0.1%	96.8%	0.1%
1.00	14.1%	90.8%	12.8%
1.50	14.2%	87.4%	12.4%
2.00	14.1%	85.1%	12.0%
2.50	4.2%	83.4%	3.5%
3.00	1.5%	82.0%	1.2%
3.50	8.5%	80.8%	6.9%
4.00	5.4%	79.8%	4.3%
4.50	1.2%	78.9%	0.9%
5.00	5.5%	78.2%	4.3%
6.00	4.3%	76.8%	3.3%
7.00	4.5%	75.7%	3.4%
8.00	3.1%	74.8%	2.3%
9.00	2.3%	74.0%	1.7%
10.00	2.6%	73.3%	1.9%
20.00	9.2%	68.7%	6.4%
30.00	2.6%	66.2%	1.7%
40.00	1.2%	64.4%	0.8%
50.00	0.5%	0.0%	0.0%
100.00	0.7%	0.0%	0.0%
150.00	0.1%	0.0%	0.0%
200.00	0.0%	0.0%	0.0%
Total Net Annual Removal Efficiency:			**80.0%**
Total Annual Runoff Volume Treated:			**99.5%**

1. Rainfall Data: 1960:2007, HLY03, Ottawa, ONT, 6105976 & 6105978.
2. Based on third party verified data and appoximating the removal of a PSD similar to the STC Fine distribution
3. Rainfall adjusted to 5 min peak intensity based on hourly average.

Designer Notes:

Hydro First Defense® - HC



All drawing elevations are metres.

FD-4HC Specification

1	Vortex Chamber Diameter	1200	mm
2	Inlet Pipe Diameter	600	mm
3	Oil Storage Capacity	723.00	L
4	Min. Provided Sediment Storage Capacity	0.54	m^3
5	Outlet Pipe Diameter	600	mm
6	Height(Final Grade to Outlet Invert)	1690	mm
7	Sump Depth(Outlet Invert to Sump)	1130	mm
	Total Depth	**2820**	**mm**

Notes:

Hydro First Defense® - HC

Rev. 9.1

Project Name:	**6776 Rothbourne Road**	*Report Date:*	**12/17/2019**
Street:	**6776 Rothbourne Road**	*City:*	**Ottawa**
Province:	**Ontario**	*Country:*	
Designer:	**Charissa Hampel**	*email:*	**c.hampel@mcintoshperry.**

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Teatment Parameters:

Structure ID:	Area B4	
TSS Goal:	80	% Removal
TSS Particle Size:	Fine	
Area:	3.55	ha
Percent Impervious:	64%	
Rational C value:	0.68	Calc. Cn
Rainfall Station:	Ottawa, ONT	MAP
Peak Storm Flow:	260	L/s

RESULTS SUMMARY

Model	TSS	Volume
FD-3HC	64.7%	93.2%
FD-4HC	74.3%	98.9%
FD-5HC	80.3%	99.6%
FD-6HC	**83.1%**	**99.9%**
FD-8HC	88.2%	99.9%

Model Specification:

Model:	**FD-6HC**	
Diameter:	1800	mm
No Bypass Flow:	62.00	L/s
Peak Flow Capacity:	906.00	L/s
Sediment Storage:	1.22	m^3
Oil Storage:	1878.00	L

Installation Configuration:

Placement:	Online		
Outlet Pipe Size:	675	mm	*OK*
Inlet Pipe 1 Size:	675	mm	*OK*
Inlet Pipe 2 Size:		mm	*OK*
Inlet Pipe 3 Size:		mm	*OK*

Rim Level:	131.820	m	Calc Invs.
Outlet Pipe Invert:	130.500	m	*Additional cover may be required*
Invert Pipe 1:	130.530	m	*Check cover*
Invert Pipe 2:		m	
Invert Pipe 3:		m	

Net Annual Removal Model: FD-6HC

Intensity[1]	Fraction of Rainfall[1]	FD-6HC Removal Efficiency[2]	Weighted Net Annual Efficiency
(mm/hr)	(%)	(%)	(%)
0.50	0.1%	100.0%	0.1%
1.00	14.1%	93.9%	13.2%
1.50	14.2%	90.4%	12.8%
2.00	14.1%	88.0%	12.4%
2.50	4.2%	86.2%	3.6%
3.00	1.5%	84.8%	1.3%
3.50	8.5%	83.6%	7.1%
4.00	5.4%	82.5%	4.5%
4.50	1.2%	81.6%	1.0%
5.00	5.5%	80.8%	4.5%
6.00	4.3%	79.5%	3.4%
7.00	4.5%	78.4%	3.5%
8.00	3.1%	77.4%	2.4%
9.00	2.3%	76.5%	1.8%
10.00	2.6%	75.8%	1.9%
20.00	9.2%	71.1%	6.6%
30.00	2.6%	68.4%	1.8%
40.00	1.2%	66.6%	0.8%
50.00	0.5%	65.3%	0.3%
100.00	0.7%	0.0%	0.0%
150.00	0.1%	0.0%	0.0%
200.00	0.0%	0.0%	0.0%
Total Net Annual Removal Efficiency:			**83.1%**
Total Annual Runoff Volume Treated:			**99.9%**

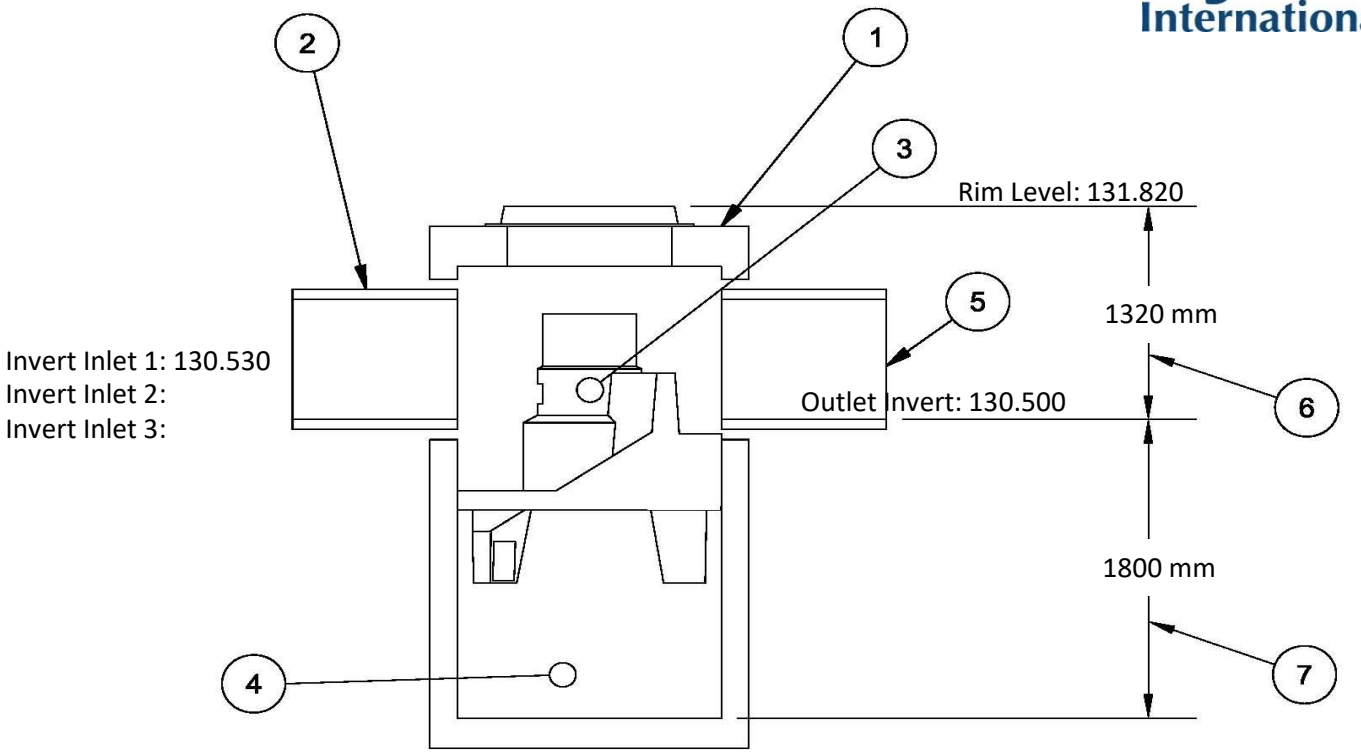
1. Rainfall Data: 1960:2007, HLY03, Ottawa, ONT, 6105976 & 6105978.

2. Based on third party verified data and appoximating the removal of a PSD similar to the STC Fine distribution

3. Rainfall adjusted to 5 min peak intensity based on hourly average.

Designer Notes:

Hydro First Defense® - HC



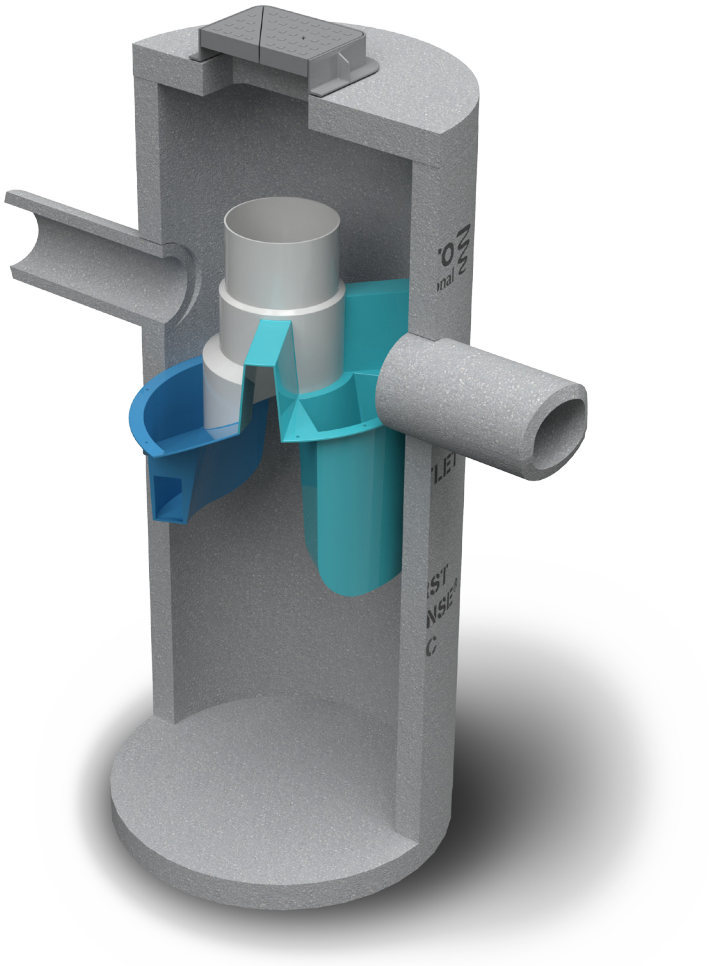
All drawing elevations are metres.

FD-6HC Specification

1	Vortex Chamber Diameter	1800	mm
2	Inlet Pipe Diameter	675	mm
3	Oil Storage Capacity	1878.00	L
4	Min. Provided Sediment Storage Capacity	1.22	m^3
5	Outlet Pipe Diameter	675	mm
6	Height(Final Grade to Outlet Invert)	1320	mm
7	Sump Depth(Outlet Invert to Sump)	1130	mm
	Total Depth	**2450**	**mm**

Notes:

Hydro International



Operation and Maintenance Manual

First Defense® and First Defense® High Capacity

Vortex Separator for Stormwater Treatment

Table of Contents

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations (refer to *Section II. Model Sizes & Configurations*, page 4) to accommodate a wide range of pipe sizes, peak flows and depth constraints.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 500% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

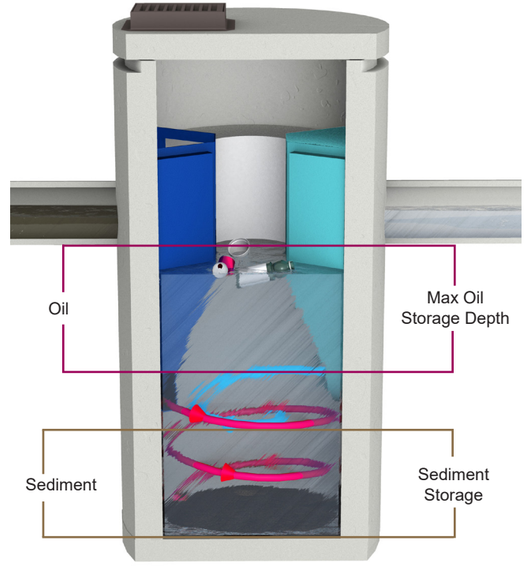


Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components of the First Defense®-4HC and First Defense®-6HC have modified geometries as to allow greater design flexibility needed to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2a - 2b). First Defense® model parameters and design criteria are shown in Table 1.

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

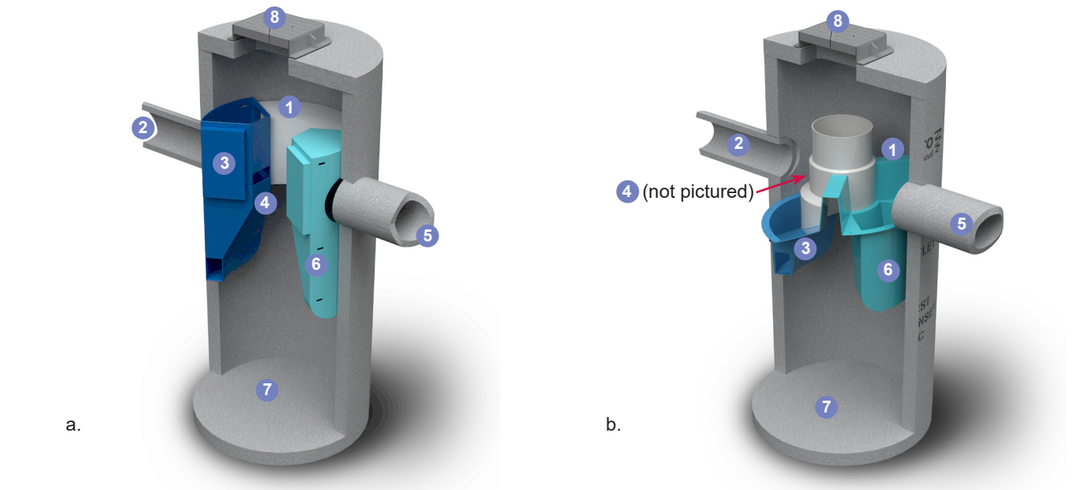


Fig.2a) First Defense®-4 and First Defense®-6; b) First Defense®-4HC and First Defense®-6HC, with higher capacity dual internal bypass and larger maximum pipe diameter.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates NJDEP Certified	Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Chamber Depth
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.85 / 24.0	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.75 / 1.14
FD-4HC	4 / 1.2	1.50 / 42.4	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	5.00 / 1.52
FD-5HC	5 / 1.5	2.35 / 66.2	20 / 566	24 / 609	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.25 / 1.60
FD-6HC	6 / 1.8	3.38 / 95.7	32 / 906	30 / 750	496 / 1878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	6.25 / 1.90
FD-7HC	7 / 2.1	4.60 / 130.2	40 / 1133	42 / 1067	750 / 2839	2.1 / 1.9	3.0 - 5.5 / 0.9 - 1.7	7.25 / 2.20
FD-8HC	8 / 2.4	6.00 / 169.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	8.00 / 2.43

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

III. Maintenance

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense®-HC have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

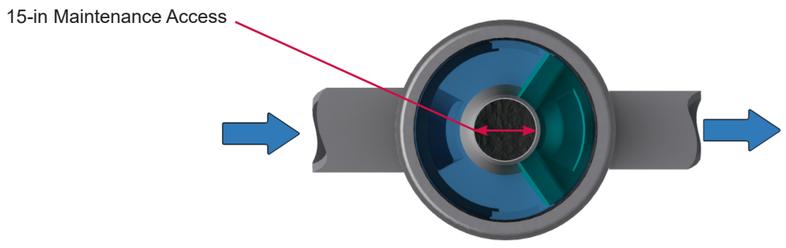


Fig.3 The central opening to the sump of the First Defense®-HC is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for a 6-ft First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.5).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.

- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Fig.4 Floatables are removed with a vactor hose (First Defense model FD-4, shown).

Recommended Equipment

- Safety Equipment (traffic cones, etc)

- Crow bar or other tool to remove grate or lid

- Pole with skimmer or net (if only floatables are being removed)

- Sediment probe (such as a Sludge Judge®)

- Vactor truck (flexible hose recommended)

- First Defense® Maintenance Log

Floatables and sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose (Fig.5) or with the skimmer or net (not pictured).

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor (Fig.5).

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

Fig.5 Sediment is removed with a vactor hose (First Defense model FD-4, shown).

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): **FD-4** **FD-4HC** **FD-6** **FD-6HC**

INLET (CIRCLE ALL THAT APPLY): **GRATED INLET (CATCH BASIN)** **INLET PIPE (FLOW THROUGH)**

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

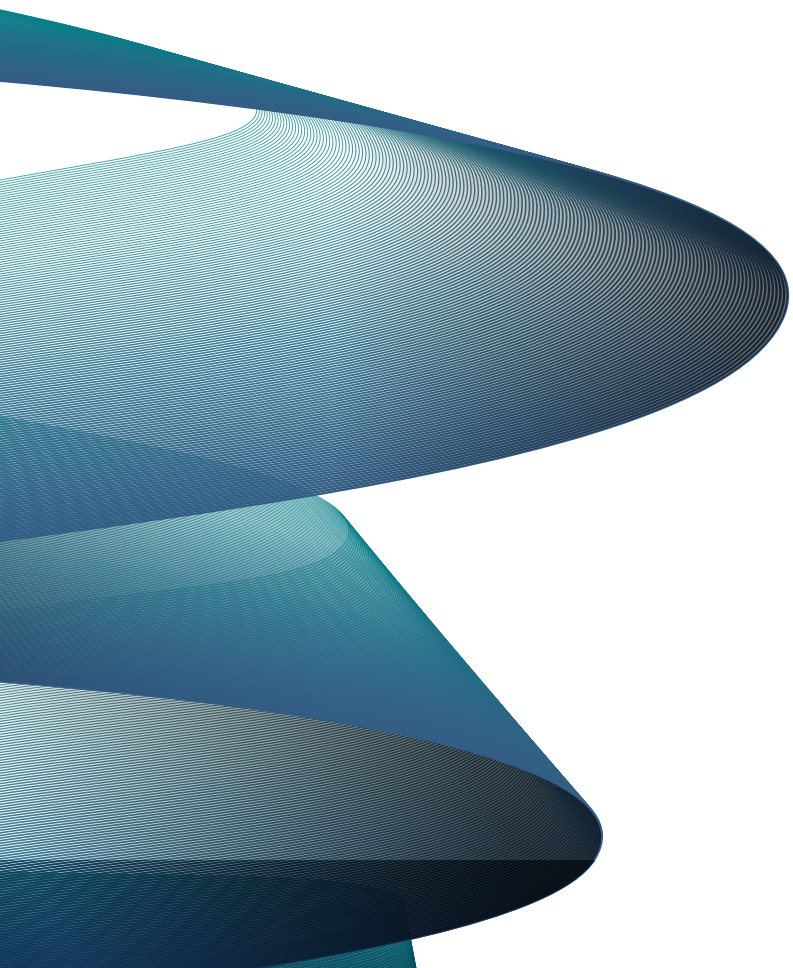
First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Notes

Hydro International®



Stormwater Solutions

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www.hydro-int.com

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