Stormwater Management Report and Servicing Brief

Proposed Halo Car Wash
3535 Borrisokane Rd
Barrhaven, Ontario

Prepared for:

Halo Car Wash Inc.
18 Adelaide Street
Maxville, ON
K0C 1T0

Attention: Mr. Jordan Lupovici

LRL File No.: 210691

Revised November 17, 2022
April 22, 2022

5430 Canotek Road | Ottawa, ON, K1J 9G2 | info@lrl.ca | www.lrl.ca | (613) 842-3434

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1 INTRODUCTION AND SITE DESCRIPTION

LRL Associates Ltd. was retained by Halo Car Wash Inc. to complete a Stormwater Management Analysis and Servicing Brief for the construction of a car-wash development located at 3535 Borrisokane Rd, Barrhaven, Ontario. The property is legally described as Part of Lot 11, Concession 3 (Rideau Front), geographic Township of Nepean and Zoning IL – Light Industrial. The location of the proposed development can be viewed in Figure 1.

Figure 1: Aerial View of Proposed Development

The development proposes construction of a Halo Tunnel Car Wash (±513 sqm). The site will be accessible from a 7.5 m wide entrance located off Flagstaff Drive. This entrance will be a shared ROW once the future development to the south is developed. For additional details of the proposed development, refer to Site Plan C201 included in Appendix E.

This report has been prepared in consideration of the terms and conditions noted above and with the civil drawings prepared for the proposed new development. Should there be any changes in the design features, which may relate to the stormwater management and servicing considerations, LRL Associates Ltd. should be advised to review the report recommendations.

2 EXISTING SITE AND DRAINAGE DESCRIPTION

The subject site measures approximately 0.534 ha and is currently undeveloped, consisting of grassed area and treed area. Elevations of existing site range between 93.01 near the northeast corner to 92.23 at the southwest corner of the site.

Sewer and watermain locations were adopted from the current subdivision design produced by DSEL Engineering. It indicates the following infrastructures located within the adjacent right-of-way:

Flagstaff Drive

- 200 mm diameter PVC watermain stub
- 200 mm diameter PVC sanitary sewer

Borrisokane Rd

- Roadside ditch

The design intentions are to continue the water and sanitary services that were provided through this subject property and stub them past the proposed curb for future development to the south. This development will be connected to those services, and the storm outlet will be directed to the roadside ditch along Borrisokane Rd.

3 SCOPE OF WORK

As per applicable guidelines, the scope of work includes the following:

Stormwater management

- Calculate the allowable stormwater release rate.
- Calculate the anticipated post-development stormwater release rates.
- Demonstrate how the target quantity control objectives will be achieved.
- Demonstrate how the target quality control objectives will be achieved.

Water services

- Calculate the expected water supply demand at average and peak conditions.
- Calculate the required fire flow as per the Fire Underwriters Survey (FUS) method.
- Confirm the adequacy of water supply and pressure during peak flow and fire flow.
- Describe the proposed water distribution network and connection to the existing system.

Sanitary services

- Describe the existing sanitary sewers available to receive wastewater from the proposed development.
- Calculate peak flow rates from the proposed development.
- Describe the proposed sanitary sewer system.

4 REGULATORY APPROVALS

An MECP Environmental Compliance Approval (ECA) is expected to be required for installation of the proposed storm and sanitary sewers within the site. A Permit to Take Water is not anticipated to be required for pumping requirements for sewer installation. The Rideau Valley Conservation Authority (RVCA) will need to be consulted in order to obtain municipal approval for site development. No other approval requirements from other regulatory agencies are anticipated.

5 WATER SUPPLY AND FIRE PROTECTION

5.1 Existing Water Supply Services

The subject property is located to the south of a proposed 300 mm dia. watermain along Flagstaff Drive. A 200 mm dia. water service stub is available near the northeast corner of the property for service connection.

5.2 Water Supply Servicing Design

The subject property is proposed to be serviced via a 100 mm dia. water servicing to be connected to the 200 mm dia. watermain which will be extended from the existing stub located within Flagstaff Drive at the northeast corner of the site. For servicing layout, refer to Site Servicing Plan C401 (Appendix E).

Table 1 summarizes the City of Ottawa Design Guidelines design parameters employed in the preparation of the water demand estimate.

Table 1: City of Ottawa Water Servicing Design Parameters

Design Parameters	Value
Average Day Demand - Commercial	28,000 L/gross ha/day
Average Day Demand - Light Industrial	35,000 L/gross ha/day
Maximum Day Demand-Commercial/Industrial	1.5 × Average Day Demand
Maximum Hour Demand-Commercial/Industrial	1.8 × Maximum Day Demand
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
Desired operating pressure during Maximum Day Flow	345 kPa (50 psi) to 552 kPa (80 psi)
Minimum allowable pressure during Peak Hour Flow	275 kPa (40 psi)
Minimum allowable pressure during Fire Flow Conditions	140 kPa (20 psi)

Below is a summary of anticipated water demands calculated by using the parameters mentioned in Table 1 together with anticipated car wash demand (Appendix B)

- Average Day Demand = 1.29 L/s
- Maximum Day Demand = 2.29 L/s
- Peak Hour Demand = 6.72 L/s

The City of Ottawa provided boundary conditions associated with the estimated water demand (correspondence included in Appendix B). Table 2 below summarizes the boundary conditions for the proposed development.

Table 2: Summary of Boundary Conditions

Design Parameter	Anticipated Demand (L/s)	Boundary Conditions @ Flagstaff Dr.	
		*Existing Conditions (m H2O / psi)	*SUC Zone Reconfiguration (m H2O / psi)
Average Daily Demand	1.29	157.0/89.6	146.9/75.3
Peak Hour	6.72	140.7/66.3	142.0/68.2
Max Day + Fire Flow	2.29 + 65	133.0/55.4	142.4/68.9
**Ground Elevation assumed at 94.0 m for Connection 1 @ Flagstaff Dr.*			

Based on the review of boundary condition results (Table 2), it appears that adequate pressure is available in proximity to the site to service the proposed development. Overall, the pressure scenarios at the proposed connection meet the required pressure range stated in Table 1 except for the average day demand scenario when the maximum pressure exceeds 89.6. As a result, the maximum pressure at the service entry is anticipated to be more than 80 psi, therefore, a pressure check at the completion of construction is required to determine if a pressure reducing valve (PRV) is needed as the residual pressure is not to exceed 80 psi.

The estimated fire flow for the proposed buildings was determined in accordance with Fire Underwriters Survey (FUS) using the formula:

$$F = 220C\sqrt{A}$$

where,

F = The required fire flow (L/min)

C = Coefficient related to the type of construction

A = The total floor area (m^2)

The estimated fire flow demand is calculated 3900 L/min, see Appendix B for calculation details. Two (2) fire hydrants in proximity to the site along Flagstaff Dr is expected to provide required fire flow for the subject site. Refer to Servicing Plan C401 for the location of available fire hydrants.

6 SANITARY SERVICE

6.1 Existing Sanitary Sewer Services

There is an existing 200 mm dia. sanitary sewer service stub extending to the property line from Flagstaff Dr. at the northeast corner of the subject site.

6.2 Sanitary Sewer Servicing Design

As previously stated, the sanitary sewer will be extended along the south extent of the property and stubbed at the proposed curb. The proposed development will be serviced via 150 mm dia. sanitary sewers which will be connected to the proposed 200 mm dia. sanitary sewer extending to the subject site. Refer to LRL drawing C401 for the proposed sanitary servicing layout. Table 3 summarizes the City of Ottawa Design Guidelines design parameters used in the estimation of wastewater flow.

Table 3: City of Ottawa Wastewater Design Parameters

Design Parameters	Value
Commercial Average Flow	28,000 L/gross ha/day
Average Light Industrial Flow	35,000 L/gross ha/day
Commercial Peak Factor	1.5
Industrial Peak Factor	Appendix 4-B (City Guidelines-Sewer)
Infiltration Allowance (Dry Weather)	0.05 L/s/gross ha
Infiltration Allowance (Wet Weather)	0.28 L/s/gross ha
Total Infiltration Allowance	0.33 L/s/gross ha

Based on these parameters, City of Ottawa's Appendix 4-A (Daily Sewage Flow for Various Types of Establishments), and the car wash information as per Halo Car Wash, the anticipated post-development peak design wastewater flow for the subject site is calculated 6.39 L/s. Refer to Appendix C for calculation details and the sewer design sheet.

7 STORMWATER MANAGEMENT

7.1 Existing Stormwater Infrastructure

There is an existing roadside ditch along Borrisokane Rd. at the west extent of the site.

In pre-development conditions, the stormwater runoff would flow uncontrolled overland to the existing ditch. Refer to Appendix D for pre- and post-development watershed information.

7.2 Design Criteria

The stormwater management criteria for this development is based on pre-consultation meeting with the City of Ottawa officials, the City of Ottawa Sewer Design Guidelines, 2012 (City standards), as well as the Ministry of the Environment's Stormwater Management, Planning and Design Manual, 2003.

7.2.1 Water Quality

Based on site plan pre-consultation meeting note and correspondence with Rideau Valley Conservation Authority (RVCA), it was advised to achieve enhanced water quality protection (80% TSS removal) either through on-site or downstream infrastructure prior to discharging stormwater to a natural watercourse.

To address water quality objective, a Jellyfish Filter model JF4-2-1 is proposed downstream of CBMH10 which will exceeds the required 80% TSS removal. As per manufacturers, JF4-2-1 will have the following capacities.

- Maximum Treatment Flow Rate: 12.6 L/s
- Filter Sediment Capacity: 142 kg
- Maximum Sump Maintenance Sediment Capacity: 356 L
- Maximum Hydrocarbon Storage Capacity: 379 L
- Total Storage Volume: 2,313 L

Refer to Appendix D for additional details on proposed treatment unit and Servicing Plan C401 (Appendix E) for its location.

7.2.2 Water Quantity

The allowable release rate for the subject site has been calculated to 5-yr pre-development level and was determined 30.95 L/s. Post-development storm events up to and including 100-yr storm

will be controlled to 5-yr pre-development level. For calculations, refer to STM design calculation sheets in Appendix D.

7.3 Method of Analysis

The modified Rational Method has been used to calculate the peak flow rate from the proposed site and to quantify the storage required for quantity control for the proposed development.

$$Q = 2.78CIA$$

Where,

Q = Flow (L/s)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hr), determined from the City of Ottawa IDF curves

A = Area (ha)

Refer to Appendix D for runoff and storage calculations.

7.4 Proposed Stormwater Quantity Controls

The proposed stormwater management quantity control for this development will be accomplished using an Inlet Control Device (ICD). Ponding required as a result of quantity control will be accomplished through surface storage in the parking lot.

A network of storm sewers is proposed to service the site which will outlet to the existing ditch along Borrisokane Rd and eventually to the existing 800mm dia. culvert crossing Borrisokane Rd. Refer to Site Servicing Plan C401 and Appendix D for calculation details.

The existing site is delineated by catchments EWS-01 which currently drains uncontrolled towards the west and outlet to the existing ditch. Refer to Pre-development Watershed Plan C701 (Appendix E). The site has been analyzed and post-development watersheds have been allocated. A few watersheds WS-08 and WS-09 consisting of grass area and asphalt area will flow un-controlled off the site. For additional details, refer to Post-development Watershed Plan C702 (Appendix E).

Overland flow in Halo Car Wash area within watersheds WS-01, WS-02, WS-03, WS-04, WS-05, WS-06, WS-07 & WS-08 will be captured by a several CB/CBMHs. An ICD, Hydrovex Vortex Flow Regulator 100VHV-1 (or approved equivalent), is proposed at CBMH10 to restrict the collected

runoff and control the release rate at 10.49 L/s (H=2.04 m). For additional details on select ICD, refer to Appendix D. Table 4 summarizes post-development drainage areas. Additional details and calculations can be found in Appendix D.

Table 4: Drainage Areas and Runoff Coefficients

Watersheds	Area (ha)	Weighted Runoff Coefficient (C)
WS-01 (controlled)	0.064	0.46
WS-02 (controlled)	0.049	0.90
WS-03 (controlled)	0.028	0.71
WS-04 (controlled)	0.101	0.58
WS-05 (controlled)	0.054	0.90
WS-06 (controlled)	0.112	0.90
WS-07 (controlled)	0.034	0.70
WS-08 (controlled)	0.045	0.44
WS-09 (uncontrolled)	0.027	0.20
WS-10 (uncontrolled)	0.020	0.53
Total	**0.534**	**0.68**

Table 5 summarizes the release rates, storage volume required and available storage in the proposed site.

Table 5: Summary of Proposed Development Stormwater Release Rates

Watersheds	Area (ha)	Release Rate (L/s)			Storage Required (m^3)			Storage Provided (m^3)	
		100-yr	5-yr	2-yr	100-yr	5-yr	2-yr	Under-ground	Surface
Controlled (WS-01 to WS-08)	0.487	10.49	10.49	10.49	210.16	104.65	50.72	50.76	260.62
Uncontrolled (WS-09 to WS-10)	0.047	9.97	4.65	3.43	N/A	N/A	N/A	N/A	N/A
Total	**0.534**	**20.46**	**15.15**	**13.92**	**210.16**	**104.65**	**50.72**	**50.76**	**260.62**

The runoff exceeding the allowable release rate will be stored on-site via surficial ponding. For 100-yr storm event, it is calculated that a total of 210.16 m^3 of storage will be required to attenuate flows to the average allowable release rate of 10.49 L/s (ICD controlled release rate). The total surface storage provided is 260.62 m^3, thus exceeds the required storage. The storage needed for 2-yr storm event will be accommodated underground in oversized pipes and MH/CBMH structures.

It is important to note that the available storage can also accommodate storage requirement of 265.77 m^3 for 100-yr + “Stress Test” event. Refer to Appendix D for runoff and storage calculation

details. The maximum ponding elevation and depths can be found on Stormwater Management Plan C601 in Appendix E.

8 EROSION AND SEDIMENT CONTROL

During construction, erosion and sediment controls will be provided primarily via a sediment control fence to be erected along the perimeter of the site where runoff has the potential of leaving the site. Inlet sediment control devices are also to be provided in any catch basin and/or manholes in and around the site that may be impacted by the site construction. Construction and maintenance requirements for erosion and sediment controls are to comply with Ontario Provincial Standard Specification OPSS 577. Refer to Erosion and Sediment Control Plan C101 for additional details.

9 CONCLUSION

This Stormwater Management and Servicing Report for the proposed development at 3535 Borrisokane Rd presents the rationale and details for the servicing requirements for the subject property. In accordance with the report objectives, the servicing requirements for the development are summarized below.

Water Service

- The anticipated maximum hour demand of the proposed development is 6.72 L/s.
- The maximum required fire flow is 65.00 L/, calculated using the FUS method.
- The fire hydrants along Flagstaff Dr will service the proposed development.
- The proposed development will be serviced with a new 100 mm dia. watermain to be connected to the proposed 200 mm dia. watermain to be extended from the existing stub.
- Boundary Conditions received from the City of Ottawa show that adequate pressure is available to service the proposed development.

Sanitary Service

- The anticipated sanitary flow from the proposed development is 6.39 L/s.

- The proposed development will be serviced by a network of 150 mm dia. sanitary sewers which will connect to the proposed 200 mm dia. SAN sewer to be extended from the existing stub.

Stormwater Management

- Stormwater quality control requirements of 80% TSS removal will be met using stormwater treatment unit (Jellyfish Filter JF4-2-1).
- The storm water release rates from the proposed development will meet contemplated average allowable release rate of 10.49 L/s (controlled release rate).
- Stormwater quantity control objectives will be met using an Inlet Control Device (ICD) to restrict flow and on-site stormwater surface & underground storage.

10 REPORT CONDITIONS AND LIMITATIONS

The report conclusions are applicable only to this specific project described in the preceding pages. Any changes, modifications or additions will require a subsequent review by LRL Associates Ltd. to ensure the compatibility with the recommendations contained in this document.

If you have any questions or comments, please contact the undersigned.

Prepared by:
LRL Associates Ltd.

Maxime Longtin
Civil Engineering Technologist

Mohan Basnet, P.Eng.
Civil Engineer

APPENDIX A

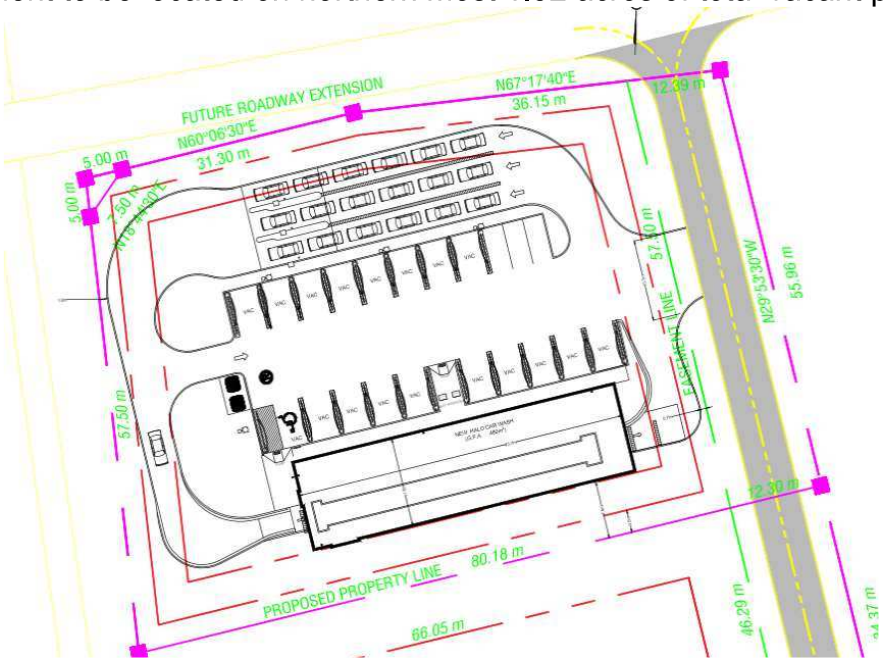
Pre-consultation / Correspondance

3555 Borrisokane Road
Meeting Summary Notes
Sept 23, 2021. Online Teams Meeting

Attendees:
- Jonah Bonn (Applicant, First Bay Properties Inc.)
- Bill Holzman (Applicant, Holzman Consultants)
- Philippe Paquette (LRL Associates)
- Peter MacEwen (MacEwen)
- Brad Moore (MacEwen)
- Greg Pedersen (Halowash)
- Jordan Lupovici (Halowash)
- Katie Morphet (File Lead, Panner, City of Ottawa)
- Jeff Shillington (Project Manager, City of Ottawa)
- Neeti Paudel (Transportation Project Manager, City of Ottawa)
- Sami Rehman (Environmental, City of Ottawa)
- Jeannette Krabicka (Parks, City of Ottawa)

Not in Attendance:
- Mark Richardson (Forestry, City of Ottawa)
- RVCA

Issue of Discussion:
- Site Plan Control for a new 1-storey 480 sq. m drive-through carwash with 3 queuing lanes for 18 cars and 21 parking spaces (18 of which are vacuum accessible).
- Development to be located on northern most 1.32 acres of total vacant property.



1. **Official Plan -** designated “General Urban Area”.

   Car wash a permitted use

   Barrhaven South CDP – property identified as institutional

2. **Zoning Information**

   Zoned IL [304]

   Urban Exception 304 permits place of worship as an additional use.

   IL Zone permits Drive-Through Facility and Car wash uses

   Zoning interpretation has confirmed that Section 203 (2)(c) limits the Car wash use to 300 sq. m.

   Floodplain overlay on a portion of the site – RVCA has confirmed that this floodplain area has been removed from their mapping. It will still need to be removed from the City’s mapping.

   Within the 400 m MTO Permit Control Area

3. **Infrastructure/Servicing – Jeff Shillington**

   - Servicing for the subdivision is currently being designed by DSEL for Mattamy. To coordinate service locations please contact Jen Ailey at DSEL (email: jailey@dsel.ca, cell no. 613-222-6476)

   - The current design has not yet been approved, however a 2nd submission of the detailed design is currently under review. There were no significant concerns with any of the servicing proposed for this area.

   - The current design shows the following:
     - 300 mm dia. sanitary sewer along Flagstaff with a 200 mm service and control MH proposed just inside the property in the northeast corner.

     - 300 mm watermain along Flagstaff with a 200 mm service and valve on the property line in the northeast corner of the property.

     - No storm sewer is proposed along Flagstaff. Stormwater could be outlet into the ditch on Borrisokane Road. A C=0.80 for the 5 year event should be used for the design. As per RVCA requirements the stormwater must maintain enhanced water quality protection either through on-site or down stream infrastructure prior to outletting to the Jock River.

- A MECP ECA is likely required for the stormwater outlet to the Borrisokane ditch.

- As discussed at the meeting a shared servicing corridor along the private road would be possible to service the neighboring site to the south. A joint use maintenance agreement and MECP ECA for the shared sanitary sewer would be required.

4. Initial Planning Comments – Katie Morphet

- Please add table to submitted site plan to identify all required zone and applicable general provisions and that they are being met.

- I have been able to confirm that Section 203 (2)(c) does limit the proposed car wash use to 300 sq.m. If you wish to move forward with a footprint of this size a minor variance would need to be approved prior to the Site Plan being finalized and approved. I understand that the minor variance process is severely backed up due to covid so I would inquire with the Committee timing for the next available meeting.

- The floodplain overlay will need to be removed from the property prior to approval of a Site Plan.

  The flood plain can be dealt with multiple ways.

  1. You can undertake a site-specific ZBA;

  2. If the timing works for both the applicant and the zoning group the City can add it to the omnibus report. The next omnibus report is expected in Q1 of 2022. This means it could go forward at the end of April 2022; or

  3. It will be removed when the City undertakes flood plain mapping updates. The floodplain mapping for this area is expected to be updated by the end of the year but it is not guaranteed.

- A Survey Plan will be required to clarify property boundaries and lot ownership.

- The Site Plan design drawings and agreement and will apply to entire lot if it is yet to be severed at the time of application.

- The site is within 400m of the High 416 – MTO Permit control Area – please confirm with MTO whether you require a permit from them.

5. **Parks – Jeanette Krabicka**

   Please see the attached comments.

6. **Trees - Mark Richardson**

   1) if there are trees >10cm in diameter on site a tree removal permit will required and a TCR will need to be submitted with their application

   2) they will need to contact mark.richardson@ottawa.ca for information on the permitting and TCR process.

7. **Environment – Sami Rehman**

   The subject property is located adjacent to an Urban Natural Feature (UNF) called Cambrian Woods North and the proposal requires an Environmental Impact Statement (EIS) as outlined in OP section 3.2.3 and 4.7.8. As such, the EIS will need to address:

   - potential impacts from the development on the UNF
   - potential impacts from the development on the adjacent watercourse
   - significant habitat for threatened or endangered species
   - review and draw recommendations from the Jock River Reach 1 Subwatershed Plan
   - review and draw recommendations from the Protocol for Wildlife Protection during Construction

   Further details on the EIS requirements can be found in OP Section 4.7.8 or the EIS guidelines:
   https://documents.ottawa.ca/sites/documents/files/documents/eis_guidelines2015_en.pdf

   City staff will be looking to ensure that the proposal's design includes buffering along the adjacent watercourse.

   Staff are also recommending landscaping and design elements that will reduce energy and water consumption, as outlined in OP Section 4.9.

   Given the subject property's proximity to the UNF, the adjacent watercourse and the Jock River, staff will be anticipating using only locally appropriate native species in their landscape plan.

   I recommend contacting the Trail Road Waste Facility to identify their comments or advice for this proposed development because the subject property is within 500m of the facility.

I would also recommend consulting with the Rideau Valley Conservation Authority to determine if any permits or approvals are required under their regulations.

While not explicitly discussed in this meeting, a severance will trigger the requirement for an EIS and the advice provided above would be applicable to that EIS and severance application.

8. Conservation Authority – Eric Lalande (RVCA)

For the floodplain, mapping below shows that the floodplain does not extend onto the property. This was confirmed and updated on our end earlier this year, and mapping at the City should be updated through an omnibus zoning amendment.

As for SWM and TSS removal, you are required to maintain enhanced water quality protection either through on-site or down stream infrastructure prior to any outlet to a natural watercourse. Note that setbacks and stormwater should take into consideration the realigned channel adjacent to your site (along the easterly property boundary).

Given the use, I would also suggest you contact the City's HydroG related to any groundwater constraints given the use.

9. Transportation – Neeti Paudel

Follow Traffic Impact Assessment Guidelines

- Complete the screening form as soon as possible and submit it to the Neeti Paudel at neeti.paudel@ottawa.ca for review. Please include the **site generated trips** for the trip generation trigger. Once reviewed, and if, the triggers are met, proceed to Step 2.

- **Applicant advised that their application will not be deemed complete until the submission of the draft step 1-4, including the functional draft RMA package (if applicable) and/or monitoring report (if applicable). Collaboration and communication between development proponents and City staff are required at the end of every step in the TIA process**

- Request base mapping asap if RMA is required. Contact Engineering Services (https://ottawa.ca/en/city-hall/planning-and-development/engineering-services)

- Noise Impact Studies required for the following:
  - Stationary (if, within 100m of noise sensitive land use).

- Ensure clear throat length requirements as per TAC are met at the accesses.

- On site plan:
    - 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.
    - 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).
    - Show all curb radii measurements; ensure that all curb radii are reduced as much as possible

- As the proposed site is for general public use, AODA legislation applies. Consider using the City's Accessibility Design Standards.

- Number of accessible parking spaces should meet the requirements from Table 3 of the City's accessible Design Standards.

- Site triangles at the following locations on the final plan will be required:
    - Local Road to Local Road: 3 metre x 3 metres
    - Local Road to Collector Road: 5 metre x 5 metres
    - Collector Road to Collector Road: 5 metre x 5 metres
    - Collector Road to Arterial Road: 5 metre x 5 metres

10. General Information

a. Ensure that all plans and studies are prepared as per City guidelines – as available online…
https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans

Mohan Basnet

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: September 24, 2021 10:42 AM
To: Philippe Paquette; Jamie Batchelor
Cc: katie.morphet@ottawa.ca; Brad Moore; Jordan Lupovici; Jonah Bonn
Subject: RE: Future Halo carwash Borrisokane Rd. Barrhaven ON. (LRL#210691)

Hi Philippe,

As for the floodplain, mapping below shows that the floodplain does not extend onto the property. This was confirmed and updated on our end earlier this year, and mapping at the City should be updated through an omnibus zoning amendment.
As for SWM and TSS removal, you are required to maintain enhanced water quality protection either through on-site or down stream infrastructure prior to any outlet to a natural watercourse. Note that setbacks and stormwater should take into consideration the realigned channel adjacent to your site (along the easterly property boundary).

Given the use, I would also suggest you contact the City's HydroG related to any groundwater constraints given the use.

Cheers,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: Philippe Paquette <ppaquette@lrl.ca>
Sent: Thursday, September 23, 2021 4:25 PM

To: Jamie Batchelor <jamie.batchelor@rvca.ca>; Eric Lalande <eric.lalande@rvca.ca>
Cc: katie.morphet@ottawa.ca; Brad Moore <b.moore@macewen.ca>; Jordan Lupovici <jlupovici@halowash.com>; Jonah Bonn <jbonn@firstbay.ca>
Subject: Future Halo carwash Borrisokane Rd. Barrhaven ON. (LRL#210691)

Hi Jamie and Eric,
After pre-consulting with the City of Ottawa this morning regrading the above mentioned project, the City of Ottawa planner assigned to the file (Katie Morphet) gave me your contacts in order to discuss about the flood plain crossing this property, SWM and TSS removal criterion. To put you in context, our client wishes to purchase a piece of land located at the north end of the employment block of the Mattamy Homes Half Moon bay West Subdivision. Refer to the attached document for more info. Also attached is a preliminary plan of what they want to develop.
Let us know of your availability so we can book a meeting very soon.
Thanks for your time.

Philippe Paquette, C.E.T.
Certified Engineering Technologist

LRL Engineering
5430 Canotek Road
Ottawa, Ontario K1J 9G2

T (613) 842-3434 or (877) 632-5664 ext 209
C (613) 880-9793
F (613) 842-4338
E ppaquette@lrl.ca
W www.lrl.ca

Given the current COVID-19 situation, please be aware that LRL has implemented alternative working conditions for our team. Many of us have now transitioned to working from home; however, communication and workability remains one of our top priorities.
We will continue to be reachable by cell phone or by calling LRL at 613-842-3434 which will prompt you to enter the extension of the person you are trying to reach.
In addition, we will continue to have access to all e-mail correspondence and do our best to return all inquiries in a timely manner.

APPENDIX B

Water Supply Calculations

Mohan Basnet

From: Bramah, Bruce <bruce.bramah@ottawa.ca>
Sent: October 7, 2022 8:41 AM
To: Mohan Basnet
Cc: Maxime Longtin
Subject: RE: Halo Car Wash_3535 Borrisokane Rd_Boundary Condition (LRL210691)
Attachments: 3535 Borrisokane Rd_05Oct2022.docx

Good morning,

Please see the attached boundary conditions.
Thank you,
Bruce Bramah, EIT
Project Manager
Planning, Real Estate and Economic Development Department / Direction générale de la planification, des biens immobiliers et du développement économique
Development Review - South Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste 29686, Bruce.Bramah@ottawa.ca

From: Mohan Basnet <mbasnet@lrl.ca>
Sent: September 19, 2022 1:56 PM
To: Bramah, Bruce <bruce.bramah@ottawa.ca>
Cc: Maxime Longtin <mlongtin@lrl.ca>
Subject: Halo Car Wash_3535 Borrisokane Rd_Boundary Condition (LRL210691)

Good afternoon,

We are working on serviceability study for the proposed Car Wash building at 3535 Borrisokane Rd, Ottawa and require boundary conditions at this site to proceed. Please use the following data to provide the required boundary conditions.

- Service location: please see a draft servicing plan C401 attached which also show fire hydrants nearby along Flagstaff Dr.
- Type of development: proposed Car Wash building
- Average daily demand: 1.29 L/s
- Maximum daily demand: 2.29 L/s
- Peak hourly demand: 6.72 L/s
- FUS fire flow demand: 65.00 L/s

For your reference, I have also included copies of domestic water demand calculations and FUS fire flow calculations along with this email.

Thank you and please let me know if you have any questions.

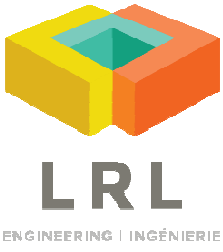
Mohan

Mohan Basnet, P.Eng.
Civil Engineer

LRL Engineering
5430 Canotek Road
Ottawa, Ontario K1J 9G2

T (613) 842-3434
F (613) 842-4338
E mbasnet@lrl.ca
W www.lrl.ca

Given the current COVID-19 situation, please be aware that LRL has implemented alternative working conditions for our team. Many of us have now transitioned to working from home; however, communication and workability remains one of our top priorities.
We will continue to be reachable by cell phone or by calling LRL at 613-842-3434 which will prompt you to enter the extension of the person you are trying to reach.
In addition, we will continue to have access to all e-mail correspondence and do our best to return all inquiries in a timely manner.



Boundary Conditions
3535 Borrisokane Rd

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	77	1.29
Maximum Daily Demand	174	2.90
Peak Hour	403	6.72
Fire Flow Demand #1	3,900	65.00

Location

Results – Existing Conditions

Connection 1 – Flagstaff Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	157.0	89.6
Peak Hour	140.7	66.3
Max Day plus Fire 1	133.0	55.4

Ground Elevation = 94.0 m

Results – SUC Zone Reconfiguration

Connection 1 – Flagstaff Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	146.9	75.3
Peak Hour	142.0	68.2
Max Day plus Fire 1	142.4	68.9

Ground Elevation = 94.0 m

Notes

1. Elevation of Connection 1 was assumed based on site plans for modelling purposes.
2. A second connection to the watermain, separated by an isolation valve, is required to decrease vulnerability of the water system in case of breaks.
3. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

Water Service Calculations

LRL File No. : 210691
Project : Proposed Development - Halo Car Wash
Location : 3555 Borrisokane Rd
Date : April 13, 2022
Designed by : M. Basnet

Water Demand

Site area = 0.534 ha

Average day demand =	*35000*	*L / ha·day*	(based on City of Ottawa guidelines)
=	18690	L / day	
=	**0.22**	**L / s**	
Maximum daily peak factor =	1.5		
Maximum daily demand =	**0.32**	**L / s**	
Maximum hour peak factor =	1.8		
Maximum hour demand =	**0.58**	**L / s**	

Adjustment - Car Wash (as per Halo Car Wash Inc.)

Estimated vol. of water/car wash = 170 L

Average day demand =	93151	L / day	(assuming 200000 car wash/year)
	1.08	**L / s**	
Maximum daily demand =	**1.97**	**L / s**	(assuming 1000 car wash/day)
Maximum hour demand =	**6.14**	**L / s**	(assuming 130 car wash/hour)

Total Anticipated Water Demand

Average day demand =	**1.29**	**L / s**
Maximum daily demand =	**2.29**	**L / s**
Maximum hour demand =	**6.72**	**L / s**

Water Service Pipe Sizing

$Q = VA$

Where: V = velocity
A = area of watermain pipe
Q = water supply flow rate

By deriving the above formula with V=1.5 m/s

Minimum pipe diameter:

$d = (4Q/\pi V)^{1/2}$

$d =$ 0.076 m

$d =$ 76 mm (minimum required size)

Proposed pipe diameter: **100** mm

Fire Flow Calculations

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3535 Borrisokane Rd, Barrhaven, ON
Date: April 14, 2022
Method: Fire Underwriters Survey (FUS)
Prepared by: M. Basnet

Step	Task	Term	Options	Multiplier	Choose:	Value	Unit	Fire Flow
Structural Framing Material								
1	Choose frame used for building	Coefficient C related to the type of construction	Wood Frame	1.5	Non-combustible Construction	**0.8**		
			Ordinary Construction	1.0				
			Non-combustible construction	0.8				
			Fire resistive construction <2 hrs	0.7				
			Fire resistive construction >2 hrs	0.6				
Floor Space Area (A)								
2	Total area					**485**	m^2	
3	Obtain fire flow before reductions	Required fire flow	Fire Flow = 220 x C x $A^{0.5}$				L/min	**3,876**
Reductions or surcharge due to factors affecting burning								
4	Choose combustibility of contents	Occupancy hazard reduction or surcharge	Non-combustible	-25%	Combustible	**0%**	L/min	**3,876**
			Limited combustible	-15%				
			Combustible	0%				
			Free burning	15%				
			Rapid burning	25%				
5	Choose reduction for sprinklers	Sprinkler reduction	Full automatic sprinklers	-30%	False	**0%**	L/min	**3,876**
			Water supply is standard for both the system and fire department hose lines	-10%	False	**0%**		
			Fully supervised system	-10%	False	**0%**		
6	Choose separation	Exposure distance between units	North side	>45m	0%		L/min	**3,876**
			East side	>45m	0%			
			South side	>45m	0%			
			West side	>45m	0%	**0%**		
Net required fire flow								
7	Obtain fire flow, duration, and volume	Minimum required fire flow rate (rounded to nearest 100)					L/min	**3,900**
		Minimum required fire flow rate					L/s	**65.0**
		Required duration of fire flow					hr	**1.5**

APPENDIX C

Wastewater Calculations

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3535 Borrisokane Rd, Barrhaven, ON
Date: November 16, 2022

Sanitary Design Parameters

Average Daily Flow = 280 L/p/day
Commercial & Institutional Flow = 28000 L/ha/day
Light Industrial Flow = 35000 L/ha/day
Heavy Industrial Flow = 55000 L/ha/day
Maximum Residential Peak Factor = 4.0
Commercial & Institutional Peak Factor = 1.5
Industrial Peak Factor = as per Appendix 4-B
Extraneous Flow = 0.33 L/s/gross ha
(as Per Tech Bulletin ISTB-2018-01)

Pipe Design Parameters

Minimum Velocity = 0.60 m/s
Manning's n = 0.013

LOCATION			RESIDENTIAL AREA AND POPULATION						COMMERCIAL		INDUSTRIAL			INSTITUTIONAL		C+I+I	INFILTRATION			*TOTAL	PIPE					
STREET/ SITE	FROM MH	TO MH	AREA (Ha)	POP.	CUMMULATIVE AREA (Ha)	CUMMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (Ha)	ACCU. AREA (Ha)	AREA (Ha)	ACCU. AREA (Ha)	PEAK FACT.	AREA (Ha)	ACCU. AREA (Ha)	*PEAK FLOW (l/s)	TOTAL AREA (Ha)	ACCU. AREA (Ha)	INFILT. FLOW (l/s)	FLOW (l/s)	LENGTH (m)	DIA. (mm)	SLOPE (%)	MATERIAL	CAP. (FULL) (l/s)	VEL. (FULL) (m/s)
	Bldg.	SAN MH03																		0.003	4.4	150	2.00%	PVC	21.54	1.22
	SAN MH03	Prop. SAN connection																		0.003	15.8	150	2.00%	PVC	21.54	1.22
	SAN MH01	SAN MH02									0.534					6.139	0.534	0.534	0.176	6.318	36.8	150	1.41%	PVC	18.08	1.02

Designed: M. B./M.L.	PROJECT: Proposed Halo Car Wash		
Checked: M.B.	LOCATION: 3535 Borrisokane Rd, Barrhaven, ON		
Dwg. Reference: C401	File Ref.: 210691	Date: 2022-11-16	Sheet No. 1 of 1

Note:
*Peak flow including anticipated waste water from Halo Car Wash (6.141 L/s), see below

Site Description	Qty	L/Qty	Total L/day	Total L/s
Halo Car Wash				
Anticipated Employees	2	75	150	0.002
Total x Peak Factor (1.5)				**0.003**
Estimated Car Wash/Hour (based on info by Halo Car Wash)	130	170		**6.139**
Total Anticipated Peak Design Flow (dry weather flow)				**6.141**

APPENDIX D

Stormwater Management Calculations

LRL Associates Ltd.

Storm Watershed Summary

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: November 10, 2022
Designed: M. Longtin
Checked: M. Basnet
Dwg Reference: C701, C702

Pre-Development Catchments

Watershed	C = 0.20	C = 0.80	C = 0.90	Total Area (ha)	Combined C
EWS-01 (uncontrolled)	0.534	0.000	0.000	0.534	0.20
Total	**0.534**	**0.000**	**0.000**	**0.534**	**0.20**

Post-Development Catchments

Watershed	C = 0.20	C = 0.8	C = 0.90	Total Area (ha)	Combined C
WS-01 (controlled)	0.040	0.000	0.024	0.064	0.46
WS-02 (controlled)	0.000	0.000	0.049	0.049	0.90
WS-03 (controlled)	0.008	0.000	0.021	0.028	0.71
WS-04 (controlled)	0.046	0.000	0.055	0.101	0.58
WS-05 (controlled)	0.000	0.000	0.054	0.054	0.90
WS-06 (controlled)	0.000	0.000	0.112	0.112	0.90
WS-07 (controlled)	0.010	0.000	0.024	0.034	0.70
WS-08 (controlled)	0.029	0.000	0.016	0.045	0.44
WS-09 (uncontrolled)	0.027	0.000	0.000	0.027	0.20
WS-10 (uncontrolled)	0.011	0.000	0.009	0.020	0.53
Total	**0.170**	**0.000**	**0.364**	**0.534**	**0.68**

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: November 10, 2022
Designed: M. Longtin
Checked: M. Basnet
Drawing Ref.: C701, C702

Stormwater Management Design Sheet

STORM - 100 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) = A / (Td + C)^{B}
A = Area (ha)
T_c = Time of concentration (min)

Pre-Devlopment Catchments within Development Area

	Total Area =	**0.534**	ha	**∑R=**	**0.20**
Un-Controlled	EWS-01	0.534	ha	R=	0.20
	Total Uncontrolled =	**0.534**	**ha**	**∑R=**	**0.20**

Pre-development Stormwater Management (5-Yr)

$I_5 = 998.071 / (Td + 6.053)^{0.814}$ **A =** 998.071 **B =** 0.814 **C =** 6.053

C =	0.20	max of 0.5 as per City of Ottawa
I =	104.2	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	30.95	L/s

Pre-development Stormwater Management (100-Yr)

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$ **A =** 1735.688 **B =** 0.820 **C =** 6.014

C =	0.20	
I =	178.6	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	53.04	L/s

Allowable Release Rate = 30.95 L/s
(5-yr pre-development level corresponding to EWS-01, see drawing C701)

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**0.534**	ha	**∑R=**	**0.68**	**0.85**
Controlled	WS-01	0.064	ha	R=	0.46	0.58
	WS-02	0.049	ha	R=	0.90	1.00
	WS-03	0.028	ha	R=	0.71	0.89
	WS-04	0.101	ha	R=	0.58	0.73
	WS-05	0.054	ha	R=	0.90	1.00
	WS-06	0.112	ha	R=	0.90	1.00
	WS-07	0.034	ha	R=	0.70	0.88
	WS-08	0.045	ha	R=	0.44	0.56
	Total Contolled =	**0.487**	**ha**	**∑R=**	**0.71**	**0.89**
Uncontrolled	WS-09	0.027	ha	R=	0.20	0.25
	WS-10	0.020	ha	R=	0.53	0.66
	Total Uncontrolled =	**0.047**	**ha**	**∑R=**	**0.34**	**0.42**

Post-development Stormwater Management (100-Yr)

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	*Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	178.56	214.44	122.37	10.49	9.97	20.46
15	142.89	171.61	145.00	10.49	7.97	18.47
20	119.95	144.06	160.27	10.49	6.69	17.19
25	103.85	124.72	171.33	10.49	5.80	16.29
30	91.87	110.33	179.71	10.49	5.13	15.62
35	82.58	99.17	186.23	10.49	4.61	15.10
40	75.15	90.25	191.41	10.49	4.19	14.69
45	69.05	82.93	195.57	10.49	3.85	14.35
50	63.95	76.81	198.94	10.49	3.57	14.06
55	59.62	71.61	201.67	10.49	3.33	13.82
60	55.89	67.13	203.88	10.49	3.12	13.61
65	52.65	63.23	205.66	10.49	2.94	13.43
70	49.79	59.80	207.07	10.49	2.78	13.27
75	47.26	56.75	208.16	10.49	2.64	13.13
80	44.99	54.03	208.98	10.49	2.51	13.00
85	42.95	51.59	209.57	10.49	2.40	12.89
90	41.11	49.37	209.95	10.49	2.29	12.79
95	39.43	47.36	210.13	10.49	2.20	12.69
100	37.90	45.52	210.16	10.49	2.12	12.61
105	36.50	43.83	210.03	10.49	2.04	12.53
110	35.20	42.28	209.77	10.49	1.96	12.46
115	34.01	40.84	209.38	10.49	1.90	12.39
120	32.89	39.51	208.88	10.49	1.84	12.33

*Average release rate taken as 50% of max. allowable controlled release rate (20.98 L/s)

On-site stormwater detention

Storage required =	**210.16**	m^3	
Surface storage provided =	**260.62**	m^3	(See Dwg C601)
Underground storage provided =	**50.76**	m^3	(See 2-Yr STM Design Sheet)

LRL File No.	210691
Project:	Proposed Development-Halo Car Wash
Location:	3555 Borrisokane Rd (Barrhaven, ON)
Date:	November 10, 2022
Designed:	M. Longtin
Checked:	M. Basnet
Drawing Ref.:	C701, C702

Stormwater Management Design Sheet

STORM - 100 YEAR + Stress Test

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) = $A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-Devlopment Catchments within Development Area

	Total Area =	**0.534**	ha	**∑R=**	**0.20**
Un-Controlled	EWS-01	0.534	ha	R=	0.20
	Total Uncontrolled =	**0.534**	**ha**	**∑R=**	**0.20**

Pre-development Stormwater Management (5-Yr)

$I_5 = 998.071 / (Td + 6.053)^{0.814}$ **A =** 998.071 **B =** 0.814 **C =** 6.053

C =	0.20	max of 0.5 as per City of Ottawa
I =	104.2	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	30.95	L/s

Pre-development Stormwater Management (100-Yr)

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$ **A =** 1735.688 **B =** 0.820 **C =** 6.014

C =	0.20	
I =	178.6	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	53.04	L/s

Allowable Release Rate = 30.95 L/s

(5-yr pre-development level corresponding to EWS-01, see drawing C701)

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**0.534**	ha	**∑R=**	**0.68**	**0.85**
Controlled	WS-01	0.064	ha	R=	0.46	0.58
	WS-02	0.049	ha	R=	0.90	1.00
	WS-03	0.028	ha	R=	0.71	0.89
	WS-04	0.101	ha	R=	0.58	0.73
	WS-05	0.054	ha	R=	0.90	1.00
	WS-06	0.112	ha	R=	0.90	1.00
	WS-07	0.034	ha	R=	0.70	0.88
	WS-08	0.045	ha	R=	0.44	0.56
	Total Contolled =	**0.487**	**ha**	**∑R=**	**0.71**	**0.89**
Uncontrolled	WS-09	0.027	ha	R=	0.20	0.25
	WS-10	0.020	ha	R=	0.53	0.66
	Total Uncontolled =	**0.047**	**ha**	**∑R=**	**0.34**	**0.42**

Post-development Stormwater Management (100-Yr + Stress Test)

Time (min)	**Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	*Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	214.27	257.33	148.10	10.49	11.96	22.45
15	171.47	205.93	175.89	10.49	9.57	20.06
20	143.94	172.87	194.85	10.49	8.03	18.53
25	124.62	149.66	208.75	10.49	6.95	17.45
30	110.24	132.40	219.42	10.49	6.15	16.65
35	99.09	119.01	227.88	10.49	5.53	16.02
40	90.17	108.30	234.72	10.49	5.03	15.53
45	82.86	99.51	240.35	10.49	4.62	15.12
50	76.74	92.17	245.02	10.49	4.28	14.78
55	71.55	85.93	248.93	10.49	3.99	14.49
60	67.07	80.55	252.21	10.49	3.74	14.24
65	63.18	75.87	254.97	10.49	3.53	14.02
70	59.75	71.75	257.29	10.49	3.33	13.83
75	56.71	68.10	259.24	10.49	3.16	13.66
80	53.99	64.84	260.86	10.49	3.01	13.51
85	51.54	61.90	262.19	10.49	2.88	13.37
90	49.33	59.25	263.27	10.49	2.75	13.25
95	47.32	56.83	264.12	10.49	2.64	13.13
100	45.48	54.62	264.78	10.49	2.54	13.03
105	43.80	52.60	265.26	10.49	2.44	12.94
110	42.24	50.73	265.57	10.49	2.36	12.85
115	40.81	49.01	265.74	10.49	2.28	12.77
120	39.47	47.41	265.77	10.49	2.20	12.70
125	38.23	45.92	265.68	10.49	2.13	12.63
130	37.08	44.53	265.47	10.49	2.07	12.56
135	36.00	43.23	265.16	10.49	2.01	12.50

*Average release rate taken as 50% of max. allowable controlled release rate (20.98 L/s)
**20% increase in intensity for "Stress Test"

On-site stormwater detention

Storage required =	**265.77**	m^3	
Surface storage provided =	**260.62**	m^3	(See Dwg C601)
Underground storage provided =	**50.76**	m^3	(See 2-Yr STM Design Sheet)

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: November 10, 2022
Designed: M. Longtin
Checked: M. Basnet
Drawing Ref.: C701, C702

Stormwater Management Design Sheet

STORM - 5 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) = $A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-Devlopment Catchments within Development Area

	Total Area =	**0.534**	ha	**∑R=**	**0.20**
Un-Controlled	EWS-01	0.534	ha	R=	0.20
	Total Uncontrolled =	**0.534**	**ha**	**∑R=**	**0.20**

Pre-development Stormwater Management (5-Yr)

$I_5 = 998.071 / (Td + 6.053)^{0.814}$ **A =** 998.071 **B =** 0.814 **C =** 6.053

C =	0.20	max of 0.5 as per City of Ottawa
I =	104.2	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	30.95	L/s

Pre-development Stormwater Management (100-Yr)

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$ **A =** 1735.688 **B =** 0.820 **C =** 6.014

C =	0.20	
I =	178.6	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	53.04	L/s

Allowable Release Rate = 30.95 L/s
(5-yr pre-development level corresponding to EWS-01, see drawing C701)

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**0.534**	ha	**∑R=**	**0.68**	**0.85**
Controlled	WS-01	0.064	ha	R=	0.46	0.58
	WS-02	0.049	ha	R=	0.90	1.00
	WS-03	0.028	ha	R=	0.71	0.89
	WS-04	0.101	ha	R=	0.58	0.73
	WS-05	0.054	ha	R=	0.90	1.00
	WS-06	0.112	ha	R=	0.90	1.00
	WS-07	0.034	ha	R=	0.70	0.88
	WS-08	0.045	ha	R=	0.44	0.56
	Total Contolled =	**0.487**	**ha**	**∑R=**	**0.71**	**0.89**
Uncontrolled	WS-09	0.027	ha	R=	0.20	0.25
	WS-10	0.020	ha	R=	0.53	0.66
	Total Uncontolled =	**0.047**	**ha**	**∑R=**	**0.34**	**0.42**

Post-development Stormwater Management (5-Yr)

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	*Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	104.19	125.13	68.78	10.49	4.65	15.15
15	83.56	100.35	80.87	10.49	3.73	14.22
20	70.25	84.37	88.65	10.49	3.14	13.63
25	60.90	73.13	93.96	10.49	2.72	13.21
30	53.93	64.76	97.69	10.49	2.41	12.90
35	48.52	58.27	100.33	10.49	2.17	12.66
40	44.18	53.06	102.17	10.49	1.97	12.47
45	40.63	48.79	103.41	10.49	1.81	12.31
50	37.65	45.22	104.18	10.49	1.68	12.17
55	35.12	42.18	104.57	10.49	1.57	12.06
60	32.94	39.56	104.65	10.49	1.47	11.96
65	31.04	37.28	104.47	10.49	1.39	11.88
70	29.37	35.27	104.08	10.49	1.31	11.81
75	27.89	33.49	103.50	10.49	1.25	11.74
80	26.56	31.90	102.75	10.49	1.19	11.68
85	25.37	30.47	101.86	10.49	1.13	11.63
90	24.29	29.17	100.85	10.49	1.08	11.58
95	23.31	27.99	99.72	10.49	1.04	11.53
100	22.41	26.91	98.50	10.49	1.00	11.49
105	21.58	25.92	97.18	10.49	0.96	11.46
110	20.82	25.01	95.79	10.49	0.93	11.42
115	20.12	24.16	94.32	10.49	0.90	11.39
120	19.47	23.38	92.78	10.49	0.87	11.36

*Average release rate taken as 50% of max. allowable controlled release rate (20.98 L/s)

On-site stormwater detention

Storage required =	**104.65**	m^3	
Surface storage provided =	**260.62**	m^3	(See Dwg C601)
Underground Storage provided =	**50.76**	m^3	(See 2-Yr STM Design Sheet)

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: November 10, 2022
Designed: M. Longtin
Checked: M. Basnet
Drawing Ref.: C701, C702

Stormwater Management Design Sheet

STORM - 2 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) = $A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-Devlopment Catchments within Development Area

	Total Area =	**0.534**	ha	**∑R=**	**0.20**
Un-Controlled	EWS-01	0.534	ha	R=	0.20
	Total Uncontrolled =	**0.534**	**ha**	**∑R=**	**0.20**

Pre-development Stormwater Management (2-Yr)

$I_2 = 732.951 / (Td + 6.199)^{0.810}$ **A =** 732.951 **B =** 0.810 **C =** 6.199

C =	0.20	max of 0.5 as per City of Ottawa
I =	76.8	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	22.82	L/s

Pre-development Stormwater Management (5-Yr)

$I_5 = 998.071 / (Td + 6.053)^{0.814}$ **A =** 998.071 **B =** 0.814 **C =** 6.053

C =	0.20	max of 0.5 as per City of Ottawa
I =	104.2	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	30.95	L/s

Pre-development Stormwater Management (100-Yr)

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$ **A =** 1735.688 **B =** 0.820 **C =** 6.014

C =	0.20	max of 0.5 as per City of Ottawa
I =	178.6	mm/hr
Tc =	10	min
Total Area =	0.534	ha
Release Rate =	53.04	L/s

Allowable Release Rate = 30.95 L/s
(5-yr pre-development level corresponding to EWS-01, see drawing C701)

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**0.534**	ha	**∑R=**	**0.68**	**0.85**
Controlled	WS-01	0.064	ha	R=	0.46	0.58
	WS-02	0.049	ha	R=	0.90	1.00
	WS-03	0.028	ha	R=	0.71	0.89
	WS-04	0.101	ha	R=	0.58	0.73
	WS-05	0.054	ha	R=	0.90	1.00
	WS-06	0.112	ha	R=	0.90	1.00
	WS-07	0.034	ha	R=	0.70	0.88
	WS-08	0.045	ha	R=	0.44	0.56
	Total Contolled =	**0.487**	**ha**	**∑R=**	**0.71**	**0.89**
Uncontrolled	WS-09	0.027	ha	R=	0.20	0.25
	WS-10	0.020	ha	R=	0.53	0.66
	Total Uncontolled =	**0.047**	**ha**	**∑R=**	**0.34**	**0.42**

LRL File No. 210691
Project: Proposed Development-Halo Car Wash
Location: 3555 Borrisokane Rd (Barrhaven, ON)
Date: November 10, 2022
Designed: M. Longtin
Checked: M. Basnet
Drawing Ref.: C701, C702

Stormwater Management Design Sheet

Post-development Stormwater Management (2-Yr)

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	*Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	76.81	73.79	37.98	10.49	3.43	13.92
15	61.77	59.34	43.97	10.49	2.76	13.25
20	52.03	49.99	47.40	10.49	2.32	12.82
25	45.17	43.39	49.35	10.49	2.02	12.51
30	40.04	38.47	50.36	10.49	1.79	12.28
35	36.06	34.64	50.72	10.49	1.61	12.10
40	32.86	31.57	50.59	10.49	1.47	11.96
45	30.24	29.05	50.11	10.49	1.35	11.84
50	28.04	26.94	49.34	10.49	1.25	11.75
55	26.17	25.14	48.34	10.49	1.17	11.66
60	24.56	23.59	47.16	10.49	1.10	11.59
65	23.15	22.24	45.82	10.49	1.03	11.53
70	21.91	21.05	44.35	10.49	0.98	11.47
75	20.81	20.00	42.76	10.49	0.93	11.42
80	19.83	19.05	41.08	10.49	0.89	11.38
85	18.94	18.20	39.31	10.49	0.85	11.34
90	18.14	17.43	37.46	10.49	0.81	11.30
95	17.41	16.73	35.55	10.49	0.78	11.27
100	16.75	16.09	33.57	10.49	0.75	11.24
105	16.13	15.50	31.54	10.49	0.72	11.21
110	15.57	14.96	29.47	10.49	0.70	11.19
115	15.05	14.46	27.34	10.49	0.67	11.17
120	14.56	13.99	25.18	10.49	0.65	11.14

*Average release rate taken as 50% of max. allowable controlled release rate (20.98 L/s)

On-site stormwater detention

Storage required = **50.72** m^3
Underground Storage provided = **50.76** m^3

Pipe Storage

Length (m)	dia. (m)	Storage (m^3)
87.70	0.450	13.95
21.70	0.450	3.45
37.60	0.450	5.98
	Total	**23.39**

MH/CBMH Storage

CB/CBMH	Depth (m)	dia. (m)	Storage (m^3)
CBMH01	1.26	1.20	1.43
CBMH02	1.46	1.20	1.65
CBMH03	1.23	1.50	2.17
CBMH04	1.23	1.20	1.39
CBMH05	1.35	1.50	2.39
CBMH06	1.50	1.20	1.70
CBMH07	1.47	1.20	1.66
MH08	1.84	1.80	4.68
CBMH10	1.95	1.80	4.96
CBMH11	1.46	1.20	1.65
MH12	1.46	1.20	1.65
CBMH09	1.79	1.20	2.03
		Total	**27.37**

LRL Associates Ltd.

Storm Design Sheet

LRL File No.	210691
Project:	Proposed Development-Halo Car Wash
Location:	3555 Borrisokane Rd (Barrhaven, ON)
Date:	November 10, 2022
Designed:	M. Longtin
Checked:	M. Basnet
Drawing Reference:	C702, C401

Storm Design Parameters

Rational Method	Runoff Coefficient (C)		City of Ottawa IDF curve equation
Q = 2.78CIA	Grass	0.20	(5 year event, intensity in mm/hr)
Q = Peak flow (L/s)	Gravel	0.80	$I_5 = 998.071 / (Td + 6.053)^{0.814}$
A = Drainage area (ha)	Asphalt / rooftop	0.90	Min. velocity = 0.80 m/s
C = Runoff coefficient			Manning's "n" = 0.013
I = Rainfall intensity (mm/hr)			

LOCATION			AREA (ha)			FLOW						STORM SEWER							
WATERSHED / STREET	From MH	To MH	C = 0.20	C = 0.80	C = 0.90	Indiv. 2.78AC	Accum. 2.78AC	Time of Conc. (min.)	Rainfall Intensity (mm/hr)	Peak Flow Q (L/s)	Controlled Flow Q (L/s)	Pipe Diameter (mm)	Type	Slope (%)	Length (m)	Capacity Full (L/s)	Velocity Full (m/s)	Time of Flow (min.)	Ratio (Q/Q_{FULL})
WS-01	CBMH02	CBMH03	0.040	0.000	0.024	0.08	0.08	10.00	104.19	8.57		450	PVC	0.45%	22.9	191.3	1.20	0.32	0.04
WS-02	CBMH11	MH12	0.000	0.000	0.049	0.12	0.12	10.00	104.19	12.83		450	PVC	0.45%	16.2	191.3	1.20	0.22	0.07
	MH12	CBMH03					0.12	10.22	103.02	12.68		450	PVC	0.45%	6.9	191.3	1.20	0.10	0.07
WS-03	CBMH03	CBMH05	0.008	0.000	0.021	0.06	0.26	10.32	102.53	26.78		450	PVC	0.45%	16.7	191.3	1.20	0.23	0.14
WS-04	CBMH04	CBMH05	0.046	0.000	0.055	0.16	0.16	10.00	104.19	17.02		450	PVC	0.45%	14.9	191.3	1.20	0.21	0.09
WS-05	CBMH05	CBMH06	0.000	0.000	0.054	0.13	0.56	10.43	101.97	56.96		450	PVC	0.35%	21.7	168.7	1.06	0.34	0.34
WS-06	CBMH06	MH08	0.000	0.000	0.112	0.28	0.84	10.77	100.28	84.20		450	PVC	0.32%	23.2	161.3	1.01	0.38	0.52
WS-07	CBMH07	MH08	0.010	0.000	0.024	0.07	0.07	10.00	104.19	6.83		450	PVC	0.45%	10.1	191.3	1.20	0.14	0.04
	MH08	CBMH10					0.91	10.91	99.61	90.17		450	PVC	0.36%	14.4	171.1	1.08	0.22	0.53
WS-08	CBMH10	OGS	0.029	0.000	0.016	0.06	0.96	11.14	98.56	94.69	10.49	250	PVC	0.79%	2.5	52.9	1.08	0.04	0.20
	OGS	Ex. STM					0.96	11.17	98.38	94.52	10.49	250	PVC	0.44%	9.9	39.4	0.80	0.21	0.27

Note

The Peak flow will be controlled by an ICD at the outlet of STM CBMH10

STANDARD OFFLINE
Jellyfish Filter Sizing Report

Project Information

Date	Wednesday, October 19, 2022
Project Name	3555 Borrisokane Rd.
Project Number	210691
Location	Barrhaven

Jellyfish Filter Design Overview

This report provides information for the sizing and specification of the Jellyfish Filter. When designed properly in accordance to the guidelines detailed in the Jellyfish Filter Technical Manual, the Jellyfish Filter will exceed the performance and longevity of conventional horizontal bed and granular media filters.
Please see ***www.ImbriumSystems.com*** *for more information.*

Jellyfish Filter System Recommendation

The Jellyfish Filter model JF4-2-1 is recommended to meet the water quality objective by treating a flow of 12.6 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 36 years of OTTAWA MACDONALD-CARTIER INT'L A rainfall data for this site. This model has a sediment capacity of 142 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-2-1	2	1	1.2	12.6	142

The Jellyfish Filter System

The patented Jellyfish Filter is an engineered stormwater quality treatment technology featuring unique membrane filtration in a compact stand-alone treatment system that removes a high level and wide variety of stormwater pollutants. Exceptional pollutant removal is achieved at high treatment flow rates with minimal head loss and low maintenance costs. Each lightweight Jellyfish Filter cartridge contains an extraordinarily large amount of membrane surface area, resulting in superior flow capacity and pollutant removal capacity.

Maintenance

Regular scheduled inspections and maintenance is necessary to assure proper functioning of the Jellyfish Filter. The maintenance interval is designed to be a minimum of 12 months, but this will vary depending on site loading conditions and upstream pretreatment measures. Quarterly inspections and inspections after all storms beyond the 5-year event are recommended until enough historical performance data has been logged to comfortably initiate an alternative inspection interval.

Please see ***www.ImbriumSystems.com*** *for more information.*

Thank you for the opportunity to present this information to you and your client.

Performance

Jellyfish efficiently captures a high level of Stormwater pollutants, including:

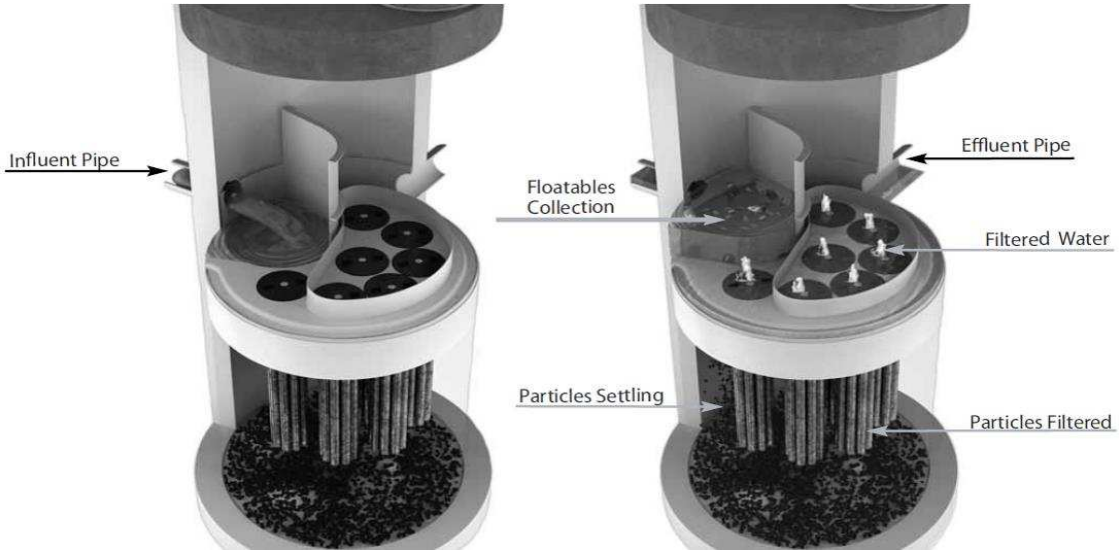
- ☑ 89% of the total suspended solids (TSS) load, including particles less than 5 microns
- ☑ 77% TP removal & 51% TN removal
- ☑ 90% Total Copper, 81% Total Lead, 70% Total Zinc
- ☑ Particulate-bound pollutants such as nutrients, toxic metals, hydrocarbons and bacteria
- ☑ Free oil, Floatable trash and debris

Field Proven Peformance

The Jellyfish filter has been field-tested on an urban site with 25 TARP qualifying rain events and field monitored according to the TARP field test protocol, demonstrating:

- A median TSS removal efficiency of 89%, and a median SSC removal of 99%;
- The ability to capture fine particles as indicated by an effluent d50 median of 3 microns for all monitotred storm events, and a median effluent turbidity of 5 NTUs;
- A median Total Phosphorus removal of 77%, and a median Total Nitrogen removal of 51%.

Jellyfish Filter Treatment Functions



Pre-treatment and Membrane Filtration

Jellyfish® Filter

Project Information

Date:	Wednesday, October 19, 2022
Project Name:	3555 Borrisokane Rd.
Project Number:	210691
Location:	Barrhaven

Designer Information

Company:	LRL Associates Ltd.
Contact:	Mohan Basnet
Phone #:	

Notes

Rainfall

Name:	OTTAWA MACDONALD-CARTIER INT'L A
State:	ON
ID:	6000
Record:	1967 to 2003
Co-ords:	45°19'N, 75°40'W

Drainage Area

Total Area:	0.487 ha
Runoff Coefficient:	0.7

Upstream Detention

Peak Release Rate:	n/a
Pretreatment Credit:	n/a

Design System Requirements

Flow Loading	90% of the Average Annual Runoff based on 36 years of OTTAWA MACDONALD-CARTIER INT'L A rainfall	**8.5 L/s**
Sediment Loading	Treating 90% of the average annual runoff volume, 1664 m³, with a suspended sediment concentration of 60 mg/L.	**100 kg**

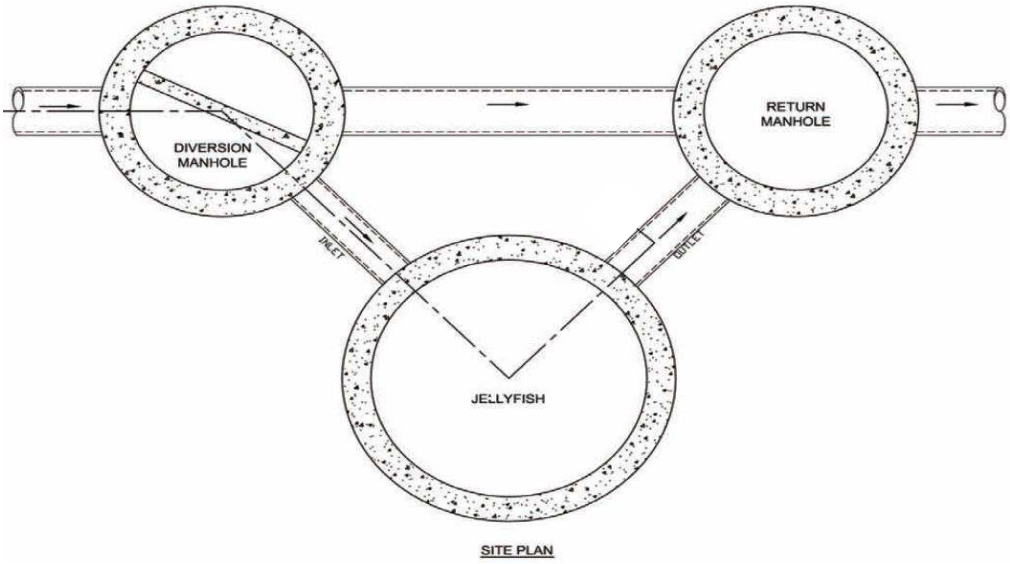
Recommendation

The Jellyfish Filter model JF4-2-1 is recommended to meet the water quality objective by treating a flow of 12.6 L/s, which meets or exceeds 90% of the average annual rainfall runoff volume based on 36 years of OTTAWA MACDONALD-CARTIER INT'L A rainfall data for this site. This model has a sediment capacity of 142 kg, which meets or exceeds the estimated average annual sediment load.

Jellyfish Model	Number of High-Flo Cartridges	Number of Draindown Cartridges	Manhole Diameter (m)	Wet Vol Below Deck (L)	Sump Storage (m³)	Oil Capacity (L)	Treatment Flow Rate (L/s)	Sediment Capacity (kg)
JF4-1-1	1	1	1.2	2313	0.34	379	7.6	85
JF4-2-1	**2**	**1**	**1.2**	**2313**	**0.34**	**379**	**12.6**	**142**
JF6-3-1	3	1	1.8	5205	0.79	848	17.7	199
JF6-4-1	4	1	1.8	5205	0.79	848	22.7	256
JF6-5-1	5	1	1.8	5205	0.79	848	27.8	313
JF6-6-1	6	1	1.8	5205	0.79	848	28.6	370
JF8-6-2	6	2	2.4	9252	1.42	1469	35.3	398
JF8-7-2	7	2	2.4	9252	1.42	1469	40.4	455
JF8-8-2	8	2	2.4	9252	1.42	1469	45.4	512
JF8-9-2	9	2	2.4	9252	1.42	1469	50.5	569
JF8-10-2	10	2	2.4	9252	1.42	1469	50.5	626
JF10-11-3	11	3	3.0	14456	2.21	2302	63.1	711
JF10-12-3	12	3	3.0	14456	2.21	2302	68.2	768
JF10-12-4	12	4	3.0	14456	2.21	2302	70.7	796
JF10-13-4	13	4	3.0	14456	2.21	2302	75.7	853
JF10-14-4	14	4	3.0	14456	2.21	2302	78.9	910
JF10-15-4	15	4	3.0	14456	2.21	2302	78.9	967
JF10-16-4	16	4	3.0	14456	2.21	2302	78.9	1024
JF10-17-4	17	4	3.0	14456	2.21	2302	78.9	1081
JF10-18-4	18	4	3.0	14456	2.21	2302	78.9	1138
JF10-19-4	19	4	3.0	14456	2.21	2302	78.9	1195
JF12-20-5	20	5	3.6	20820	3.2	2771	113.6	1280
JF12-21-5	21	5	3.6	20820	3.2	2771	113.7	1337
JF12-22-5	22	5	3.6	20820	3.2	2771	113.7	1394
JF12-23-5	23	5	3.6	20820	3.2	2771	113.7	1451
JF12-24-5	24	5	3.6	20820	3.2	2771	113.7	1508
JF12-25-5	25	5	3.6	20820	3.2	2771	113.7	1565
JF12-26-5	26	5	3.6	20820	3.2	2771	113.7	1622
JF12-27-5	27	5	3.6	20820	3.2	2771	113.7	1679

Jellyfish Filter Design Notes

- Typically the Jellyfish Filter is designed in an offline configuration, as all stormwater filter systems will perform for a longer duration between required maintenance services when designed and applied in off-line configurations. Depending on the design parameters, an optional internal bypass may be incorporated into the Jellyfish Filter, however note the inspection and maintenance frequency should be expected to increase above that of an off-line system. Speak to your local representative for more information.



Jellyfish Filter Typical Layout

- Typically, 18 inches (457 mm) of driving head is designed into the system, calculated as the difference in elevation between the top of the diversion structure weir and the invert of the Jellyfish Filter outlet pipe. Alternative driving head values can be designed as 12 to 24 inches (305 to 610mm) depending on specific site requirements, requiring additional sizing and design assistance.
- Typically, the Jellyfish Filter is designed with the inlet pipe configured 6 inches (150 mm) above the outlet invert elevation. However, depending on site parameters this can vary to an optional configuration of the inlet pipe entering the unit below the outlet invert elevation.
- The Jellyfish Filter can accommodate multiple inlet pipes within certain restrictions.
- While the optional inlet below deck configuration offers 0 to 360 degree flexibility between the inlet and outlet pipe, typical systems conform to the following:

Model Diameter (m)	Minimum Angle Inlet / Outlet Pipes	Minimum Inlet Pipe Diameter (mm)	Minimum Outlet Pipe Diameter (mm)
1.2	**62º**	**150**	**200**
1.8	59º	200	250
2.4	52º	250	300
3.0	48º	300	450
3.6	40º	300	450

- The Jellyfish Filter can be built at all depths of cover generally associated with conventional stormwater conveyance systems. For sites that require minimal depth of cover for the stormwater infrastructure, the Jellyfish Filter can be applied in a shallow application using a hatch cover. The general minimum depth of cover is 36 inches (915 mm) from top of the underslab to outlet invert.
- If driving head caclulations account for water elevation during submerged conditions the Jellyfish Filter will function effectively under submerged condtions.
- Jellyfish Filter systems may incorporate grated inlets depending on system configuration.
- For sites with water quality treatment flow rates or mass loadings that exceed the design flow rate of the largest standard Jellyfish Filter manhole models, systems can be designed that hydraulically connect multiple Jellyfish Filters in series or alternatively Jellyfish Vault units can be designed.

STANDARD SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

Specifies requirements for construction and performance of an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS

ASTM C 891: Specification for Installation of Underground Precast Concrete Utility Structures
ASTM C 478: Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443: Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM D 4101: Specification for Copolymer steps construction

CAN/CSA-A257.4-M92
Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections and Fittings Using Rubber Gaskets

CAN/CSA-A257.4-M92
Precast Reinforced Circular Concrete Manhole Sections, Catch Basins and Fittings

Canadian Highway Bridge Design Code

1.3 SHOP DRAWINGS

Shop drawings for the structure and performance are to be submitted with each order to the contractor. Contractor shall forward shop drawing submittal to the consulting engineer for approval. Shop drawings are to detail the structure's precast concrete and call out or note the fiberglass (FRP) internals/components.

1.4 PRODUCT SUBSTITUTIONS

No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the engineer of record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

1.5 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The device shall be a cylindrical or rectangular, all concrete structure (including risers), constructed from precast concrete riser and slab components or monolithic precast structure(s), installed to conform to ASTM C 891 and to any required state highway, municipal or local specifications; whichever is more stringent. The device shall be watertight.

2.1.2 Cartridge Deck The cylindrical concrete device shall include a fiberglass deck. The rectangular concrete device shall include a coated aluminum deck. In either instance, the insert shall be bolted and sealed watertight inside the precast concrete chamber. The deck shall serve as: (a) a horizontal divider between the lower treatment zone and the upper treated effluent zone; (b) a deck for attachment of filter cartridges such that the membrane filter elements of each cartridge extend into the lower treatment zone; (c) a platform for maintenance workers to service the filter cartridges (maximum manned weight = 450 pounds (204 kg)); (d) a conduit for conveyance of treated water to the effluent pipe.

2.1.3 Membrane Filter Cartridges Filter cartridges shall be comprised of reusable cylindrical membrane filter elements connected to a perforated head plate. The number of membrane filter elements per cartridge shall be a minimum of eleven 2.75-inch (70-mm) diameter elements. The length of each filter element shall be a minimum 15 inches (381 mm). Each cartridge shall be fitted into the cartridge deck by insertion into a cartridge receptacle that is permanently mounted into the cartridge deck. Each cartridge shall be secured by a cartridge lid that is threaded onto the receptacle, or similar mechanism to secure the cartridge into the deck. The maximum treatment flow rate of a filter cartridge shall be controlled by an orifice in the cartridge lid, or on the individual cartridge itself, and based on a design flux rate (surface loading rate) determined by the maximum treatment flow rate per unit of filtration membrane surface area. The maximum design flux rate shall be 0.21 gpm/ft² (0.142 lps/m²).

Each membrane filter cartridge shall allow for manual installation and removal. Each filter cartridge shall have filtration membrane surface area and dry installation weight as follows (if length of filter cartridge is between those listed below, the surface area and weight shall be proportionate to the next length shorter and next length longer as shown below):

Filter Cartridge Length (in / mm)	Minimum Filtration Membrane Surface Area (ft2 / m2)	Maximum Filter Cartridge Dry Weight (lbs / kg)
15	106 / 9.8	10.5 / 4.8
27	190 / 17.7	15.0 / 6.8
40	282 / 26.2	20.5 / 9.3
54	381 / 35.4	25.5 / 11.6

2.1.4 Backwashing Cartridges The filter device shall have a weir extending above the cartridge deck, or other mechanism, that encloses the high flow rate filter cartridges when placed in their respective cartridge receptacles within the cartridge deck. The weir, or other mechanism, shall collect a pool of filtered water during inflow events that backwashes the high flow rate cartridges when the inflow

event subsides. All filter cartridges and membranes shall be reusable and allow for the use of filtration membrane rinsing procedures to restore flow capacity and sediment capacity; extending cartridge service life.

2.1.5 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the deck. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

2.1.6 Bend Structure The device shall be able to be used as a bend structure with minimum angles between inlet and outlet pipes of 90-degrees or less in the stormwater conveyance system.

2.1.7 Double-Wall Containment of Hydrocarbons The cylindrical precast concrete device shall provide double-wall containment for hydrocarbon spill capture by a combined means of an inner wall of fiberglass, to a minimum depth of 12 inches (305 mm) below the cartridge deck, and the precast vessel wall.

2.1.8 Baffle The filter device shall provide a baffle that extends from the underside of the cartridge deck to a minimum length equal to the length of the membrane filter elements. The baffle shall serve to protect the membrane filter elements from contamination by floatables and coarse sediment. The baffle shall be flexible and continuous in cylindrical configurations, and shall be a straight concrete or aluminum wall in rectangular configurations.

2.1.9 Sump The device shall include a minimum 24 inches (610 mm) of sump below the bottom of the cartridges for sediment accumulation, unless otherwise specified by the design engineer. Depths less than 24 inches may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be manufactured to a minimum live load of HS-20 truck loading or greater based on local regulatory specifications, unless otherwise modified or specified by the design engineer, and shall be watertight.

2.3 JOINTS All precast concrete manhole configuration joints shall use nitrile rubber gaskets and shall meet the requirements of ASTM C443, Specification C1619, Class D or engineer approved equal to ensure oil resistance. Mastic sealants or butyl tape are not an acceptable alternative.

2.4 GASKETS Only profile neoprene or nitrile rubber gaskets in accordance to CSA A257.3-M92 will be accepted. Mastic sealants, butyl tape or Conseal CS-101 are not acceptable gasket materials.

2.5 FRAME AND COVER Frame and covers must be manufactured from cast-iron or other composite material tested to withstand H-20 or greater design loads, and as approved by the

local regulatory body. Frames and covers must be embossed with the name of the device manufacturer or the device brand name.

2.6 DOORS AND HATCHES If provided shall meet designated loading requirements or at a minimum for incidental vehicular traffic.

2.7 CONCRETE All concrete components shall be manufactured according to local specifications and shall meet the requirements of ASTM C 478.

2.8 FIBERGLASS The fiberglass portion of the filter device shall be constructed in accordance with the following standard: ASTM D-4097: Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks.

2.9 STEPS Steps shall be constructed according to ASTM D4101 of copolymer polypropylene, and be driven into preformed or pre-drilled holes after the concrete has cured, installed to conform to applicable sections of state, provincial and municipal building codes, highway, municipal or local specifications for the construction of such devices.

2.10 INSPECTION All precast concrete sections shall be inspected to ensure that dimensions, appearance and quality of the product meet local municipal specifications and ASTM C 478.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter must be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV).

3.1.2 Function - The stormwater quality filter treatment device shall function to remove pollutants by the following unit treatment processes; sedimentation, floatation, and membrane filtration.

3.1.3 Pollutants - The stormwater quality filter treatment device shall remove oil, debris, trash, coarse and fine particulates, particulate-bound pollutants, metals and nutrients from stormwater during runoff events.

3.1.4 Bypass - The stormwater quality filter treatment device shall typically utilize an external bypass to divert excessive flows. Internal bypass systems shall be equipped with a floatables baffle, and must avoid passage through the sump and/or cartridge filtration zone.

3.1.5 Treatment Flux Rate (Surface Loading Rate) – The stormwater quality filter treatment device shall treat 100% of the required water quality treatment flow based on a maximum design treatment flux rate (surface loading rate) across the membrane filter cartridges of 0.21 gpm/ft² (0.142 lps/m²).

3.2 FIELD TEST PERFORMANCE

At a minimum, the stormwater quality filter device shall have been field tested and verified with a minimum 25 TARP qualifying storm events and field monitoring shall have been conducted according to the TARP 2009 NJDEP TARP field test protocol, and have received NJCAT verification.

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median TSS removal efficiency of 85% and a minimum median SSC removal efficiency of 95%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce the turbidity from influent from a range of 5 to 171 NTU to an effluent turbidity of 15 NTU or lower.

3.2.5 Nutrient (Total Phosphorus & Total Nitrogen) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Phosphorus removal of 55%, and a minimum median Total Nitrogen removal of 50%.

3.2.6 Metals (Total Zinc & Total Copper) Removal - The stormwater quality filter treatment device shall have demonstrated a minimum median Total Zinc removal of 55%, and a minimum median Total Copper removal of 85%.

3.3 INSPECTION and MAINTENANCE

The stormwater quality filter device shall have the following features:

3.3.1 Durability of membranes are subject to good handling practices during inspection and maintenance (removal, rinsing, and reinsertion) events, and site specific conditions that may have heavier or lighter loading onto the cartridges, and pollutant variability that may impact the membrane structural integrity. Membrane maintenance and replacement shall be in accordance with manufacturer's recommendations.

3.3.2 Inspection which includes trash and floatables collection, sediment depth determination, and visible determination of backwash pool depth shall be easily conducted from grade (outside the structure).

3.3.3 Manual rinsing of the reusable filter cartridges shall promote restoration of the flow capacity and sediment capacity of the filter cartridges, extending cartridge service life.

3.3.4 The filter device shall have a minimum 12 inches (305 mm) of sediment storage depth, and a minimum of 12 inches between the top of the sediment storage and bottom of the filter cartridge tentacles, unless otherwise specified by the design engineer. Variances may have an impact on the total performance and/or longevity between cartridge maintenance/replacement of the device.

3.3.5 Sediment removal from the filter treatment device shall be able to be conducted using a standard maintenance truck and vacuum apparatus, and a minimum one point of entry to the sump that is unobstructed by filter cartridges.

3.3.6 Maintenance access shall have a minimum clear height that provides suitable vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of the receptacles and deck for the entire length of the cartridge.

3.3.7 Filter cartridges shall be able to be maintained without the requirement of additional lifting equipment.

PART 4 – EXECUTION

4.1 INSTALLATION

4.1.1 PRECAST DEVICE CONSTRUCTION SEQUENCE

The installation of a watertight precast concrete device should conform to ASTM C 891 and to any state highway, municipal or local specifications for the construction of manholes, whichever is more stringent. Selected sections of a general specification that are applicable are summarized below.

4.1.1.1 The watertight precast concrete device is installed in sections in the following sequence:

- aggregate base
- base slab
- treatment chamber and cartridge deck riser section(s)
- bypass section
- connect inlet and outlet pipes
- concrete riser section(s) and/or transition slab (if required)
- maintenance riser section(s) (if required)
- frame and access cover

4.1.2 The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

4.1.3 Adjustment of the stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary to restore original condition and watertight seals. Once the stormwater quality treatment device has been constructed, any/all lift holes must be plugged watertight with mortar or non-shrink grout.

4.1.4 Inlet and Outlet Pipes Inlet and outlet pipes should be securely set into the device using approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight, and such that any pipe intrusion into the device does not impact the device functionality.

4.1.5 Frame and Cover Installation Adjustment units (e.g. grade rings) should be installed to set the frame and cover at the required elevation. The adjustment units should be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover should be set in a full bed of mortar at the elevation specified.

4.2 MAINTENANCE ACCESS WALL
In some instances the Maintenance Access Wall, if provided, shall require an extension attachment and sealing to the precast wall and cartridge deck at the job site, rather than at the precast facility. In this instance, installation of these components shall be performed according to instructions provided by the manufacturer.

4.3 FILTER CARTRIDGE INSTALLATION Filter cartridges shall be installed in the cartridge deck only after the construction site is fully stabilized and in accordance with the manufacturer's guidelines and recommendations. Contractor to contact the manufacturer to schedule cartridge delivery and review procedures/requirements to be completed to the device prior to installation of the cartridges and activation of the system.

PART 5 – QUALITY ASSURANCE

5.1 FILTER CARTRIDGE INSTALLATION Manufacturer shall coordinate delivery of filter cartridges and other internal components with contractor. Filter cartridges shall be delivered and installed complete after site is stabilized and unit is ready to accept cartridges. Unit is ready to accept cartridges after is has been cleaned out and any standing water, debris, and other materials have been removed. Contractor shall take appropriate action to protect the filter cartridge receptacles and filter cartridges from damage during construction, and in accordance with the manufacturer's recommendations and guidance. For systems with cartridges installed prior to full site stabilization and prior to system activation, the contractor can plug inlet and outlet pipes to prevent stormwater and other influent from entering the device. Plugs must be removed during the activation process.

5.2 INSPECTION AND MAINTENANCE

5.2.1 The manufacturer shall provide an Owner's Manual upon request.

5.2.2 After construction and installation, and during operation, the device shall be inspected and cleaned as necessary based on the manufacturer's recommended inspection and maintenance guidelines and the local regulatory agency/body.

5.3 REPLACEMENT FILTER CARTRIDGES When replacement membrane filter elements and/or other parts are required, only membrane filter elements and parts approved by the manufacturer for use with the stormwater quality filter device shall be installed.

END OF SECTION

DRAWING NOT TO BE USED FOR CONSTRUCTION

GENERAL NOTES:

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. JELLYFISH 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 JELLYFISH 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.

JELLYFISH STRUCTURE & DESIGN NOTES:

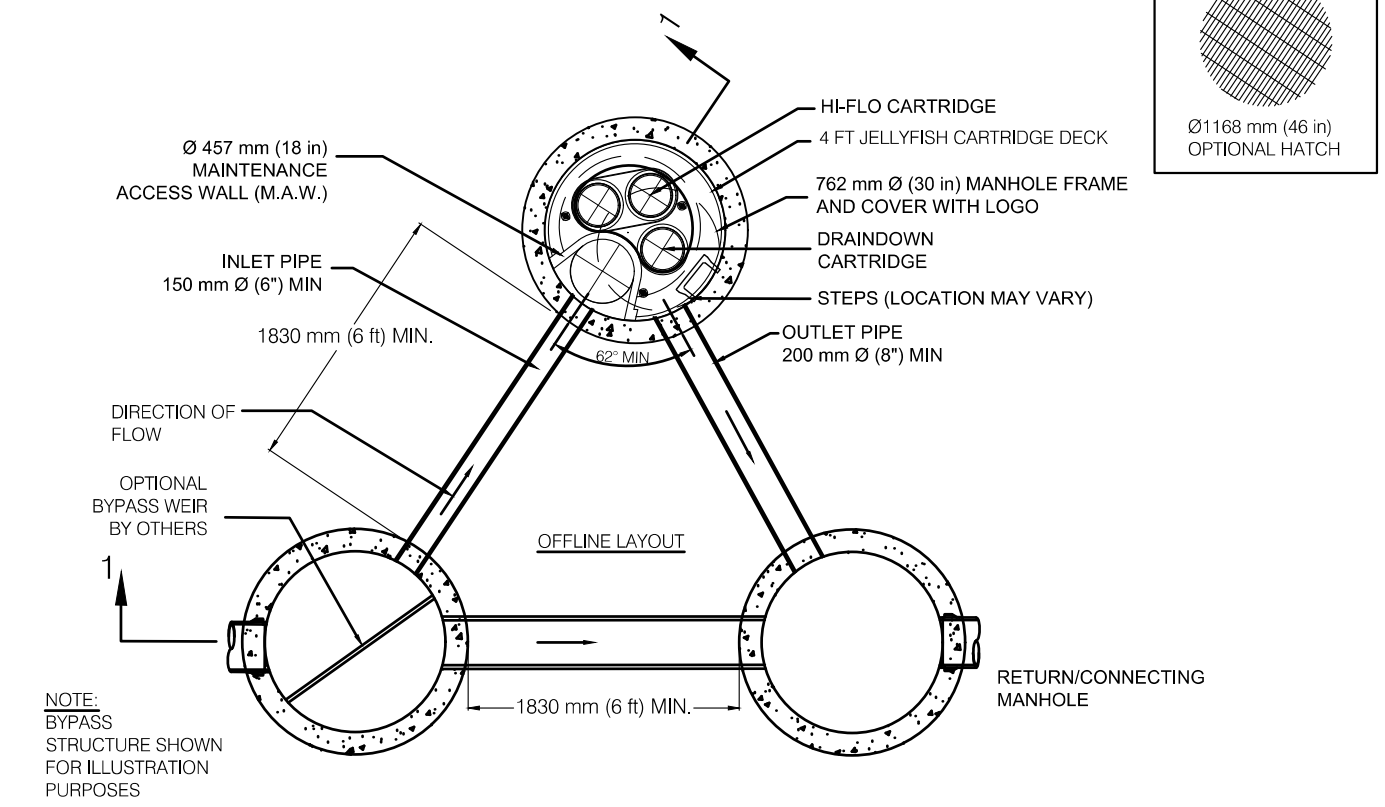
1. 457 MM Ø (18") MAINTENANCE ACCESS WALL TO BE USED FOR CLEANOUT AND ACCESS BELOW CARTRIDGE DECK.
2. CASTINGS OR DOORS OF THE JELLYFISH MANHOLE STRUCTURE TO EXTEND TO DESIGN FINISH GRADE. DEPTHS IN EXCESS OF 3.65 M (12') MAY REQUIRE THE DESIGN AND INSTALLATION OF INTERMEDIATE SAFETY GRATES OR OTHER STRUCTURAL ELEMENTS.
3. CASTINGS AND GRADE RINGS, OR DOORS AND DOOR RISERS, OR BOTH, SHALL BE GROUTED FOR WATERTIGHTNESS.
   STRUCTURE SHALL MEET AASHTO HS-20, ASSUMING EARTH COVER OF 0' - 3', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE IMBRIUM LOGO.
4. ALL STRUCTURAL SECTIONS AND PARTS TO MEET OR EXCEED ASTM C-478, ASTM C-443, AND ASTM D-4097 CORRESPONDING TO AASHTO SPECIFICATIONS, AND ANY OTHER SITE OR LOCAL STANDARDS.
5. CONCRETE RISER SECTIONS FROM BOTTOM TO TOP WILL BE ADDED AS REQUIRED INCLUDING TRANSITION PIECES TO SMALLER DIAMETER RISERS FOR SURFACE ACCESSES WHERE WARRANTED BY SERVICING DEPTH.
6. IF MINIMUM DEPTH FROM TOP OF CARTRIDGE DECK TO BOTTOM OF STRUCTURAL TOP SLAB CANNOT BE ACHIEVED DUE TO PIPING INVERT ELEVATIONS OR OTHER SITE CONSTRAINTS. ALTERNATIVE HATCH CONFIGURATIONS MAY BE AVAILABLE. HATCH DOORS SHOULD BE SIZED TO PROVIDE FULL ACCESS ABOVE THE CARTRIDGES TO ACCOMMODATE MAINTENANCE.
7. STEPS TO BE APPROXIMATELY 330 MM (13") APART AND DIMENSIONS MUST MEET LOCAL STANDARDS. STEPS MUST BE INSTALLED AFTER CARTRIDGE DECK IS IN PLACE.
8. CONFIGURATION OF INLET AND OUTLET PIPE CAN VARY TO MEET SITE'S NEEDS.
9. IT IS THE RESPONSIBILITY OF OTHERS TO PROPERLY PROTECT THE TREATMENT DEVICE, AND KEEP THE DEVICE OFFLINE DURING CONSTRUCTION. FILTER CARTRIDGES SHALL NOT BE INSTALLED UNTIL THE PROJECT SITE IS CLEAN AND FREE OF DEBRIS, BY OTHERS. THE PROJECT SITE INCLUDES ANY SURFACE THAT CONTRIBUTES STORM DRAINAGE TO THE TREATMENT DEVICE. CARTRIDGES SHALL BE FURNISHED NEW, AT THE TIME OF FINAL ACCEPTANCE.
10. THIS DRAWING MUST BE VIEWED IN CONJUNCTION WITH THE STANDARD JELLYFISH SPECIFICATION, AND STORMWATER QUALITY FILTER TREATMENT JELLYFISH DOCUMENTS.

INSTALLATION NOTES

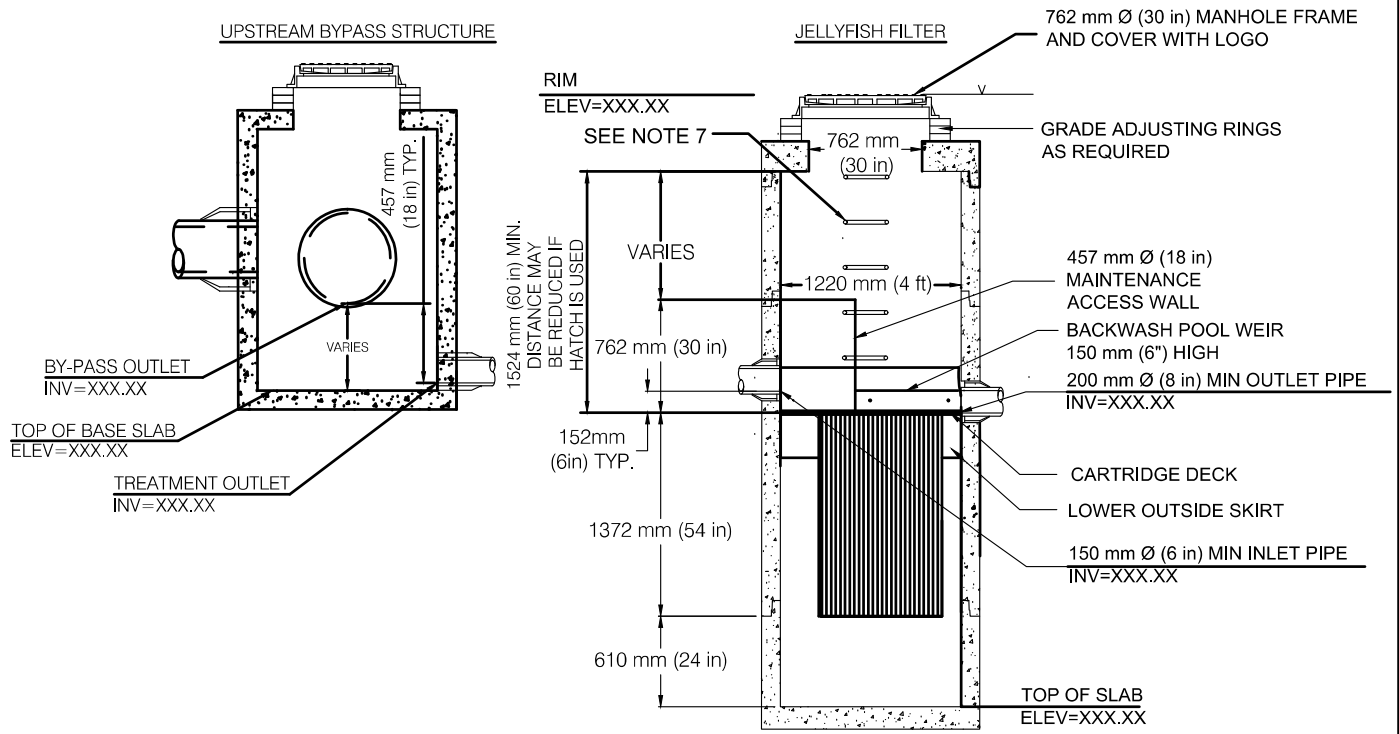
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR 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 CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. CARTRIDGE INSTALLATION, BY IMBRIUM, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT IMBRIUM TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION.

STANDARD OFFLINE JELLYFISH RECOMMENDED PIPE DIAMETERS			
MODEL DIAMETER (m)	MINIMUM ANGLE INLET/OUTLET PIPES	MINIMUM INLET PIPE DIAMETER (mm)	MINIMUM OULTET PIPE DIAMETER (mm)
1.2	62	150	200
1.8	59	200	250
2.4	52	250	300
3.0	48	300	450
3.6	40	300	450
CONTACT IMBRIUM SYSTEMS FOR ALTERNATE PIPE DIAMETERS			

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL JELLYFISH FILTER 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.



XXX.XX INFORMATION TO BE SUPPLIED BY ENGINEER OF RECORD



CROSS SECTION 1-1

JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN. Ø1220 mm (48") MANHOLE JELLYFISH PEAK TREATMENT CAPACITY IS 12.7 L/s (0.54 CFS). TREATMENT FLOW RATE IS BASED ON 457 mm (18") OF HEAD PRESSURE.

CARTRIDGE SELECTION		54"	40"		27"		15"	
		90"	76"		63"		51"	
OUTLET INVERT TO STRUCTURE BASE SLAB		5.09 / 2.55	3.68 / 1.84		2.55 / 1.27		1.41 / 0.71	
FLOW RATE HIGH-FLO / DRAINDOWN (L/s) (per cart)		57 / 28	42 / 21		28 / 14		16 / 8	
SEDIMENT CAPACITY HIGH-FLO / DRAINDOWN (kg) (per cart)				2 / 1				
MAX. CARTS HIGH-FLO/DRAINDOWN		142	105		70		40	
MAX. SEDIMENT CAPACITY (kg)		12.7	9.3		6.2		3.4	
MAX. TREATMENT (L/s)								

SITE SPECIFIC DATA REQUIREMENTS

JELLYFISH MODEL	*
STRUCTURE ID	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED (HF / DD)	*
CARTRIDGE SIZE (inches)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
1	08/01/2015	NOTES	BSF
0	10/01/2014	INTIAL RELEASE	BSF

Jellyfish
JF4 STANDARD
Scale = 1:50

imbrium
7037 Ridge Road, Suite 350, Hanover, MD 21076
USA 888-279-2826 CA 800-565-4801 INT'L +1-416-560-9566
Jellyfish® Filter
www.imbriumsystems.com
info@imbriumsystems.com

DATE:	#####
DESIGNED:	DRAWN: BSF
CHECKED: BSF	APPROVED: SP
PROJECT #: #####	PROJECT NAME: #####
SHEET:	1 OF 2

JELLYFISH® FILTER - SPECIFICATIONS

GENERAL

A. WORK INCLUDED: SPECIFIES REQUIREMENTS FOR CONSTRUCTION AND PERFORMANCE OF AN UNDERGROUND STORMWATER QUALITY, MEMBRANE FILTRATION, AND TREATMENT DEVICE THAT REMOVES POLLUTANTS FROM STORMWATER RUNOFF THROUGH THE UNIT OPERATIONS OF SEDIMENTATION, FLOATATION, AND MEMBRANE FILTRATION.

B. REFERENCE STANDARDS:
ASTM C 891: SPECIFICATION FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES
ASTM C 478: SPECIFICATION FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS
ASTM C 990: SPECIFICATION FOR JOINTS FOR CONCRETE MANHOLES USING PREFORMED FLEXIBLE JOINT SEALANTS
ASTM D 4101: SPECIFICATION FOR COPOLYMER STEPS CONSTRUCTION

C. SHOP DRAWINGS: SHOP DRAWINGS FOR THE STRUCTURE AND PERFORMANCE ARE TO BE SUBMITTED WITH EACH ORDER TO THE CONTRACTOR. CONTRACTOR SHALL FORWARD SHOP DRAWING SUBMITTAL TO THE CONSULTING ENGINEER FOR APPROVAL. SHOP DRAWINGS ARE TO DETAIL THE STRUCTURE PRECAST CONCRETE AND CALL OUT OR NOTE THE FIBERGLASS (FRP) INTERNALS/COMPONENTS.

D. PRODUCT SUBSTITUTIONS: NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD. SUBMISSIONS FOR SUBSTITUTIONS REQUIRE REVIEW AND APPROVAL BY THE ENGINEER OF RECORD, FOR HYDRAULIC PERFORMANCE, IMPACT TO PROJECT DESIGNS, EQUIVALENT TREATMENT PERFORMANCE, AND ANY REQUIRED PROJECT PLAN AND REPORT (HYDROLOGY/HYDRAULIC, WATER QUALITY, STORMWATER POLLUTION) MODIFICATIONS THAT WOULD BE REQUIRED BY THE APPROVING JURISDICTIONS/AGENCIES. CONTRACTOR TO COORDINATE WITH THE ENGINEER OF RECORD ANY APPLICABLE MODIFICATIONS TO THE PROJECT ESTIMATES OF COST, BONDING AMOUNT DETERMINATIONS, PLAN CHECK FEES FOR CHANGES TO APPROVED DOCUMENTS, AND/OR ANY OTHER REGULATORY REQUIREMENTS RESULTING FROM THE PRODUCT SUBSTITUTION.

E. HANDLING AND STORAGE: PREVENT DAMAGE TO MATERIALS DURING STORAGE AND HANDLING.

PRODUCTS

A. THE DEVICE SHALL BE A CYLINDRICAL OR RECTANGULAR, ALL CONCRETE STRUCTURE (INCLUDING RISERS), CONSTRUCTED FROM PRECAST CONCRETE RISER AND SLAB COMPONENTS OR MONOLITHIC PRECAST STRUCTURE(S), INSTALLED TO CONFORM TO ASTM C 891 AND TO ANY REQUIRED STATE HIGHWAY, MUNICIPAL OR LOCAL SPECIFICATIONS; WHICHEVER IS MORE STRINGENT. THE DEVICE SHALL BE WATERTIGHT.

B. THE CYLINDRICAL CONCRETE DEVICE SHALL INCLUDE A FIBERGLASS CARTRIDGE DECK INSERT. THE RECTANGULAR CONCRETE DEVICE SHALL INCLUDE A COATED ALUMINUM INSERT. IN EITHER INSTANCE, THE INSERT SHALL BE BOLTED AND SEALED WATERTIGHT INSIDE THE PRECAST CONCRETE CHAMBER. THE INSERT SHALL SERVE AS: (A) A HORIZONTAL DIVIDER BETWEEN THE LOWER TREATMENT ZONE AND THE UPPER TREATED EFFLUENT ZONE; (B) A DECK FOR ATTACHMENT OF FILTER CARTRIDGES SUCH THAT THE MEMBRANE FILTER ELEMENTS OF EACH CARTRIDGE EXTEND INTO THE LOWER TREATMENT ZONE; (C) A PLATFORM FOR MAINTENANCE WORKERS TO SERVICE THE FILTER CARTRIDGES (MAXIMUM MANNED WEIGHT = 450 POUNDS); (D) A CONDUIT FOR CONVEYANCE OF TREATED WATER TO THE EFFLUENT PIPE.

C. MEMBRANE FILTER CARTRIDGES SHALL BE COMPRISED OF REUSABLE CYLINDRICAL MEMBRANE FILTER ELEMENTS CONNECTED TO A PERFORATED HEAD PLATE. THE NUMBER OF MEMBRANE FILTER ELEMENTS PER CARTRIDGE SHALL BE A MINIMUM OF ELEVEN 2.75-INCH (70-MM) OR GREATER DIAMETER ELEMENTS, THE LENGTH OF EACH FILTER ELEMENT SHALL BE A MINIMUM 15 INCHES (381 MM). EACH CARTRIDGE SHALL BE FITTED INTO THE CARTRIDGE DECK BY INSERTION INTO A CARTRIDGE RECEPTACLE THAT IS PERMANENTLY MOUNTED INTO THE CARTRIDGE DECK. EACH CARTRIDGE SHALL BE SECURED BY A CARTRIDGE LID THAT IS THREADED ONTO THE RECEPTACLE, OR SIMILAR MECHANISM TO SECURE THE CARTRIDGE INTO THE DECK. THE MAXIMUM TREATMENT FLOW RATE OF A FILTER CARTRIDGE SHALL BE CONTROLLED BY AN ORIFICE IN THE CARTRIDGE LID, OR ON THE INDIVIDUAL CARTRIDGE ITSELF, AND BASED ON A DESIGN FLUX RATE (SURFACE LOADING RATE) DETERMINED BY THE MAXIMUM TREATMENT FLOW RATE PER UNIT OF FILTRATION MEMBRANE SURFACE AREA. THE MAXIMUM FLUX RATE SHALL BE 0.21 GPM/FT2 (0.142 LPS/M2). EACH MEMBRANE FILTER CARTRIDGE SHALL ALLOW FOR MANUAL INSTALLATION AND REMOVAL.

D. ALL FILTER CARTRIDGES AND MEMBRANES SHALL BE REUSABLE AND ALLOW FOR THE USE OF FILTRATION MEMBRANE RINSING PROCEDURES TO RESTORE FLOW CAPACITY AND SEDIMENT CAPACITY; EXTENDING CARTRIDGE SERVICE LIFE.

E. ACCESS SHALL HAVE A MINIMUM CLEAR HEIGHT OF 60" OVER ALL OF THE FILTER CARTRIDGES, OR BE ACCESSIBLE BY A HATCH OR OTHER MECHANISM THAT PROVIDES MINIMUM 60" VERTICAL CLEAR SPACE OVER ALL OF THE FILTER CARTRIDGES. FILTER CARTRIDGES SHALL BE ABLE TO BE LIFTED STRAIGHT VERTICALLY OUT OF THE RECEPTACLES AND DECK FOR THE ENTIRE LENGTH OF THE CARTRIDGE.

F. THE DEVICE SHALL INCLUDE A MINIMUM 24 INCHES (610 MM) OF SUMP BELOW THE BOTTOM OF THE CARTRIDGES FOR SEDIMENT ACCUMULATION, UNLESS OTHERWISE SPECIFIED BY THE DESIGN ENGINEER. DEPTHS LESS THAN 24" MAY HAVE AN IMPACT ON THE TOTAL PERFORMANCE AND/OR LONGEVITY BETWEEN CARTRIDGE MAINTENANCE/REPLACEMENT OF THE DEVICE.

G. ALL PRECAST CONCRETE COMPONENTS SHALL BE MANUFACTURED TO A MINIMUM LIVE LOAD OF HS-20 TRUCK LOADING OR GREATER BASED ON LOCAL REGULATORY SPECIFICATIONS, UNLESS OTHERWISE MODIFIED OR SPECIFIED BY THE DESIGN ENGINEER, AND SHALL BE WATERTIGHT.

H. GASKETS AND/OR SEALANTS TO PROVIDE WATER TIGHT SEAL BETWEEN CONCRETE JOINTS. JOINTS SHALL BE SEALED WITH PREFORMED JOINT SEALING COMPOUND CONFORMING TO ASTM C 990.

I. FRAME AND COVERS MUST BE MANUFACTURED FROM CAST-IRON OR OTHER COMPOSITE MATERIAL TESTED TO WITHSTAND H-20 OR GREATER DESIGN LOADS, AND AS APPROVED BY THE LOCAL REGULATORY BODY. FRAMES AND COVERS MUST BE EMBOSSED WITH THE NAME OF THE DEVICE MANUFACTURER OR THE DEVICE BRAND NAME.

J. DOOR AND HATCHES, IF PROVIDED SHALL MEET DESIGNATED LOADING REQUIREMENTS OR AT A MINIMUM FOR INCIDENTAL VEHICULAR TRAFFIC.

K. ALL CONCRETE COMPONENTS SHALL BE MANUFACTURED ACCORDING TO LOCAL SPECIFICATIONS AND SHALL MEET THE REQUIREMENTS OF ASTM C 478.

L. THE FIBERGLASS PORTION OF THE FILTER DEVICE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE FOLLOWING STANDARD: ASTM D-4097: CONTACT MOLDED GLASS FIBER REINFORCED CHEMICAL RESISTANT TANKS.

M. STEPS SHALL BE CONSTRUCTED ACCORDING TO ASTM D4101 OF COPOLYMER POLYPROPYLENE, AND BE DRIVEN INTO PREFORMED OR PRE-DRILLED HOLES AFTER THE CONCRETE HAS CURED, INSTALLED TO CONFORM TO APPLICABLE SECTIONS OF STATE, PROVINCIAL AND MUNICIPAL BUILDING CODES, HIGHWAY, MUNICIPAL OR LOCAL SPECIFICATIONS FOR THE CONSTRUCTION OF SUCH DEVICES.

N. ALL PRECAST CONCRETE SECTIONS SHALL BE INSPECTED TO ENSURE THAT DIMENSIONS, APPEARANCE AND QUALITY OF THE PRODUCT MEET LOCAL MUNICIPAL SPECIFICATIONS AND ASTM C 478.

PERFORMANCE

A. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL FUNCTION TO REMOVE POLLUTANTS BY THE FOLLOWING UNIT TREATMENT PROCESSES; SEDIMENTATION, FLOATATION, AND MEMBRANE FILTRATION.

B. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL REMOVE OIL, DEBRIS, TRASH, COARSE AND FINE PARTICULATES, PARTICULATE-BOUND POLLUTANTS, METALS AND NUTRIENTS FROM STORMWATER DURING RUNOFF EVENTS.

C. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL TYPICALLY UTILIZE AN EXTERNAL BYPASS TO DIVERT EXCESSIVE FLOWS. INTERNAL BYPASS SYSTEMS SHALL BE EQUIPPED WITH A FLOATABLES BAFFLE, AND MUST PASS WATER OVER THE CARTRIDGE DECK, AND AVOID PASSAGE THROUGH THE SUMP AND/OR CARTRIDGE FILTRATION ZONE.

D. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL TREAT 100% OF THE REQUIRED WATER QUALITY TREATMENT FLOW BASED ON A MAXIMUM TREATMENT FLUX RATE (SURFACE LOADING RATE) ACROSS THE MEMBRANE FILTER CARTRIDGES NOT TO EXCEED 0.21 GPM/FT2 (0.142 LPS/M2).

E. AT A MINIMUM, THE STORMWATER QUALITY FILTER DEVICE SHALL HAVE BEEN FIELD TESTED AND VERIFIED WITH A MINIMUM 25 QUALIFYING STORM EVENTS AND FIELD MONITORING CONDUCTED ACCORDING TO THE TARP TIER II OR TAPE FIELD TEST PROTOCOL, AND HAVE RECEIVED NJCAT VERIFICATION.

F. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED A MINIMUM MEDIAN TSS REMOVAL EFFICIENCY OF 85% AND A MINIMUM MEDIAN SSC REMOVAL EFFICIENCY OF 95%.

G. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED THE ABILITY TO CAPTURE FINE PARTICLES AS INDICATED BY A MINIMUM MEDIAN REMOVAL EFFICIENCY OF 75% FOR THE PARTICLE FRACTION LESS THAN 25 MICRONS, AN EFFLUENT D50 OF 15 MICRONS OR LOWER FOR ALL MONITORED STORM EVENTS, AND AN EFFLUENT TURBIDITY OF 15 NTUS OR LOWER.

H. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED A MINIMUM MEDIAN TOTAL PHOSPHORUS REMOVAL OF 55%, AND A MINIMUM MEDIAN TOTAL NITROGEN REMOVAL OF 50%.

I. THE STORMWATER QUALITY FILTER TREATMENT DEVICE SHALL HAVE DEMONSTRATED A MINIMUM MEDIAN TOTAL ZINC REMOVAL OF 50%, AND A MINIMUM MEDIAN TOTAL COPPER REMOVAL OF 75%.

INSPECTION AND MAINTENANCE

A. DURABILITY OF MEMBRANES ARE SUBJECT TO GOOD HANDLING PRACTICES DURING INSPECTION AND MAINTENANCE (REMOVAL, RINSING, AND REINSERTION) EVENTS, AND SITE SPECIFIC CONDITIONS THAT MAY HAVE HEAVIER OR LIGHTER LOADING ONTO THE CARTRIDGES, AND POLLUTANT VARIABILITY THAT MAY IMPACT THE MEMBRANE STRUCTURAL INTEGRITY. MEMBRANE MAINTENANCE AND REPLACEMENT SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

B. INSPECTION WHICH INCLUDES TRASH AND FLOATABLES COLLECTION, SEDIMENT DEPTH DETERMINATION, AND VISIBLE DETERMINATION OF BACKWASH POOL DEPTH SHALL BE EASILY CONDUCTED FROM GRADE (OUTSIDE THE STRUCTURE).

C. MANUAL RINSING OF THE REUSABLE FILTER CARTRIDGES SHALL PROMOTE RESTORATION OF THE FLOW CAPACITY AND SEDIMENT CAPACITY OF THE FILTER CARTRIDGES, EXTENDING CARTRIDGE SERVICE LIFE.

D. SEDIMENT REMOVAL FROM THE FILTER TREATMENT DEVICE SHALL BE ABLE TO BE CONDUCTED USING A STANDARD MAINTENANCE TRUCK AND VACUUM APPARATUS, AND A MINIMUM ONE POINT OF ENTRY TO THE SUMP THAT IS UNOBSTRUCTED BY FILTER CARTRIDGES.

E. MAINTENANCE ACCESS SHALL HAVE A MINIMUM CLEAR HEIGHT OF 60" OVER ALL OF THE FILTER CARTRIDGES, OR BE ACCESSIBLE BY A HATCH OR OTHER MECHANISM THAT PROVIDES MINIMUM 60" VERTICAL CLEAR SPACE OVER ALL OF THE FILTER CARTRIDGES. FILTER CARTRIDGES SHALL BE ABLE TO BE LIFTED STRAIGHT VERTICALLY OUT OF THE RECEPTACLES AND DECK FOR THE ENTIRE LENGTH OF THE CARTRIDGE.

F. FILTER CARTRIDGES SHALL BE ABLE TO BE MAINTAINED WITHOUT THE USE OF ADDITIONAL LIFTING EQUIPMENT.

EXECUTION

A. THE INSTALLATION OF A WATERTIGHT PRECAST CONCRETE DEVICE SHOULD CONFORM TO ASTM C 891 AND TO ANY STATE HIGHWAY, MUNICIPAL OR LOCAL SPECIFICATIONS FOR THE CONSTRUCTION OF MANHOLES, WHICHEVER IS MORE STRINGENT. SELECTED SECTIONS OF A GENERAL SPECIFICATION THAT ARE APPLICABLE ARE SUMMARIZED BELOW.

B. THE WATERTIGHT PRECAST CONCRETE DEVICE IS INSTALLED IN SECTIONS IN THE FOLLOWING SEQUENCE:
- AGGREGATE BASE
- BASE SLAB
- TREATMENT CHAMBER AND CARTRIDGE DECK RISER SECTION(S)
- BYPASS SECTION
- CONNECT INLET AND OUTLET PIPES
- CONCRETE RISER SECTION(S) AND/OR TRANSITION SLAB (IF REQUIRED)
- MAINTENANCE RISER SECTION(S) (IF REQUIRED)
- FRAME AND ACCESS COVER

C. INLET AND OUTLET PIPES SHOULD BE SECURELY SET INTO THE DEVICE USING APPROVED PIPE SEALS (FLEXIBLE BOOT CONNECTIONS, WHERE APPLICABLE) SO THAT THE STRUCTURE IS WATERTIGHT, AND SUCH THAT ANY PIPE INTRUSION INTO THE DEVICE DOES NOT IMPACT THE DEVICE FUNCTIONALITY.

D. ADJUSTMENT UNITS (E.G, GRADE RINGS) SHOULD BE INSTALLED TO SET THE FRAME AND COVER AT THE REQUIRED ELEVATION. THE ADJUSTMENT UNITS SHOULD BE LAID IN A FULL BED OF MORTAR WITH SUCCESSIVE UNITS BEING JOINED USING SEALANT RECOMMENDED BY THE MANUFACTURER. FRAMES FOR THE COVER SHOULD BE SET IN A FULL BED OF MORTAR AT THE ELEVATION SPECIFIED.

E. IN SOME INSTANCES THE MAINTENANCE ACCESS WALL, IF PROVIDED, SHALL REQUIRE AN EXTENSION ATTACHMENT AND SEALING TO THE PRECAST WALL AND CARTRIDGE DECK AT THE JOB SITE, RATHER THAN AT THE PRECAST FACILITY. IN THIS INSTANCE, INSTALLATION OF THESE COMPONENTS SHALL BE PERFORMED ACCORDING TO INSTRUCTIONS PROVIDED BY THE MANUFACTURER.

F. FILTER CARTRIDGES SHALL BE INSTALLED IN THE CARTRIDGE DECK AFTER THE CONSTRUCTION SITE IS FULLY STABILIZED AND IN ACCORDANCE WITH THE MANUFACTURERS GUIDELINES AND RECOMMENDATIONS. CONTRACTOR TO CONTACT THE MANUFACTURER TO SCHEDULE CARTRIDGE DELIVERY AND REVIEW PROCEDURES/REQUIREMENTS TO BE COMPLETED TO THE DEVICE PRIOR TO INSTALLATION OF THE CARTRIDGES AND ACTIVATION OF THE SYSTEM.

G. MANUFACTURER SHALL COORDINATE DELIVERY OF FILTER CARTRIDGES AND OTHER INTERNAL COMPONENTS WITH CONTRACTOR. FILTER CARTRIDGES SHALL BE DELIVERED AND INSTALLED COMPLETE AFTER SITE IS STABILIZED AND UNIT IS READY TO ACCEPT CARTRIDGES. UNIT IS READY TO ACCEPT CARTRIDGES AFTER IS HAS BEEN CLEANED OUT AND ANY STANDING WATER, DEBRIS, AND OTHER MATERIALS HAVE BEEN REMOVED. CONTRACTOR SHALL TAKE APPROPRIATE ACTION TO PROTECT THE FILTER CARTRIDGE RECEPTACLES AND FILTER CARTRIDGES FROM DAMAGE DURING CONSTRUCTION, AND IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND GUIDANCE. FOR SYSTEMS WITH CARTRIDGES INSTALLED PRIOR TO FULL SITE STABILIZATION AND PRIOR TO SYSTEM ACTIVATION, THE CONTRACTOR CAN PLUG INLET AND OUTLET PIPES TO PREVENT STORMWATER AND OTHER INFLUENT FROM ENTERING THE DEVICE. PLUGS MUST BE REMOVED DURING THE ACTIVATION PROCESS.

H. THE MANUFACTURER SHALL PROVIDE AN OWNER'S MANUAL UPON REQUEST.

I. AFTER CONSTRUCTION AND INSTALLATION, AND DURING OPERATION, THE DEVICE SHALL BE INSPECTED AND CLEANED AS NECESSARY BASED ON THE MANUFACTURER'S RECOMMENDED INSPECTION AND MAINTENANCE GUIDELINES AND THE LOCAL REGULATORY AGENCY/BODY.

J. WHEN REPLACEMENT MEMBRANE FILTER ELEMENTS AND/OR OTHER PARTS ARE REQUIRED, ONLY MEMBRANE FILTER ELEMENTS AND PARTS APPROVED BY THE MANUFACTURER FOR USE WITH THE STORMWATER QUALITY FILTER DEVICE SHALL BE INSTALLED.

END OF SECTION

MARK	DATE	REVISION DESCRIPTION	BY
0	10/01/2014	INITIAL RELEASE	BSF
#	#	#	#
#	#	#	#
#	#	#	#
#	#	#	#

JELLYFISH FILTER SPECIFICATIONS

Jellyfish

JF4 STANDARD

Scale = 1:50

info@imbriumsystems.com
www.imbriumsystems.com

imbrium
7037 Ridge Road, Suite 350, Hanover, MD 21076
USA 888-279-8826 CA 866-956-4991 INTL +1-416-893-9900

DATE: #####	
DESIGNED:	DRAWN:
CHECKED: BSF	APPROVED: SP
PROJECT #: #####	PROJECT NAME: #####
SHEET: 2 OF 2	

STANDARD PERFORMANCE SPECIFICATION
STORMWATER QUALITY – MEMBRANE FILTRATION TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground stormwater quality membrane filtration treatment device that removes pollutants from stormwater runoff through the unit operations of sedimentation, floatation, and membrane filtration.

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental Management – Environmental Technology Verification (ETV)

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: filtration surface area, 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, filtration treatment device 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 GENERAL

2.1.1 Maintenance Access to Captured Pollutants The filter device shall contain an opening(s) that provides maintenance access for removal of accumulated floatable pollutants and sediment, removal of and replacement of filter cartridges, cleaning of the sump, and rinsing of the internal components. Access shall have a minimum clear vertical clear space over all of the filter cartridges. Filter cartridges shall be able to be lifted straight vertically out of their installed placement for the entire length of the cartridge.

2.1.2 Pollutant Storage: The Filter device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants.

PART 3 – PERFORMANCE

3.1 GENERAL

3.1.1 Verification – The stormwater quality filter treatment device shall have been field tested in accordance with either TARP Tier II Protocol (TARP, 2003) and New Jersey Tier II Stormwater Test Requirements – Amendments to TARP Tier II Protocol (NJDEP, 2009) or Washington State Technology Assessment Protocol – Ecology (TAPE), 2011 or later version. The field test shall have been verified in accordance with ISO 14034:2016 Environmental Management – Environmental Technology Verification (ETV). See Section 3.2 of this specification for field test performance requirements.

3.2 FIELD TEST PERFORMANCE

The field test (as specified in section 3.1.1)shall have monitored a minimum of twenty (20) TARP or TAPE qualifying storm events, and report at **minimum** the following results:

3.2.1 Suspended Solids Removal - The stormwater quality filter treatment device shall have ISO 14034 ETV verified load based median TSS removal efficiency of at least 85% and load based median SSC removal efficiency of at least 98%.

3.2.2 Runoff Volume – The stormwater quality filter treatment device shall be engineered, designed, and sized to treat a minimum of 90 percent of the annual runoff volume determined from use of a minimum 15-year rainfall data set.

3.2.3 Fine Particle Removal - The stormwater quality filter treatment device shall have demonstrated the ability to capture fine particles as indicated by a minimum median removal efficiency of 75% for the particle fraction less than 25 microns, and an effluent d_{50} of 15 microns or lower for all monitored storm events.

3.2.4 Turbidity Reduction - The stormwater quality filter treatment device shall have demonstrated the ability to reduce turbidity such that effluent turbidity is 15 NTU or lower.

3.2.5 Nutrients & Metals – The stormwater quality filter treatment device shall have ISO 14034 ETV Verified minimum load based removal efficiencies for the following:

3.2.5.1 Total Phosphorus (TP) Removal - Median TP removal efficiency of at least 49%.

3.2.5.2 Total Nitrogen (TN) Removal - Median TN removal efficiency of at least 39%.

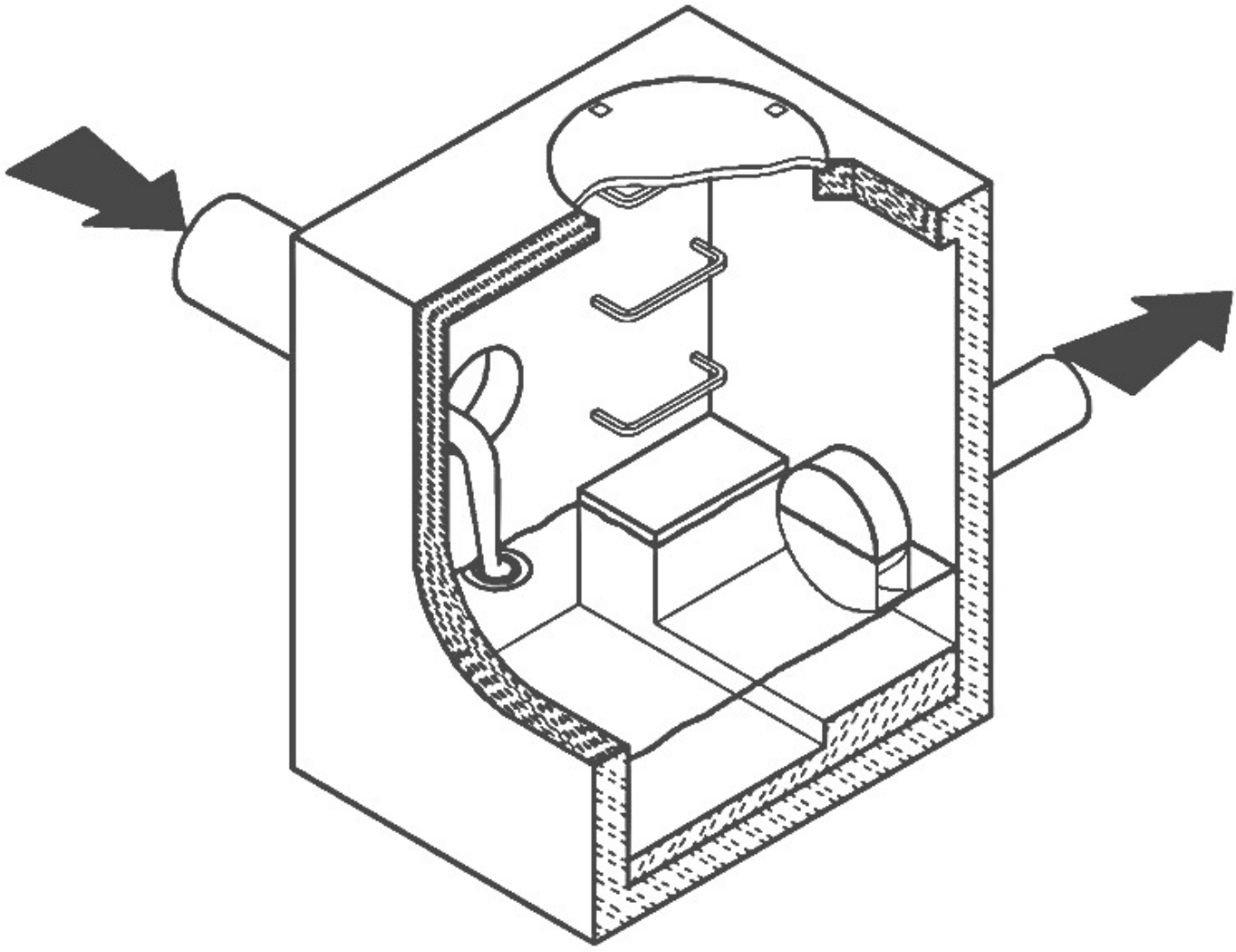
3.2.5.3 Total Zinc (Zn) Removal - Median Zn removal efficiency of at least 69%.

3.2.5.4 Total Copper (Cu) Removal - Median Cu removal efficiency of at least 91%.

END OF SECTION

CSO/STORMWATER MANAGEMENT

HYDROVEX® VHV / SVHV
Vertical Vortex Flow Regulator



JOHN MEUNIER

HYDROVEX® VHV / SVHV VERTICAL VORTEX FLOW REGULATOR

APPLICATIONS

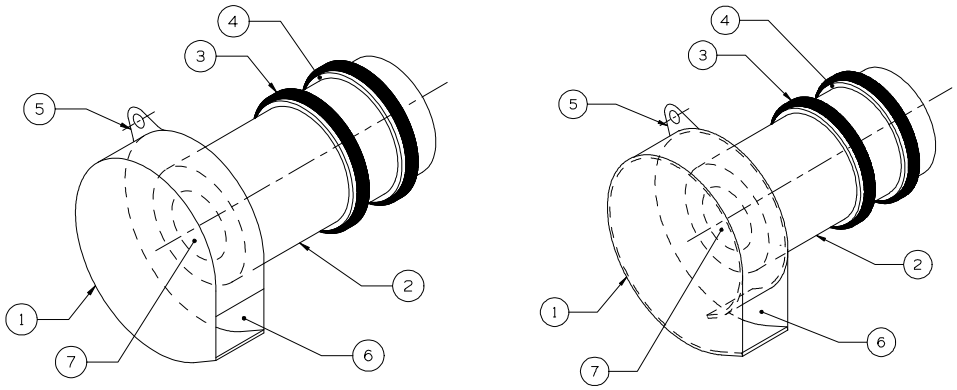
One of the major problems of urban wet weather flow management is the runoff generated after a heavy rainfall. During a storm, uncontrolled flows may overload the drainage system and cause flooding. Due to increased velocities, sewer pipe wear is increased dramatically and results in network deterioration. In a combined sewer system, the wastewater treatment plant may also experience significant increases in flows during storms, thereby losing its treatment efficiency.

A simple means of controlling excessive water runoff is by controlling excessive flows at their origin (manholes). **John Meunier Inc.** manufactures the **HYDROVEX® VHV / SVHV** line of vortex flow regulators to control stormwater flows in sewer networks, as well as manholes.

The vortex flow regulator design is based on the fluid mechanics principle of the forced vortex. This grants flow regulation without any moving parts, thus reducing maintenance. The operation of the regulator, depending on the upstream head and discharge, switches between orifice flow (gravity flow) and vortex flow. Although the concept is quite simple, over 12 years of research have been carried out in order to get a high performance.

The **HYDROVEX® VHV / SVHV** Vertical Vortex Flow Regulators **(refer to Figure 1)** are manufactured entirely of stainless steel, and consist of a hollow body (**1**) (in which flow control takes place) and an outlet orifice (**7**). Two rubber "O" rings (**3**) seal and retain the unit inside the outlet pipe. Two stainless steel retaining rings (**4**) are welded on the outlet sleeve to ensure that there is no shifting of the "O" rings during installation and use.

1. BODY
2. SLEEVE
3. O-RING
4. RETAINING RINGS (SQUARE BAR)
5. ANCHOR PLATE
6. INLET
7. OUTLET ORIFICE



VHV *SVHV*

FIGURE 1: HYDROVEX® VHV-SVHV VERTICAL VORTREX FLOW REGULATORS

ADVANTAGES

- The **HYDROVEX® VHV / SVHV** line of flow regulators are manufactured entirely of stainless steel, making them durable and corrosion resistant.
- Having no moving parts, they require minimal maintenance.
- The geometry of the **HYDROVEX® VHV / SVHV** flow regulators allows a control equal to an orifice plate, having a cross section area 4 to 6 times smaller. This decreases the chance of blockage of the regulator, due to sediments and debris found in stormwater flows. **Figure 2** illustrates the comparison between a regulator model 100 SVHV-2 and an equivalent orifice plate. One can see that for the same height of water, the regulator controls a flow approximately four times smaller than an equivalent orifice plate.
- Installation of the **HYDROVEX® VHV / SVHV** flow regulators is quick and straightforward and is performed after all civil works are completed.
- Installation requires no special tools or equipment and may be carried out by any contractor.
- Installation may be carried out in existing structures.

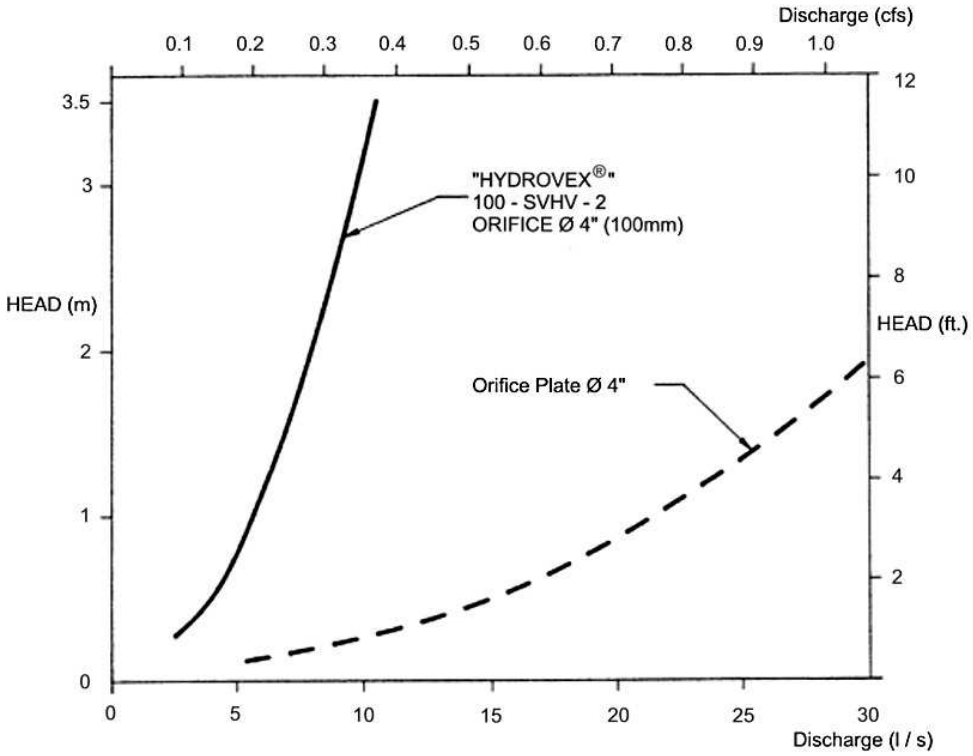


FIGURE 2: DISCHARGE CURVE SHOWING A HYDROVEX® FLOW REGULATOR VS AN ORIFICE PLATE

SELECTION

Selection of a **VHV or SVHV** regulator can be easily made using the selection charts found at the back of this brochure (see **Figure 3)**. These charts are a graphical representation of the maximum upstream water pressure (head) and the maximum discharge at the manhole outlet. The maximum design head is the difference between the maximum upstream water level and the invert of the outlet pipe. All selections should be verified by John Meunier Inc. personnel prior to fabrication.

Example:

✓ Maximum design head	2m (6.56 ft.)
✓ Maximum discharge	6 L/s (0.2 cfs)
✓ Using **Figure 3** - VHV	model required is a **75 VHV-1**

INSTALLATION REQUIREMENTS

All **HYDROVEX® VHV / SVHV** flow regulators can be installed in circular or square manholes. **Figure 4** gives the various minimum dimensions required for a given regulator. ***It is imperative to respect the minimum clearances shown to ensure easy installation and proper functioning of the regulator.***

SPECIFICATIONS

In order to specify a **HYDROVEX®** regulator, the following parameters must be defined:

- The model number (ex: 75-VHV-1)
- The diameter and type of outlet pipe (ex: 6" diam. SDR 35)
- The desired discharge (ex: 6 l/s or 0.21 CFS)
- The upstream head (ex: 2 m or 6.56 ft.) *
- The manhole diameter (ex: 36" diam.)
- The minimum clearance "H" (ex: 10 inches)
- The material type (ex: 304 s/s, 11 Ga. standard)

* ***Upstream head is defined as the difference in elevation between the maximum upstream water level and the invert of the outlet pipe where the HYDROVEX® flow regulator is to be installed.***

PLEASE NOTE THAT WHEN REQUESTING A PROPOSAL, WE SIMPLY REQUIRE THAT YOU PROVIDE US WITH THE FOLLOWING:

- ***project design flow rate***
- ***pressure head***
- ***chamber's outlet pipe diameter and type***

Typical VHV model in factory

OPTIONS

FV – SVHV (mounted on sliding plate)

VHV-1-O (standard model with odour control inlet)

FV – VHV-O (mounted on sliding plate with odour control inlet)

VHV with Gooseneck assembly in existing chamber without minimum release at the bottom

VHV with air vent for minimal slopes

HYDROVEX®

VHV Vertical Vortex Flow Regulator

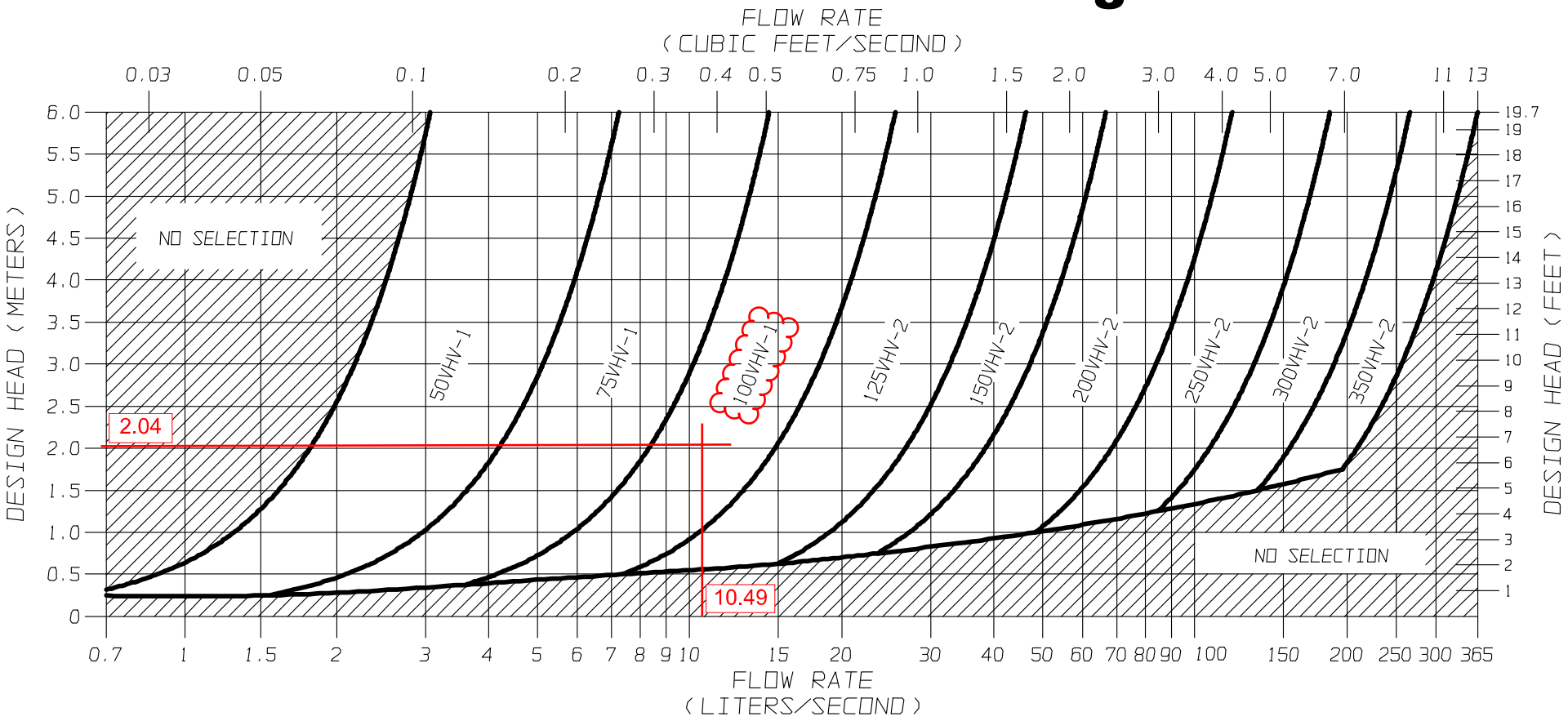
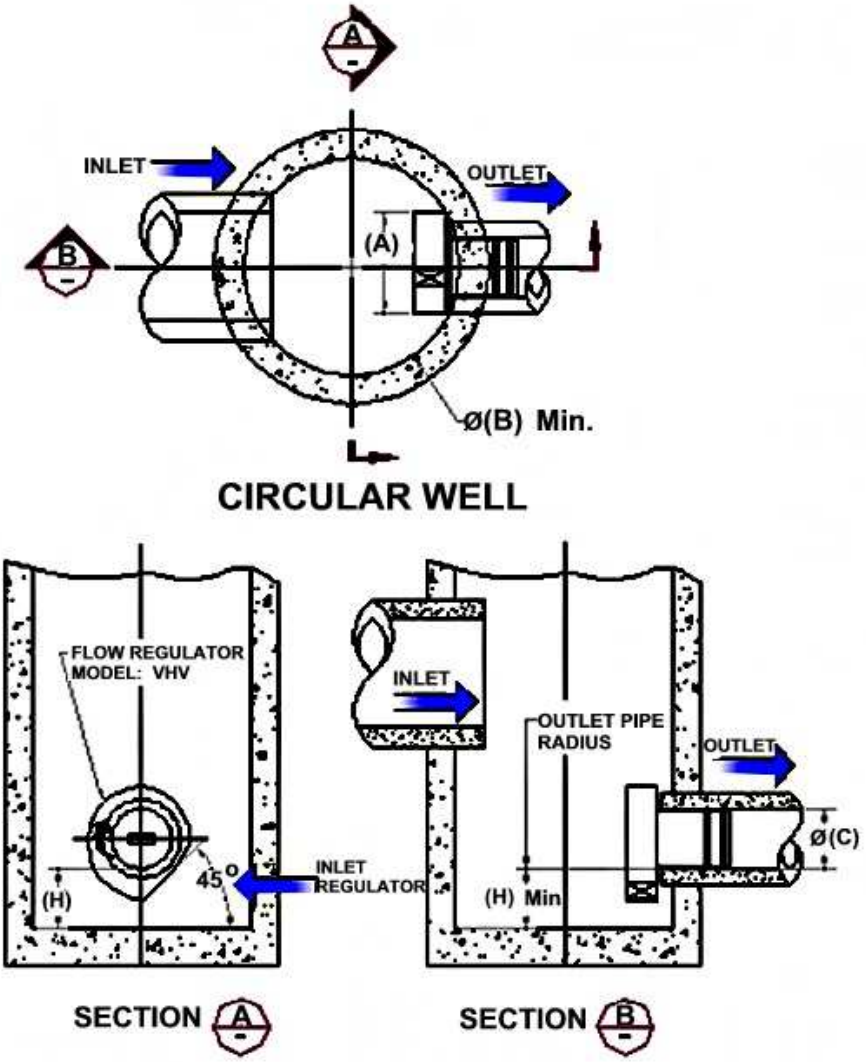


FIGURE 3 - VHV

JOHN MEUNIER

FLOW REGULATOR TYPICAL INSTALLATION IN CIRCULAR MANHOLE
FIGURE 4 (MODEL VHV)

Model Number	Regulator Diameter		Minimum Manhole Diameter		Minimum Outlet Pipe Diameter		Minimum Clearance	
	A (mm)	**A** (in.)	**B** (mm)	**B** (in.)	**C** (mm)	**C** (in.)	**H** (mm)	**H** (in.)
50VHV-1	150	6	600	24	150	6	150	6
75VHV-1	250	10	600	24	150	6	150	6
100VHV-1	325	13	900	36	150	6	200	8
125VHV-2	275	11	900	36	150	6	200	8
150VHV-2	350	14	900	36	150	6	225	9
200VHV-2	450	18	1200	48	200	8	300	12
250VHV-2	575	23	1200	48	250	10	350	14
300VHV-2	675	27	1600	64	250	10	400	16
350VHV-2	800	32	1800	72	300	12	500	20



INSTALLATION

The installation of a **HYDROVEX®** regulator may be undertaken once the manhole and piping is in place. Installation consists of simply fitting the regulator into the outlet pipe of the manhole. **John Meunier Inc.** recommends the use of a lubricant on the outlet pipe, in order to facilitate the insertion and orientation of the flow controller.

MAINTENANCE

HYDROVEX® regulators are manufactured in such a way as to be maintenance free; however, a periodic inspection (every 3-6 months) is suggested in order to ensure that neither the inlet nor the outlet has become blocked with debris. The manhole should undergo periodically, particularly after major storms, inspection and cleaning as established by the municipality

GUARANTY

The **HYDROVEX®** line of **VHV / SVHV** regulators are guaranteed against both design and manufacturing defects for a period of 5 years. Should a unit be defective, **John Meunier Inc.** is solely responsible for either modification or replacement of the unit.

John Meunier Inc.
ISO 9001 : 2008

Head Office
4105 Sartelon
Saint-Laurent (Quebec) Canada H4S 2B3
Tel.: 514-334-7230 www.johnmeunier.com
Fax: 514-334-5070 cso@johnmeunier.com

Ontario Office
2000 Argentia Road, Plaza 4, Unit 430
Mississauga (Ontario) Canada L5N 1W1
Tel.: 905-286-4846 www.johnmeunier.com
Fax: 905-286-0488 ontario@johnmeunier.com

USA Office
2209 Menlo Avenue
Glenside, PA USA 19038
Tel.: 412- 417-6614 www.johnmeunier.com
Fax: 215-885-4741 asteele@johnmeunier.com

Revised: 2011-05-03

APPENDIX E

Civil Engineering Drawings

HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

REVISION 04

KEY PLAN (N.T.S.)

DRAWING INDEX	
TITLE PAGE	
GENERAL NOTES	C000
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DEMOLITION PLAN	C102
GRADING AND DRAINAGE PLAN	C301
SERVICING PLAN	C401
STORMWATER MANAGEMENT PLAN	C601
PRE-DEVELOPMENT WATERSHED PLAN	C701
POST-DEVELOPMENT WATERSHED PLAN	C702
CONSTRUCTION DETAIL PLAN	C901
CONSTRUCTION DETAIL PLAN	C902
CONSTRUCTION DETAIL PLAN	C903

NOT FOR CONSTRUCTION TENDER OR PERMIT

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

HALO CAR WASH
3535 BORRISOKANE RD, BARRHAVEN, ON
REV.04 - RE-ISSUED FOR APPROVAL - NOVEMBER 17th 2022
LRL PROJECT no: 210691

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/11/17
PROVINCE OF ONTARIO
NOT AUTHENTIC UNLESS SIGNED AND DATED

GENERAL NOTES

1. ALL WORKS MATERIALS SHALL CONFIRM TO THE LAST REVISION OF THE STANDARDS AND SPECIFICATIONS FOR THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS), WHERE APPLICABLE. LOCAL UTILITY STANDARDS AND MINISTRY OF TRANSPORTATION STANDARDS WILL APPLY WHERE REQUIRED.
2. THE CONTRACTORS SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTORS SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION , TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
3. ALL DIMENSIONS 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. LOST TIME DUE TO FAILURE OF THE CONTRACTORS TO CONFIRM UTILITY LOCATIONS AND NOTIFY ENGINEER OF POSSIBLE CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT CONTRACTOR'S EXPENSE.
4. ANY AREA 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. RELOCATING OF EXISTING SERVICES AND/OR UTILITIES SHALL BE AS SHOWN ON THE DRAWINGS OR DETECTED BY THE ENGINEER AT THE EXPENSE OF DEVELOPERS.
5. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE 'OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS'. THE GENERAL CONTRACTORS SHALL BE DEEMED TO BE THE 'CONTRACTOR' AS DEFINED IN THE ACT.
6. ALL THE CONSTRUCTION SIGNAGE MUST CONFIRM TO THE MINISTRY OF TRANSPORTATION OF ONTARIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES PER LATEST AMENDMENT.
7. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THE CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES TO PREVENT CONFLICTS.
8. ALL DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE.
9. THERE WILL BE NO SUBSTITUTION OF MATERIALS UNLESS PRIOR WRITTEN APPROVAL IS RECEIVED FROM THE ENGINEER.
10. ALL CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN THE GEOTECHNICAL REPORT.
11. FOR DETAILS RELATING TO STORMWATER MANAGEMENT AND ROOF DRAINAGE REFER TO THE SITE SERVICING AND STORMWATER MANAGEMENT REPORT.
12. ALL SEWERS CONSTRUCTED WITH GRADES LESS THAN 1.0% SHALL BE INSTALLED USING LASER ALIGNMENT AND CHECKED WITH LEVEL INSTRUMENT PRIOR TO BACKFILLING.
13. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED AND TO BEAR THE COST OF THE SAME.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADDITIONAL BEDDING, OR ADDITIONAL STRENGTH PIPE IF THE MAXIMUM TRENCH WIDTH AS SPECIFIED BY OPSD IS EXCEEDED.
15. ALL PIPE/CULVERT SECTION SIZES REFER TO INSIDE DIMENSIONS.
16. SHOULD DEEPLY BURIED ARCHAEOLOGICAL REMAINS BE FOUND ON THE PROPERTY DURING CONSTRUCTION ACTIVITIES, THE HERITAGE OPERATIONS UNIT OF THE ONTARIO MINISTRY OF CULTURE MUST BE NOTIFIED IMMEDIATELY.
17. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REVIEW WITH CONTRACT ADMINISTRATOR AND THE CITY OF OTTAWA PRIOR TO ANY TREE CUTTING/REMOVAL.
18. DRAWINGS SHALL BE READ ON CONJUNCTION WITH ARCHITECTURAL SITE PLAN.
19. THE CONTRACTOR SHALL PROVIDE THE PROJECT ENGINEER ON SET OF AS CONSTRUCTED SITE SERVICING AND GRADING DRAWINGS.
20. BENCHMARKS: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THAT THE SITE BENCHMARK(S) HAS NOT BEEN ALTERED OR DISTURBED AND THAT ITS RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION DEPICTED ON THIS PLAN.

EROSION AND SEDIMENT CONTROL NOTES

GENERAL

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE 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.

THE CONTRACTOR ACKNOWLEDGES THAT SURFACE EROSION AND SEDIMENT RUNOFF RESULTING FROM THEIR CONSTRUCTION OPERATIONS HAS POTENTIAL TO CAUSE A DETRIMENTAL IMPACT TO ANY DOWNSTREAM WATERCOURSE OR SEWER, AND THAT ALL CONSTRUCTION OPERATIONS THAT MAY IMPACT UPON WATER QUALITY SHALL BE CARRIED OUT IN MANNER THAT STRICTLY MEETS THE REQUIREMENT OF ALL APPLICABLE LEGISLATION AND REGULATIONS.

AS SUCH, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CARRYING OUT THEIR OPERATIONS, AND SUPPLYING AND INSTALLING ANY APPROPRIATE CONTROL MEASURES, SO AS TO PREVENT SEDIMENT LADEN RUNOFF ENTERING ANY SEWER OR WATERCOURSE WITHIN OR DOWNSTREAM OF THE WORKING AREA.

THE CONTRACTOR ACKNOWLEDGES THAT NO ONE MEASURE IS LIKELY TO BE 100% EFFECTIVELY FOR EROSION PROTECTION AND CONTROLLING SEDIMENT RUNOFF AND DISCHARGES FROM THE SITE. THEREFORE, WHERE NECESSARY THE CONTRACTOR SHALL IMPLEMENT ADDITIONAL MEASURES ARRANGED IN SUCH MANNER AS TO MITIGATE SEDIMENT RELEASE FROM THE CONSTRUCTION OPERATIONS AND ACHIEVE SPECIFIC MAXIMUM PERMITTED CRITERIA WHERE APPLICABLE. SUGGESTED ON-SITE MEASURES MAY INCLUDE, BUT SHALL NOT BE LIMITED TO, THE FOLLOWING METHODS: SEDIMENT PONDS, FILTER BAGS, PUMP FILTERS, SETTLING TANKS, SILT FENCE, STRAW BALES, FILTER CLOTHS, CATCH BASIN FILTERS, CHECK DAMS AND/OR OTHER RECOGNIZED TECHNOLOGIES AND METHOD AVAILABLE AT THE TIME OF CONSTRUCTION. SPECIFIC MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF OPSS 577 WHERE APPROPRIATE, OR IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

WHERE, IN THE OPINION OF THE CONTRACT ADMINISTRATOR OR REGULATORY AGENCY, THE INSTALLED CONTROL MEASURES FAIL TO PERFORM ADEQUATELY, THE CONTRACTOR SHALL SUPPLY AND INSTALL ADDITIONAL OR ALTERNATIVE MEASURES AS DIRECTED BY THE CONTRACT ADMINISTRATOR OR REGULATORY AGENCY, AS SUCH, THE CONTRACTOR SHALL HAVE ADDITIONAL CONTROL MATERIALS ON SITE AT ALL TIME WHICH ARE EASILY ACCESSIBLE AND MAY BE IMPLEMENTED BY HIM AT THE MOMENT'S NOTICE.

PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL SUBMIT TO THE CONTRACT ADMINISTRATOR SIX COPIES OF A DETAILED EROSION AND SEDIMENT CONTROL PLAN (ESCP). THE ESCP WILL CONSIST OF WRITTEN DESCRIPTION AND DETAILED DRAWINGS INDICATING THE ON-SITE ACTIVITIES AND MEASURES TO BE USED TO CONTROL EROSION AND SEDIMENT MOVEMENT FOR EACH STEP OF THE WORK.

CONTRACTOR'S RESPONSIBILITIES

THE CONTRACTOR SHALL ENSURE THAT ALL WORKERS, INCLUDING SUB-CONTRACTOR, IN THE WORKING ARE ARE AWARE OF THE IMPORTANCE OF THE EROSION AND SEDIMENT CONTROL MEASURES AND INFORMED OF THE CONSEQUENCES OF THE FAILURE TO COMPLY WITH THE REQUIREMENTS OF ALL REGULATORY AGENCIES.

THE CONTRACTOR SHALL PERIODICALLY, AND WHEN REQUESTED BY THE CONTRACT ADMINISTRATOR, CLEAN OUT ACCUMULATED SEDIMENT DEPOSITS AS REQUIRED AT THE SEDIMENT CONTROL DEVICES, INCLUDING THOSE DEPOSITS THAT MAY ORIGINATE FROM OUTSIDE THE CONSTRUCTION AREA. ACCUMULATED SEDIMENT SHALL BE REMOVED IN SUCH A MANNER THAT PREVENTS THE DEPOSITION OF THIS MATERIAL INTO THE SEWER WATERCOURSE AND AVOIDS DAMAGE TO CONTROL MEASURES. THE SEDIMENT SHALL BE REMOVED FROM THE SITE AT THE CONTRACTOR'S EXPENSE AND MANAGED IN COMPLIANCE WITH REQUIREMENTS FRO EXCESS EARTH MATERIAL, AS SPECIFIED ELSEWHERE IN THE CONTRACT.

THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE CONTRACT ADMINISTRATOR ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO EITHER THE WATERCOURSE OR THE STORM SEWER SYSTEM. FAILURE TO REPORT WILL BE CONSTITUTE A BRACH OF THIS SPECIFICATION AND THE CONTRACTOR MAY ALSO BE SUBJECT TO THE PENALTIES IMPOSED BY THE APPLICABLE REGULATORY AGENCY. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.

THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE CONTRACT ADMINISTRATOR, THE MEASURE OR MEASURES, IS NO LONGER REQUIRED. NO CONTROL MEASURE MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE CONTRACT ADMINISTRATOR. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE REMOVED IN A MANNER THAT AVOIDS THE ENTRY OF ANY EQUIPMENT, OTHER THAN HAND-HELD EQUIPMENT, INTO ANY WATERCOURSE, AND PREVENTS THE RELEASE OF ANY SEDIMENT OR DEBRIS INTO ANY SEWER OR WATERCOURSE WITHIN OR DOWNSTREAM OF THE WORKING AREA. ALL ACCUMULATED SEDIMENT SHALL BE REMOVED FROM THE WORKING AREA AT THE CONTRACTOR'S EXPENSE AND MANAGED IN COMPLIANCE WITH THE REQUIREMENTS FOR EXCESS EARTH MATERIAL

WHERE, IN THE OPINION OF EITHER THE CONTRACT ADMINISTRATOR OR A REGULATORY AGENCY, ANY OF THE TERMS SPECIFIED HEREIN HAVE NOT BEEN COMPLIED WITH OR PERFORMED IN A SUITABLE MANNER, OR TAT ALL, THE CONTRACTOR ADMINISTRATOR OR A REGULATORY AGENCY HAS THE RIGHT TO IMMEDIATELY WITHDRAW ITS PERMISSION TO CONTINUE THE WORK BUT MAY RENEW ITS PERMISSION UPON BEING SATISFIED THAT THE DEFAULTS OR DEFICIENCIES IN THE PERFORMANCE OF THIS SPECIFICATION BY THE CONTRACTOR HAVE BEEN REMEDIED.

SPILL CONTROL NOTES

1. ALL CONSTRUCTION EQUIPMENT SHALL BE RE-FUELED, MAINTAINED, AND STORED NO LESS THAN 30 METRES FROM WATERCOURSE, STEAMS, CREEKS, WOODLOTS, AND ANY ENVIRONMENTALLY SENSITIVE AREAS, OR AS OTHERWISE SPECIFIED.
2. THE CONTRACTOR MUST IMPLEMENT ALL NECESSARY MEASURES IN ORDER TO PREVENT LEAKS, DISCHARGES OR SPILLS OF POLLUTANTS, DELETERIOUS MATERIALS, OR OTHER SUCH MATERIALS OR SUBSTANCES WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT.
3. IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF POLLUTANT, DELETERIOUS MATERIAL OR OTHER SUCH MATERIAL OR SUBSTANCE WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT, THE CONTRACTOR SHALL:
   - 3.1. IMMEDIATELY NOTIFY APPROPRIATE FEDERAL, PROVINCIAL, AND LOCAL GOVERNMENT MINISTRIES, DEPARTMENTS, AGENCIES, AND AUTHORITIES OF THE INCIDENT IN ACCORDANCE WITH ALL CURRENT LAWS, LEGISLATION, ACTS, BY-LAWS, PERMITS, APPROVALS, ETC.
   - 3.2. TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE, AND TO TAKE SUCH MEASURES TO MITIGATE AGAINST ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
   - 3.3. RESTORE THE AFFECTED AREA TO THE ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION.

MUD MAT NOTES

1. THE GRANULAR MATERIAL WILL REQUIRE PERIODIC REPLACEMENT AS IT BECOMES CONTAMINATED BY VEHICLE TRAFFIC.
2. SEDIMENT SHALL BE CLEANED FROM PUBLIC ROADS AT THE END OF EACH DAY.
3. SEDIMENT SHALL BE REMOVED FROM PUBLIC ROADS BY SHOVELING OR SWEEPING AND DISPOSED OR PROPERLY IN A CONTROLLED SEDIMENT DISPOSAL AREA.

SITE GRADING NOTES

1. PRIOR TO THE COMMENCEMENT OF THE SITE GRADING WORKS, ALL SILTATION CONTROL DEVICES SHALL BE INSTALLED AND OPERATIONAL PER EROSION CONTROL PLAN.
2. ALL GRANULAR AND PAVEMENT FOR ROADS/PARKING AREAS SHALL BE CONSTRUCTED IN ACCORDANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.
3. ALL TOPSOIL AND ORGANIC MATERIAL SHALL BE STRIPPED WITHIN THE ROAD AND PARKING AREAS ALLOWANCE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
4. CONCRETE CURB SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. SC1.1 PROVISION SHALL BE MADE OR CURB DEPRESSIONS AS INDICATED ON ARCHITECTURAL SITE PLAN. CONCRETE SIDEWALK SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD SC1.4. ALL CURBS, CONCRETE ISLANDS, AND SIDEWALKS SHOWN O THIS DRAWING ARE TO BR PRICED IN SITE WORKS PORTION OF THE CONTRACT.
5. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. R10 AND OPSD 509.010 AND OPSS 310.
6. GRANULAR 'A' SHALL BE PLACED TO A MINIMUM THICKNESS OF 30MM AROUND ALL STRUCTURES WITHIN THE PAVEMENT AREA.
7. SUB-EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'B' COMPACTED IN MAXIMUM 30MM LIFTS.
8. ALL WORK ON THE MUNICIPAL RIGHT OF WAY AND EASEMENTS TO BE INSPECTED BY THE MUNICIPALITY PRIOR BACKFILLING.
9. CONTRACTOR TO OBTAIN A ROAD OCCUPANCY PERMIT 48 HOURS PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL ROAD ALLOWANCE, IF REQUIRED BY THE MUNICIPALITY.
10. ALL PAVEMENT MARKING FEATURES AND SITE SIGNAGE SHALL BE PLACED PER ARCHITECTURAL SITE PLAN. LINE PAINTING AND DIRECTIONAL SYMBOLS SHALL BE APPLIED WITH A MINIMUM OF TWO COATS OF ORGANIC SOLVENT PAINT.
11. REFER TO ARCHITECTURAL SITE PLAN FOR DIMENSIONS AND SITE DETAILS.
12. STEP JOINTS ARE TO BE USED WHERE PROPOSED ASPHALT MEETS EXISTING ASPHALT. ALL JOINTS MUST BE SEALED.
13. SIDEWALKS TO BE 13MM & BEVELED AT 2:1 OR 6MM WITH NO BEVEL REQUIRED BELOW THE FINISHED FLOOR SLAB ELEVATION AT ENTRANCES REQUIRED TO BE BARRIER-FREE, UNLESS OTHERWISE NOTED. ALL IN ACCORDANCE WITH OBC 3.8.1.3 & OTTAWA ACCESSIBILITY DESIGN STANDARDS.
14. WHERE APPLICABLE THE CONTRACTOR IS TO SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. SHOP DRAWINGS MUST BE SITE SPECIFIC, SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER. THE CONTRACTOR WILL ALSO BE REQUIRED TO SUPPLY AND GEOTECHNICAL CERTIFICATION OF THE AS-CONSTRUCTED RETAINING WALL TO THE ENGINEER PRIOR TO FINAL ACCEPTANCE.

ROADWORK SPECIFICATIONS

15. ROADWORK TO BE COMPLETED IN ACCORDANCE WITH GEOTECHNICAL REPORT, PREPARED BY LRL ASSOCIATES. DATED NOVEMBER 2020.
16. AL TOPSOIL AND ORGANIC MATERIAL SHALL BE STRIPPED WITHIN THE ROAD ALLOWANCE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND STOCK PILLED ON SITE AS DIRECTED BY NATIONAL MUNICIPALITY.
17. THE SUBGRADE SHALL BE CROWNED AND SLOPED AT LEAST 2% AND PROOF ROLLED WITH HEAVY ROLLERS.
18. SUB-EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'A', TYPE II COMPACTED IN MAXIMUM 300MM LIFTS.
19. ALL GRANULAR FOR ROADS SHALL BE COMPACTED TO MINIMUM OF 100% STANDARD PROCTOR DENSITY MAXIMUM DRY DENSITY (SPMDD).

SANITARY, FOUNDATION DRAIN, STORM SEWER AND WATERMAIN NOTES

GENERAL

1. LASER ALIGNMENT CONTROL TO BE UTILIZED ON ALL SEWER INSTALLATIONS.
2. CLAY SEALS TO BE INSTALLED AS PER CITY STANDARD DRAWING S8. THE SEALS SHOULD BE AT LEAST 1.5M LONG (IN THE TRENCH DIRECTION) AND SHOULD EXTEND FROM TRENCH WALL TO TRENCH WALL. THE SEALS SHOULD EXTEND FROM THE FROST LINE AND FULLY PENETRATE THE BEDDING, SUB-BEDDING, AND COVER MATERIAL. THE BARRIERS SHOULD CONSIST OF RELATIVELY DRY AND COMPATIBLE BROWN SILTY CLAY PLACED IN MAXIMUM 225MM LIFTS AND COMPACTED TO A MINIMUM OF 95% SPMDD. THE CLAY SEALS SHOULD BE PLACED AT THE SITE BOUNDARIES AND AT 60M INTERVALS IN THE SERVICE TRENCHES.
3. SERVICES TO BUILDING TO BE TERMINATED 1.0M FROM THE OUTSIDE FACE OF BUILDING UNLESS OTHERWISE NOTED.
4. ALL MAINTENANCE STRUCTURE AND CATCH BASIN EXCAVATIONS TO BE BACKFILLED WITH GRANULAR MATERIAL COMPACTED TO 98% STANDARD PROCTOR DENSITY. A MINIMUM OF 300MM AROUND STRUCTURES.
5. "MODULOC" OR APPROVED PRE-CAST MAINTENANCE STRUCTURE AND CATCH BASIN ADJUSTERS TO BE USED IN LIEU OF BRICKING. PARGE ADJUSTING UNITS ON THE OUTSIDE ONLY.
6. SAFETY PLATFORMS SHALL BE PER OPSD 404.02.
7. DROP STRUCTURES SHALL BE IN ACCORDANCE WITH OPSD 1003.01, IF APPLICABLE.
8. THE CONTRACTOR IS TO PROVIDE CCTV CAMERA INSPECTIONS OF ALL SEWERS, INCLUDING PICTORIAL REPORT, ONE (1) CD COPY AND TWO (2) VIDEO RECORDING IN A FORMAT ACCEPTABLE TO ENGINEER. ALL SEWER ARE TO BE FLUSHED PRIOR TO CAMERA INSPECTION. ASPHALT WEAR COURSE SHALL NOT BE PLACED UNTIL THE VIDEO INSPECTION OF SEWERS AND NECESSARY REPAIRS HAVE BEEN COMPLETED TO THE SATISFACTION OF THE ENGINEER.
9. CONTRACTOR SHALL PERFORM LEAKAGE TESTING, IN THE PRESENCE OF THE CONSULTANT, FOR SANITARY SEWERS IN ACCORDANCE WITH OPSS 407. CONTRACTOR SHALL PERFORM VIDEO INSPECTION OF ALL SEWERS. A COPY OF THE VIDEO AND INSPECTION REPORT SHALL BE SUBMITTED TO THE CONSULTANT FOR REVIEW AND APPROVAL PRIOR TO PLACEMENT OF WEAR COURSE ASPHALT.

SANITARY

10. ALL SANITARY SEWER INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE CITY OF OTTAWA AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD), AND SPECIFICATIONS (OPSS).
11. ALL SANITARY GRAVITY SEWER SHALL BE PVC SDR 35, IPEX 'RING-TITE' (OR APPROVED EQUIVALENT) PER CSA STANDARD B182.2 OR LATEST AMENDMENT, UNLESS SPECIFIED OTHERWISE.
12. EXISTING MAINTENANCE STRUCTURES TO BE RE-BENCHED WHERE A NEW CONNECTION IS MADE.
13. SANITARY GRAVITY SEWER TRENCH AND BEDDING SHALL BE PER CITY OF OTTAWA STD. S6 AND S7 CLASS 'B' BEDDING, UNLESS SPECIFIED OTHERWISE.
14. SANITARY MAINTENANCE STRUCTURE FRAME AND COVERS SHALL BE PER CITY OF OTTAWA STD. S24 AND S25.
15. SANITARY MAINTENANCE STRUCTURES SHALL BE BENCHED PER OPSD 701.021.
16. 100MM THICK HIGH-DENSITY GRADE 'A' POLYSTYRENE INSULATION TO BE INSTALLED IN ACCORDANCE WITH CITY STD W22 WHERE INDICATED ON DRAWING SSP-1.

STORM

17. ALL REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.2, OR LATEST AMENDMENT. ALL NON-REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.1, OR LATEST AMENDMENT. PIPE SHALL BE JOINED WITH STD. RUBBER GASKETS AS PER CSA A257.3, OR LATEST AMENDMENT.
18. ALL STORM SEWER TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. S6 AND S7 CLASS 'B' UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY PROJECT GEOTECHNICAL ENGINEER.
19. ALL PVC STORM SEWERS ARE TO BE SDR 35 APPROVED PER C.S.A. B182.2 OR LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
20. CATCH BASIN SHALL BE IN ACCORDANCE WITH OPSD 705.010.
21. CATCH BASIN LEADS SHALL BE IN 200MM DIA. AT 1% SLOPE (MIN) UNLESS SPECIFIED OTHERWISE.
22. ALL CATCH BASINS SHALL HAVE 600MM SUMPS, UNLESS SPECIFIED OTHERWISE.
23. ALL CATCH BASIN LEAD INVERTS TO BE 1.5M BELOW FINISHED GRADE UNLESS SPECIFIED OTHERWISE.
24. THE STORM SEWER CLASSES HAVE BEEN DESIGNED BASED ON BEDDING CONDITIONS SPECIFIED ABOVE. WHERE THE SPECIFIED TRENCH WIDTH IS EXCEEDED , THE CONTRACTOR IS REQUIRED TO PROVIDE AND SHALL BE RESPONSIBLE FOR EXTRA TEMPORARY AND/OR PERMANENT REPAIRS MADE NECESSARY BY THE WIDENED TRENCH.
25. ALL ROAD AND PARKING LOT CATCH BASINS TO BE INSTALLED WITH ORTHOGONALLY PLACED SUBDRAINS IN ACCORDANCE WITH DETAIL. PERFORATED SUBDRAIN FOR ROAD AND PARKING LOT CATCH BASIN SHALL BE INSTALLED PER CITY STD R1 UNLESS OTHERWISE NOTED.
26. PERFORATED SUBDRAIN FOR REAR YARD AND LANDSCAPING APPLICATIONS SHALL BE INSTALLED PER CITY STD S29, S30 AND S31, WHERE APPLICABLE.
27. RIP-RAP TREATMENT SEWER AND CULVERT OUTLETS PER OPSD 810.010.
28. ALL STORM SEWER/ CULVERTS TO BE INSTALLED WITH FROST TREATMENT PER OPSD 803.031 WHERE APPLICABLE.
29. ALL STORM MANHOLES WITH PIPE LESS THAN 900MM IN DIAMETER SHALL BE CONSTRUCTED WITH A 300MM SUMP AS PER SDG, CLAUSE 6.2.6.

WATERMAIN

30. ALL WATERMAIN INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE CITY OF OTTAWA AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS).
31. ALL PVC WATERMAINS SHALL BE AWWA C-900 CLASS 150, SDR 18 OR APPROVED EQUIVALENT.
32. ALL WATER SERVICES LESS THAN OR EQUAL TO 50MM IN DIAMETER TO BE TYPE 'K' COPPER.
33. WATERMAIN TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W17. UNLESS SPECIFIED OTHERWISE. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY THE PROJECT GEOTECHNICAL ENGINEER.
34. ALL PVC WATERMAINS, SHALL BE INSTALLED WITH A 10 GAUGE STRANDED COPPER TWU OR RWU TRACER WIRE IN ACCORDANCE WITH CITY OF OTTAWA STD. W.36.
35. CATHODIC PROTECTION IS REQUIRED ON ALL METALLIC FITTINGS PER CITY OF OTTAWA STD.25.5 AND W25.6.
36. VALVE BOXES SHALL BE INSTALLED PER CITY OF OTTAWA STD W24.
37. WATERMAIN IN FILL AREAS TO BE INSTALLED WITH RESTRAINED JOINTS PER CITY OF OTTAWA STD.25.5 AND W25.6.
38. THRUST BLOCKING OF WATERMAINS TO BE INSTALLED PER CITY OF OTTAWA STD. W25.3 AND W25.4.
39. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS, BLOW-OFFS, AND NOZZLES REQUIRED FOR TESTING AND DISINFECTION OF THE WATERMAIN.
40. WATERMAIN CROSSING OVER AND BELOW SEWERS SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. W25.2 AND W25, RESPECTIVELY.
41. WATER SERVICES ARE TO BE INSULATED PER CITY STD. W23 WHERE SEPARATION BETWEEN SERVICES AND MAINTENANCE HOLES ARE LESS THAN 2.4M.
42. THE MINIMUM VERTICAL CLEARANCE BETWEEN WATERMAIN AND SEWER/UTILITY IS 0.5M PER MOE GUIDELINES. FOR CROSSING UNDER SEWERS, ADEQUATE STRUCTURAL SUPPORT FOR THE SEWER IS REQUIRED TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING. THE LENGTH OF WATER PIPE SHALL BE CENTERED AT THE POINT OF CROSSING TO ENSURE THAT THE JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.
43. ALL WATERMAINS SHALL HAVE A MINIMUM COVER OR 2.4M, OTHERWISE THERMAL INSULATION IS REQUIRED AS PER STD DWG W22.
44. GENERAL WATER PLANT TO UTILITY CLEARANCE AS PER STD DWG R20.
45. FIRE HYDRANT INSTALLATION AS PER STD DWG W19, ALL BOTTOM OF HYDRANT FLANGE ELEVATIONS TO BE INSTALLED 0.10M ABOVE PROPOSED FINISHED GRADE AT HYDRANT; FIRE HYDRANT LOCATION AS PER STD DWG W18.
46. BUILDING SERVICE TO BE CAPPED 1.0M OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED AND MUST BE RESTRAINED A MINIMUM OF 12M BACK FROM STUB.
47. ALL WATERMAINS SHALL BE HYDROSTATICALLY TESTED IN ACCORDANCE WITH THE CITY OF OTTAWA AND ONTARIO GUIDELINES UNLESS OTHERWISE DIRECTED. PROVISIONS FOR FLUSHING WATER LINE PRIOR TO TESTING, ETC. MUST BE PROVIDED.
48. ALL WATERMAINS SHALL BE BACTERIOLOGICALLY TESTED IN ACCORDANCE WITH THE CITY OF OTTAWA AND ONTARIO GUIDELINES. ALL CHLORINATED WATER TO BE DISCHARGED AND PRETREATED TO ACCEPTABLE LEVELS PRIOR TO DISCHARGE. ALL DISCHARGED WATER MUST BE CONTROLLED AND TREATED SO AS NOT TO ADVERSELY EFFECT ENVIRONMENT. IT IS RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL MUNICIPAL AND/OR PROVINCIAL REQUIREMENTS ARE FOLLOWED.
49. ALL WATERMAIN STUBS SHALL BE TERMINATED WITH A PLUG AND 50MM BLOW OFF UNLESS OTHERWISE NOTED.

USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE USE AND INTENT OF THE DRAWING. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA, AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS IF REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND DETAILED SIMILARLY AS WORK SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

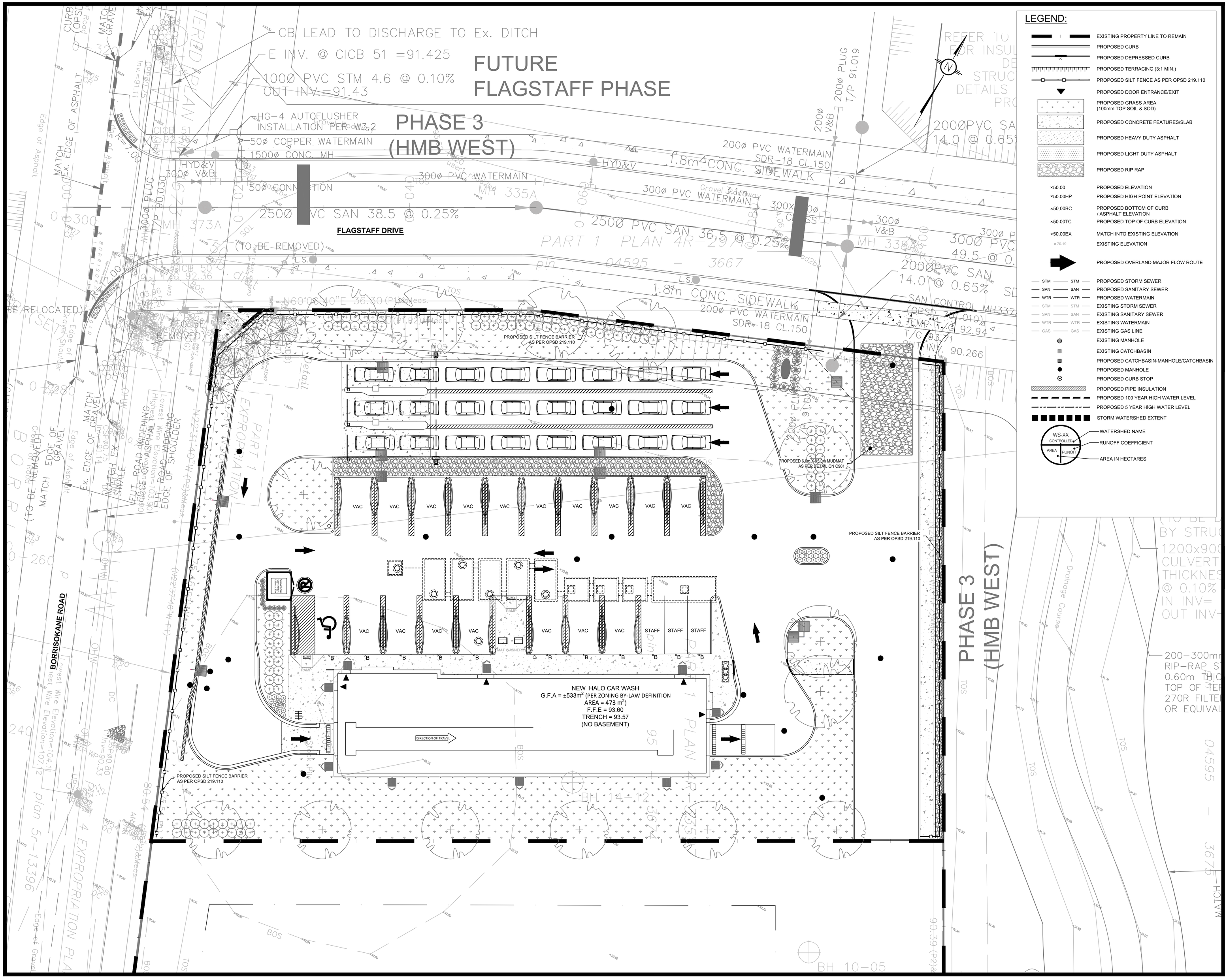
AS INSTRUMENTS OF SERVICE, ALL DRAWINGS, SPECIFICATIONS, CADD FILES OR OTHER ELECTRONIC MEDIA AND COPIED THERE OF FURNISHED BY THE ENGINEER ARE HIS PROPERTY, THEY ARE TO BE USED ONLY FOR THIS PROJECT AND ARE NOT TO BE USED ON ANY OTHER PROJECT, INCLUDING REPEATS OF THE PROJECT. CHANGES TO THE DRAWINGS MAY ONLY BE MADE BY THE ENGINEER.

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THESE DRAWINGS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

THESE DRAWINGS ILLUSTRATES THE WORK TO BE DONE. THE ENGINEER IS NOT RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES USED TO DO THE WORK, OR THE SAFETY ASPECTS OF CONSTRUCTION, AND NOTHING ON THESE DRAWINGS EXPRESSED OR IMPLIED CHANGES THIS CONDITION. CONTRACTOR SHALL DETERMINE ALL CONDITIONS AT THE SITE AND SHALL BE RESPONSIBLE FOR KNOWING HOW THEY AFFECT THE WORK. SUBMITTAL OF A BID TO PERFORM THIS WORK IS ACKNOWLEDGEMENT OF THE RESPONSIBILITIES, AND THAT THEY HAVE BEEN FULLY CONSIDERED IN PLANNING OF THE WORK, AND THE BID PRICE. NO CLAIMS FOR EXTRA CHARGES DUE TO THESE CONDITIONS WILL BE FORTHCOMING.

UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY LRL ASSOCIATES L



LEGEND:

- EXISTING PROPERTY LINE TO REMAIN
- PROPOSED CURB
- PROPOSED DEPRESSED CURB
- PROPOSED TERRACING (3:1 MIN.)
- PROPOSED SILT FENCE AS PER OPSD 219.110
- PROPOSED DOOR ENTRANCE/EXIT
- PROPOSED GRASS AREA (100mm TOP SOIL & SOD)
- PROPOSED CONCRETE FEATURES/SLAB
- PROPOSED HEAVY DUTY ASPHALT
- PROPOSED LIGHT DUTY ASPHALT
- PROPOSED RIP RAP
- ×50.00 PROPOSED ELEVATION
- ×50.00HP PROPOSED HIGH POINT ELEVATION
- ×50.00BC PROPOSED BOTTOM OF CURB / ASPHALT ELEVATION
- ×50.00TC PROPOSED TOP OF CURB ELEVATION
- ×50.00EX MATCH INTO EXISTING ELEVATION
- ×70.19 EXISTING ELEVATION
- PROPOSED OVERLAND MAJOR FLOW ROUTE
- STM STM PROPOSED STORM SEWER
- SAN SAN PROPOSED SANITARY SEWER
- WTR WTR PROPOSED WATERMAIN
- STM STM EXISTING STORM SEWER
- SAN SAN EXISTING SANITARY SEWER
- WTR WTR EXISTING WATERMAIN
- GAS GAS EXISTING GAS LINE
- EXISTING MANHOLE
- EXISTING CATCHBASIN
- PROPOSED CATCHBASIN-MANHOLE/CATCHBASIN
- PROPOSED MANHOLE
- PROPOSED CURB STOP
- PROPOSED PIPE INSULATION
- PROPOSED 100 YEAR HIGH WATER LEVEL
- PROPOSED 5 YEAR HIGH WATER LEVEL
- STORM WATERSHED EXTENT
- WS-XX CONTROLLED AREA RUNOFF — WATERSHED NAME, RUNOFF COEFFICIENT, AREA IN HECTARES

GENERAL NOTES:

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CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.

5m 2 0 5m

SCALE: 1:200

No.	REVISIONS	BY	DATE
04	RE-ISSUED FOR APPROVAL	P.P.	17 NOV 2022
03	REVISED FLOOR AREA FOR M.V. APPLICATION	P.P.	13 JULY 2022
02	REVISED FLOOR AREA FOR M.V. APPLICATION	P.P.	23 JUNE 2022
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road I Ottawa, ON, K1J 9G2
www.lrl.ca I (613) 842-3434

CLIENT

HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT

HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE

EROSION AND SEDIMENT CONTROL PLAN

PROJECT NO. 210691

DATE JANUARY 2022

C101

D07-12-22-0085

#18788

FUTURE FLAGSTAFF PHASE

PHASE 3 (HMB WEST)

FLAGSTAFF DRIVE

EXTERIOR SIDE YARD

PRIVATE ENTRANCE IS TO BE AS PER CITY OF OTTAWA DETAIL SC7.1

NEW HALO CAR WASH
G.F.A = ±533m² (PER ZONING BY-LAW DEFINITION
AREA = 473 m²)
F.F.E = 93.60
TRENCH = 93.57
(NO BASEMENT)

DIRECTION OF TRAVEL

PROPOSED ASSISTANCE INTERCOM STATION SEE DETAIL ON C903

PROPOSED ASSISTANCE INTERCOM STATION SEE DETAIL ON C902

POTENTIAL NOISE BARRIER (REFER TO NOISE STUDY REPORT)

PROPOSED 8 SPOTS BIKE RACK

PROPOSED SNOW STORAGE AREA

PROPOSED 1.8m SIDEWALK

FRONT YARD

REAR YARD

INTERIOR SIDE YARD

BORRISOKANE ROAD

DETAILS OF DEVELOPMENT

DATA		REQUIRED	PROVIDED
ZONING		IL (304) - LIGHT INDUSTRIAL URBAN EXC. 304	
SETBACKS	FY	7.5m	18.9m
	RY	7.5m	27.8m
	INT.SY	7.5m	7.5m
	EXT.SY	7.5m	39.9m
NET LOT AREA (sqm)		5342 sqm	
BUILDING COVERAGE		65 % (MAX)	9.6 %
BUILDING HEIGHT		18 m (MAX)	8.0 m
GROSS FLOOR AREA		513 sqm	
No. of UNITS		1	
LOADING SPACES		N/A	N/A
PARKING:		N/A	20 + 1 HC
No. OF STOREYS			1
OTHER:			

LEGEND:

- EXISTING PROPERTY LINE TO REMAIN
- PROPOSED CURB
- PROPOSED DEPRESSED CURB
- PROPOSED TERRACING (3:1 MIN.)
- PROPOSED SILT FENCE AS PER OPSD 219.110
- PROPOSED DOOR ENTRANCE/EXIT
- PROPOSED GRASS AREA (100mm TOP SOIL & SOD)
- PROPOSED CONCRETE FEATURES/SLAB
- PROPOSED HEAVY DUTY ASPHALT
- PROPOSED LIGHT DUTY ASPHALT
- PROPOSED RIP RAP
- ×50.00 PROPOSED ELEVATION
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- PROPOSED 5 YEAR HIGH WATER LEVEL
- STORM WATERSHED EXTENT
- WS-XX WATERSHED NAME
- C=0.XX RUNOFF COEFFICIENT
- AREA=X.XXha AREA IN HECTARES

TOPOGRAPHIC INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
PART OF LOT 11, CONCESSION 3 (RIDEAU FRONT), GEOGRAPHIC TOWNSHIP OF NEPEAN, CITY OF OTTAWA
DATED JANUARY 21st 2022

ELEVATION NOTES

1. Elevations shown are geodetic and are referred to the CGVD28 geodetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

Bearings are grid, derived from Can-Net 2016 Real Time Network GPS observations referenced to Specified Control Points 01919761338 and 01919871649, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE USE AND INTENT OF THE DRAWING. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA, AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS IF REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND DETAILED SIMILARLY AS WORK SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

AS INSTRUMENTS OF SERVICE, ALL DRAWINGS, SPECIFICATIONS, CADD FILES OR OTHER ELECTRONIC MEDIA AND COPIED THERE OF FURNISHED BY THE ENGINEER ARE HIS PROPERTY. THEY ARE TO BE USED ONLY FOR THIS PROJECT AND ARE NOT TO BE USED ON ANY OTHER PROJECT, INCLUDING REPEATS OF THE PROJECT. CHANGES TO THE DRAWINGS MAY ONLY BE MADE BY THE ENGINEER.

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THESE DRAWINGS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

THESE DRAWINGS ILLUSTRATES THE WORK TO BE DONE. THE ENGINEER IS NOT RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES USED TO DO THE WORK, OR THE SAFETY ASPECTS OF CONSTRUCTION, AND NOTHING ON THESE DRAWINGS EXPRESSED OR IMPLIED CHANGES THIS CONDITION. CONTRACTOR SHALL DETERMINE ALL CONDITIONS AT THE SITE AND SHALL BE RESPONSIBLE FOR KNOWING HOW THEY AFFECT THE WORK. SUBMITTAL OF A BID TO PERFORM THIS WORK IS ACKNOWLEDGEMENT OF THE RESPONSIBILITIES, AND THAT THEY HAVE BEEN FULLY CONSIDERED IN PLANNING OF THE WORK, AND THE BID PRICE. NO CLAIMS FOR EXTRA CHARGES DUE TO THESE CONDITIONS WILL BE FORTHCOMING.

UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY LRL ASSOCIATES LTD. (LRL) WITHOUT OBTAINING LRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES, THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST LRL AND TO RELEASE LRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

IN ADDITION, THE CLIENT AGREES, TO THE FULLEST EXTENT PERMITTED BY LAW, TO INDEMNIFY AND HOLD HARMLESS LRL FROM ANY DAMAGES, LIABILITIES OR COST, INCLUDING REASONABLE ATTORNEY'S FEES AND COST OF DEFENSE, ARISING FROM SUCH CHANGES.

IN ADDITION, THE CLIENT AGREES TO INCLUDE IN ANY CONTRACTS FOR CONSTRUCTION APPROPRIATE LANGUAGE THAT PROHIBITS THE CONTRACTOR OR ANY SUBCONTRACTORS OF ANY TIER FROM MAKING ANY CHANGES OR MODIFICATIONS TO LRL'S CONSTRUCTION DOCUMENTS WITHOUT THE PRIOR WRITTEN APPROVAL OF LRL AND THAT FURTHER REQUIRES THE CONTRACTOR TO INDEMNIFY BOTH LRL AND THE CLIENT FROM ANY LIABILITY OR COST ARISING FROM SUCH CHANGES MADE WITHOUT SUCH PROPER AUTHORIZATION.

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5m 2 0 5m
SCALE: 1:200

NOT FOR CONSTRUCTION TENDER OR PERMIT

No.	REVISIONS	BY	DATE
04	RE-ISSUED FOR APPROVAL	P.P.	17 NOV 2022
03	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	13 JULY 2022
02	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	23 JUNE 2022
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/11/17
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road I Ottawa, ON, K1J 9G2
www.lrl.ca I (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
SITE DEVELOPMENT PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C201

D07-12-22-0085

#18788

PAVEMENT STRUCTURE

COURSE	MATERIAL	THICKNESS (mm) AUTOMOBILE PARKING	THICKNESS (mm) TRUCK ROUTE (HEAVY TRAFFIC)
SURFACE	HL.3 A/C (PG 58-28)	50	40
BINDER	HL.8 A/C (PG 58-28)	--	50
BASECOURSE	OPSS GRANULAR "A"	150	150
SUBBASE	OPSS GRANULAR "B" TYPE II	350	450

NOTE:
IN PREPARATION FOR PAVEMENT CONSTRUCTION AT THIS SITE, ANY SURFICIAL OR NEAR SURFACE/SUBGRADE LEVEL TOPSOIL AND ANY SOFT, WET OR DELETERIOUS MATERIALS SHOULD BE REMOVED FROM THE PROPOSED PAVED AREAS. THE EXPOSED SUBGRADE SHOULD BE INSPECTED AND APPROVED BY GEOTECHNICAL PERSONNEL AND ANY SOFT AREAS EVIDENT SHOULD BE SUBEXCAVATED AND REPLACED WITH SUITABLE EARTH BORROW APPROVED BY THE GEOTECHNICAL ENGINEER. THE SUBGRADE SHOULD BE SHAPED AND CROWNED TO PROMOTE DRAINAGE OF THE SITE DRAINAGE STRUCTURES. FOLLOWING APPROVAL OF THE PREPARATION OF THE SUBGRADE, THE PAVEMENT GRANULARS MAY BE PLACED.

REFER TO LATEST GEOTECHNICAL REPORT PREPARED BY LRL ENGINEERING LTD.

LEGEND:

- EXISTING PROPERTY LINE TO REMAIN
- PROPOSED CURB
- PROPOSED DEPRESSED CURB
- PROPOSED TERRACING (3:1 MIN.)
- PROPOSED SILT FENCE AS PER OPSD 219.110
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- PROPOSED GRASS AREA (100mm TOP SOIL & SOD)
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- WS-XX CONTROLLED AREA / RUNOFF — WATERSHED NAME; RUNOFF COEFFICIENT; AREA IN HECTARES

FUTURE FLAGSTAFF PHASE 3 (HMB WEST)

FLAGSTAFF DRIVE (TO BE REMOVED)

BORRISOKANE ROAD

BENCHMARK
SPIKE IN UTILITY POLE
ELEV. = 92.96

NEW HALO CAR WASH
G.F.A = ±533m² (PER ZONING BY-LAW DEFINITION
AREA = 473 m²)
F.F.E = 93.60
TRENCH = 93.57
(NO BASEMENT)

DIRECTION OF TRAVEL

PROP STM CBMH07 T/G = 92.90
PROP STM MH08 T/G = 93.11
PROP STM DIVERSION MH T/G = 93.14
PROP STM JELLYFISH TREATMENT UNIT T/G = 93.17
PROP STM RETURN MH T/G = 92.90
PROP STM CBMH10 T/G = 93.41
PROP STM CBMH09 T/G = 93.15
PROP STM CBMH04 T/G = 92.90
PROP STM CBMH06 T/G = 92.90
PROP STM CBMH05 T/G = 92.90
PROP SAN MH01 T/G = 93.03 c/w WATERTIGHT COVER AS PER OPSD 401.030
PROP STM CBMH03 T/G = 92.90
PROP STM CBMH01 T/G = 92.86
PROP SAN MH04 T/G = 93.61
PROP STM MH12 T/G = 93.17
PROP SAN MH02 T/G = 93.16
PROP STM CBMH11 T/G = 92.90
PROP STM CBMH02 T/G = 93.05

CB LEAD TO DISCHARGE TO Ex. DITCH
E INV. @ CICB 51 =91.425
1000 PVC STM 4.6 @ 0.10%
OUT INV.=91.43
HG-4 AUTOFLUSHER INSTALLATION PER W3.2
50ø COPPER WATERMAIN
1500ø CONC. MH
300ø PVC WATERMAIN
50ø CONNECTION
2500 PVC SAN 38.5 @ 0.25%
1.8m CONC. SIDEWALK
200ø PVC WATERMAIN
SDR-18 CL.150
2000 PVC SAN 14.0 @ 0.65%
SAN CONTROL MH (OPSD 701.010)
300ø V&B
300ø PLUG
MH 335A
MH 335B
MH 335C
MH 335D
MH 335E
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LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501998
2022/11/17
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
GRADING AND DRAINAGE PLAN

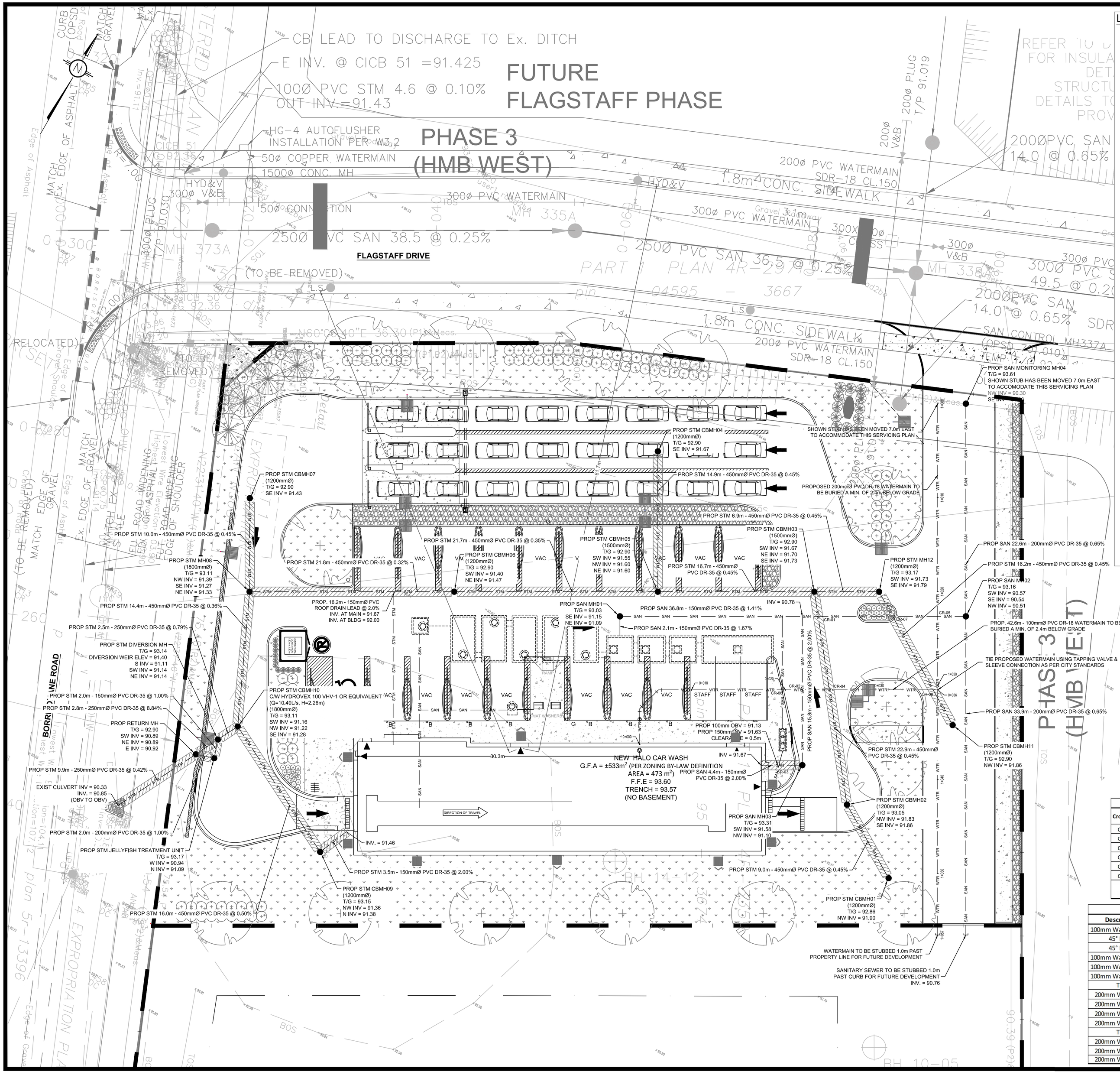
PROJECT NO.
210691

DATE
JANUARY 2022

C301

D07-12-22-0085

#18788



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- WS-XX CONTROLLED AREA RUNOFF
  - WATERSHED NAME
  - RUNOFF COEFFICIENT
  - AREA IN HECTARES

NOTE:

CLAY DYKES ARE TO BE INSTALLED DOWNSTREAM FROM EACH OF THE MANHOLES/CATCH BASINS. THESE DYKES SHOULD EXTEND FROM THE BASE OF THE SERVICE TRENCH TO THE SUBGRADE LEVEL,HAVING MIN. WIDTH OF 1.0m, REFER TO GEOTECHNICAL REPORT FOR FURTHER DETAILS.

Crossing Table

Crossing #	WM	STM	SAN	Depth Separation (m)
CR-01	N/A	91.52 (inv.)	90.88 (obv.)	0.64
CR-02	91.59 (inv.)	N/A	91.09 (obv.)	0.50
CR-03	N/A	91.13 (obv.) - 100mm	91.63 (inv.) - 150mm	0.50
CR-04	90.82 (obv.)	91.56 (inv.)	N/A	0.74
CR-05	91.20 (inv.)	N/A	90.70 (obv.)	0.50
CR-06	90.43 (obv.)	N/A	90.93 (inv.)	0.50
WM crossing above sewer per City STD W25.2				
WM crossing below sewer per City STD W25				

Watermain Table

Description	Chainage	Finish Grade	Obvert of Watermain	Cover (m)
100mm Water Service	0+000	93.41	91.01	2.40
45° Bend	0+004	93.34	90.94	2.40
45° Bend	0+007	93.27	90.87	2.40
100mm Water Service	0+010	93.32	90.92	2.40
100mm Water Service	0+020	93.25	90.43	2.82
100mm Water Service	0+030	93.37	90.97	2.40
Tee	0+036	93.02	90.62	2.40
200mm Watermain	1+000	93.59	91.19	2.40
200mm Watermain	1+010	93.35	90.95	2.40
200mm Watermain	1+020	93.17	90.77	2.40
200mm Watermain	1+030	93.03	90.63	2.40
Tee	1+031	93.02	90.62	2.40
200mm Watermain	1+040	93.02	90.62	2.40
200mm Watermain	1+050	93.09	90.69	2.40
200mm Watermain	1+057	92.75	90.35	2.40

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CLIENT
HALO CAR WASH INC.

DESIGNED BY: M.L. / P.P. | DRAWN BY: M.L. | APPROVED BY: M.B.

PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

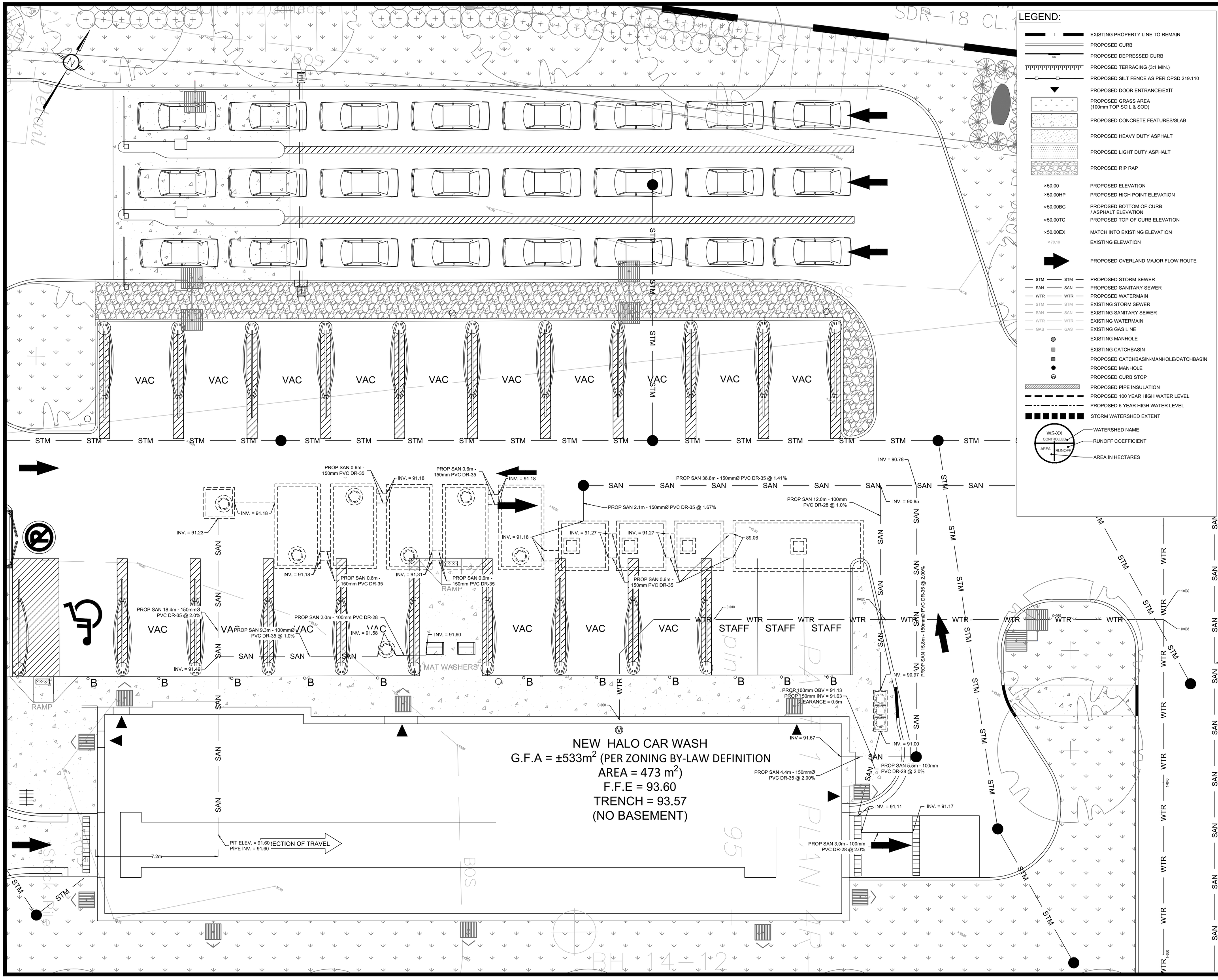
DRAWING TITLE
SERVICING PLAN

PROJECT NO. 210691
DATE JANUARY 2022

C401

D07-12-22-0085

#18788



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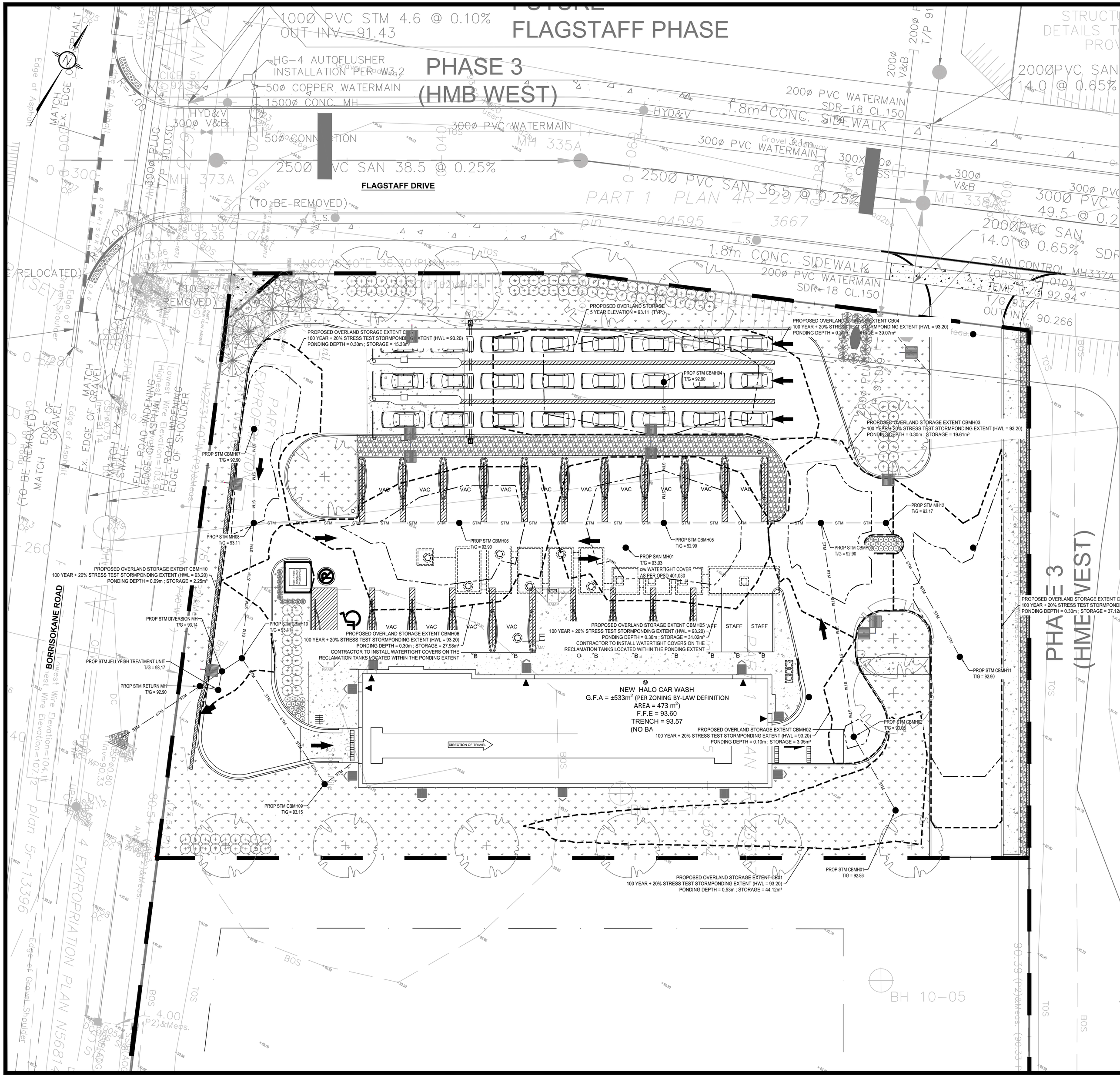
BARRHAVEN, ON

DRAWING TITLE
CAR WASH WASTEWATER TREATMENT & RECLAMATION SYSTEM

PROJECT NO. 210691
DATE JANUARY 2022
C402

D07-12-22-0085
#18788



LEGEND:

- EXISTING PROPERTY LINE TO REMAIN
- PROPOSED CURB
- PROPOSED DEPRESSED CURB
- PROPOSED TERRACING (3:1 MIN.)
- PROPOSED SILT FENCE AS PER OPSD 219.110
- PROPOSED DOOR ENTRANCE/EXIT
- PROPOSED GRASS AREA (100mm TOP SOIL & SOD)
- PROPOSED CONCRETE FEATURES/SLAB
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- PROPOSED OVERLAND MAJOR FLOW ROUTE
- STM STM PROPOSED STORM SEWER
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- PROPOSED CATCHBASIN-MANHOLE/CATCHBASIN
- PROPOSED MANHOLE
- PROPOSED CURB STOP
- PROPOSED PIPE INSULATION
- PROPOSED 100 YEAR HIGH WATER LEVEL
- PROPOSED 5 YEAR HIGH WATER LEVEL
- STORM WATERSHED EXTENT
- WS-XX CONTROLLED AREA RUNOFF — WATERSHED NAME / RUNOFF COEFFICIENT / AREA IN HECTARES

5m 2 0 5m
SCALE: 1:200

NOT FOR CONSTRUCTION TENDER OR PERMIT

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01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/11/17
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road I Ottawa, ON, K1J 9G2
www.lrl.ca I (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
STORMWATER MANAGEMENT PLAN

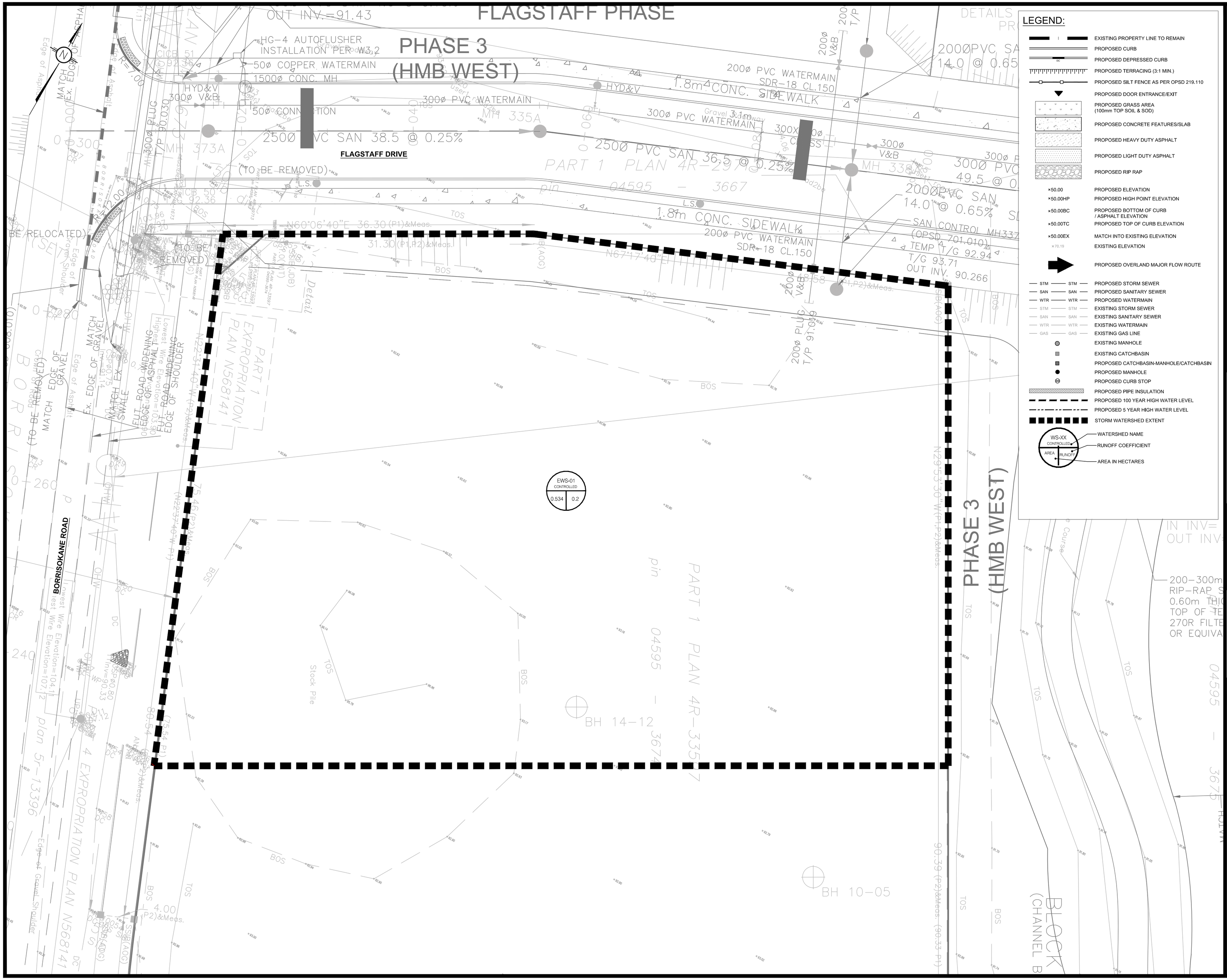
PROJECT NO.
210691

DATE
JANUARY 2022

C601

D07-12-22-0085

#18788



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5m 2 0 5m

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LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/11/17
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
PRE-DEVELOPMENT
WATERSHED PLAN

PROJECT NO.
210691

DATE
JANUARY 2022

C701

D07-12-22-0085

#18788

FLAGSTAFF PHASE

PHASE 3
(HMB WEST)

FLAGSTAFF DRIVE

NEW HALO CAR WASH
G.F.A = ±533m² (PER ZONING BY-LAW DEFINITION
AREA = 473 m²)
F.F.E = 93.60
TRENCH = 93.57
(NO BASEMENT)

DIRECTION OF TRAVEL

WS-01 CONTROLLED 0.064 0.46
WS-02 CONTROLLED 0.049 0.90
WS-03 CONTROLLED 0.028 0.71
WS-04 CONTROLLED 0.101 0.58
WS-05 CONTROLLED 0.054 0.90
WS-06 CONTROLLED 0.056 0.90
WS-07 CONTROLLED 0.034 0.70
WS-08 CONTROLLED 0.045 0.44
WS-09 UN-CONTROLLED 0.027 0.20
WS-10 UN-CONTROLLED 0.020 0.53

BORRISOKANE ROAD

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5m 2 0 5m
SCALE: 1:200

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LICENSED PROFESSIONAL ENGINEER
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HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

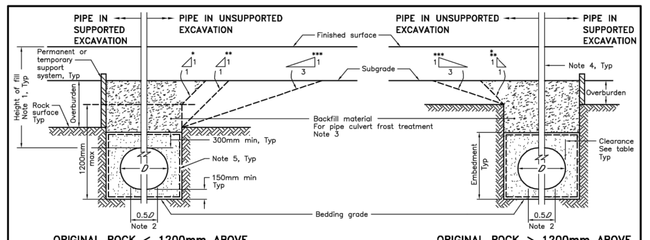
PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
POST-DEVELOPMENT
WATERSHED PLAN

PROJECT NO. 210691
DATE JANUARY 2022
C702

D07-12-22-0085

#18788

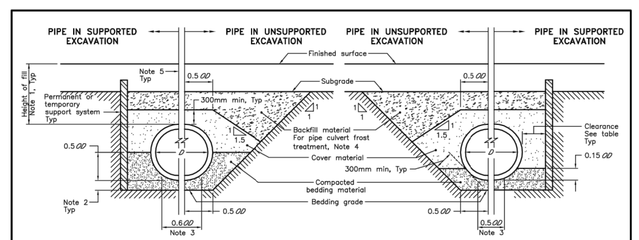


NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.
5 Embedment material shall be wrapped in non-woven geotextile when specified.
A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.
B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
C Fractured rock shall be treated as Type 1 soil.
D All dimensions are in metres unless otherwise shown.

LEGEND:
D – Inside diameter
* – Type 1 or 2 soil
** – Type 3 soil
*** – Type 4 soil

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3
FLEXIBLE PIPE EMBEDMENT AND BACKFILL ROCK EXCAVATION		
	OPSD 802.013	

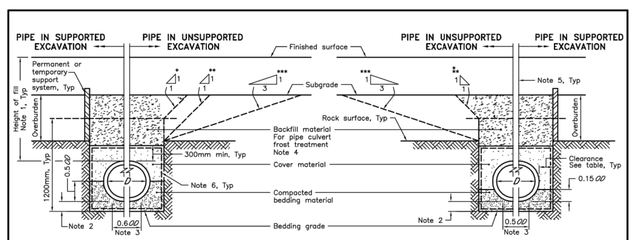


NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be 0.15D in no case shall this dimension be less than 150mm or greater than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
5 Condition of excavation is symmetrical about centreline of pipe.
A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
B All dimensions are in metres unless otherwise shown.

LEGEND:
D – Inside diameter
DD – Outside diameter

CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 3
RIGID PIPE BEDDING, COVER, AND BACKFILL TYPE 3 SOIL – EARTH EXCAVATION		
	OPSD 802.031	

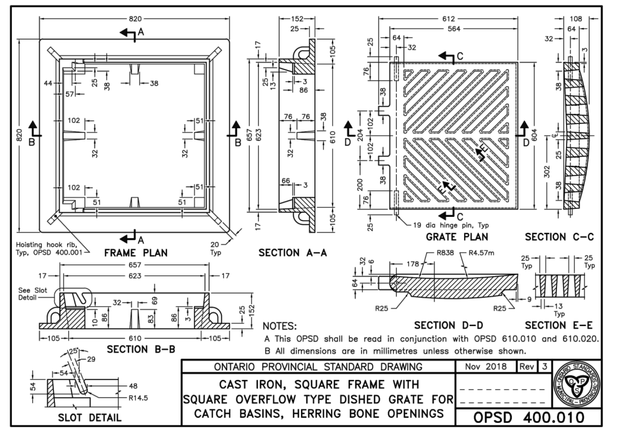


NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The minimum bedding depth below the pipe shall be 0.25D in no case shall this dimension be less than 300mm.
3 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
4 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
5 Condition of excavation is symmetrical about centreline of pipe.
6 Embedment material shall be wrapped in non-woven geotextile when specified.
A Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
B Fractured rock shall be treated as Type 1 soil.
C All dimensions are in metres unless otherwise shown.

LEGEND:
D – Inside diameter
DD – Outside diameter
* – Type 1 or 2 soil
** – Type 3 soil
*** – Type 4 soil

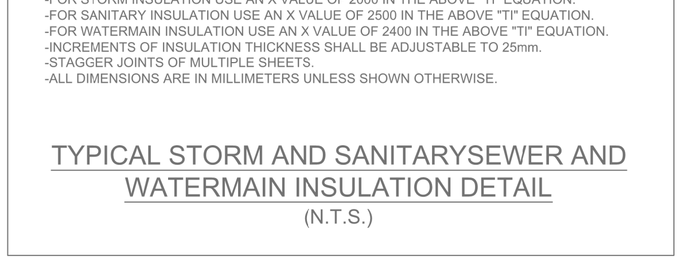
CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 3
RIGID PIPE BEDDING, COVER, AND BACKFILL ROCK EXCAVATION		
	OPSD 802.033	



NOTES:
A This OPSD shall be read in conjunction with OPSD 610.010 and 610.020.
B All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
CAST IRON, SQUARE FRAME WITH SQUARE OVERFLOW TYPE DISHED GRATE FOR CATCH BASINS, HERRING BONE OPENINGS		
	OPSD 400.010	

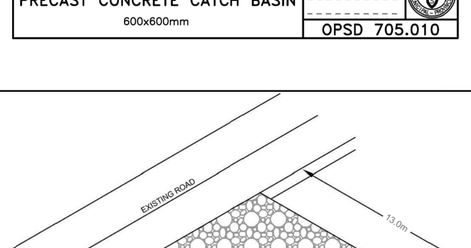


LEGEND:
D – Inside diameter

NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.
A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.
B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
C All dimensions are in metres unless otherwise shown.

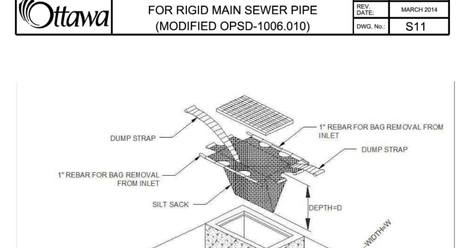
CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3
FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION		
	OPSD 802.010	



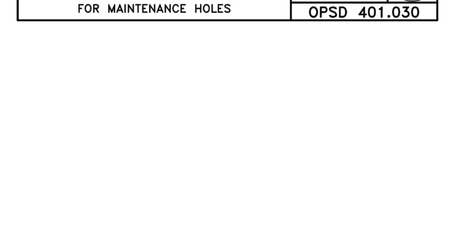
NOTE:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
LIGHT–DUTY SILT FENCE BARRIER		
	OPSD 219.110	



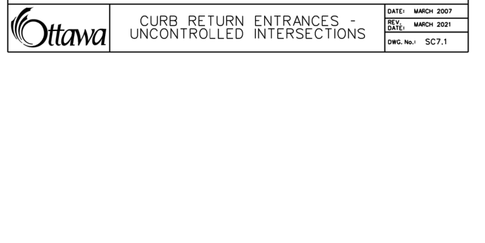
NOTES:
1 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
2 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
CONCRETE BARRIER CURB		
	OPSD 600.110	



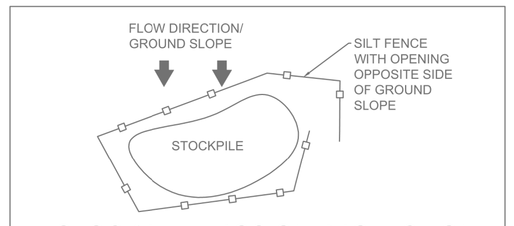
NOTES:
1 Sidewalk thickness at residential driveways and adjacent to curb shall be 150mm. At commercial and industrial driveways, the thickness shall be 200mm.
2 Sidewalk width shall be wider when specified.
3 This OPSD shall be read in conjunction with OPSD 310.030, 310.031, 310.032, 310.033 and 310.039.
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev 2
CONCRETE SIDEWALK		
	OPSD 310.010	

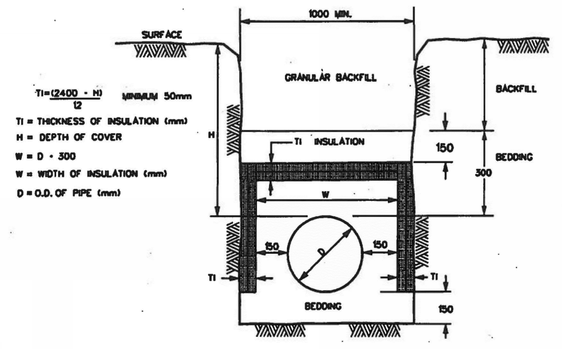


NOTES:
1 The sump is measured from the lowest invert.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, or 701.032.
C Structure exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
D Pipe support according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 1
PRECAST CONCRETE MAINTENANCE HOLE 1200mm DIAMETER		
	OPSD 701.010	

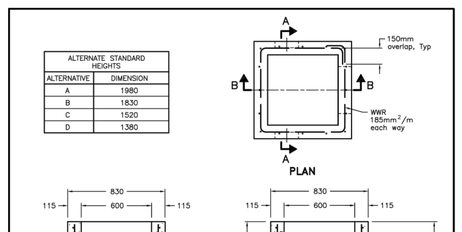


STOCKPILE EROSION PROTECTION
N.T.S.



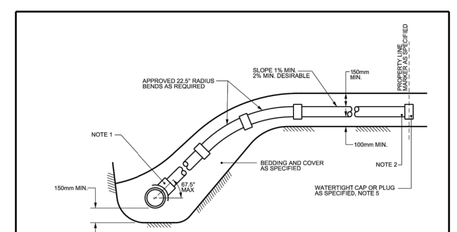
NOTES:
-FOR STORM INSULATION USE AN X VALUE OF 2000 IN THE ABOVE "TI" EQUATION.
-FOR SANITARY INSULATION USE AN X VALUE OF 2500 IN THE ABOVE "TI" EQUATION.
-FOR WATERMAIN INSULATION USE AN X VALUE OF 2400 IN THE ABOVE "TI" EQUATION.
-INCREMENTS OF INSULATION THICKNESS SHALL BE ADJUSTABLE TO 25mm.
-STAGGER JOINTS OF MULTIPLE SHEETS.
-ALL DIMENSIONS ARE IN MILLIMETERS UNLESS SHOWN OTHERWISE.

TYPICAL STORM AND SANITARYSEWER AND WATERMAIN INSULATION DETAIL
(N.T.S.)



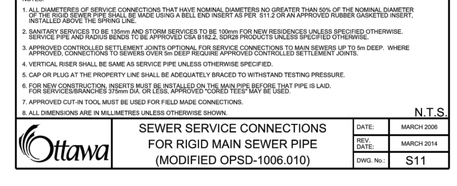
NOTES:
1 Outlet hole size 525mm diameter maximum, location as required.
2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
A Centre reinforcing in base slab and walls ±20mm.
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
D Pipe support shall be according to OPSD 708.020.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3
PRECAST CONCRETE CATCH BASIN 600x600mm		
	OPSD 705.010	



NOTES:
1 Outlet hole size 525mm diameter maximum, location as required.
2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
A Centre reinforcing in base slab and walls ±20mm.
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
D Pipe support shall be according to OPSD 708.020.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

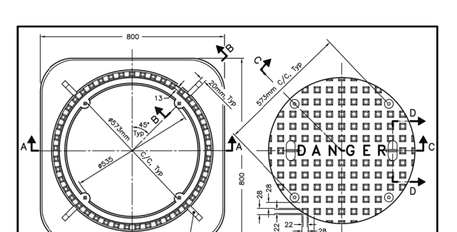
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3
PRECAST CONCRETE CATCH BASIN 600x600mm		
	OPSD 705.010	



NOTES:
1. ALL DIAMETERS OF SERVICE CONNECTIONS THAT HAVE NOMINAL DIAMETERS NO GREATER THAN 50% OF THE NOMINAL DIAMETER OF THE MAIN SEWER SHALL BE MADE USING A SADDLE WYE OR A SADDLE TEE WITH A RUBBER GASKETED INSERT. INSTALLED ABOVE THE SPRING LINE.
2. SANITARY SERVICES TO BE 125mm AND STORM SERVICES TO BE 150mm FOR NEW RESIDENCES UNLESS SPECIFIED OTHERWISE. SERVICE PIPE AND FACING BENDS TO BE APPROVED CSA B182.2 SDR35 PRODUCTS UNLESS SPECIFIED OTHERWISE.
3. APPROVED CONTROLLED SETTLEMENT JOINTS OPTIONAL FOR SERVICE CONNECTIONS TO MAIN SEWERS UP TO 5m DEEP. WHERE SEWERS ARE DEEPER THAN 5m, CONTROLLED SETTLEMENT JOINTS SHALL BE INSTALLED AT SETTLEMENT JOINTS.
4. VERTICAL RISER SHALL BE SAME AS SERVICE PIPE UNLESS OTHERWISE SPECIFIED.
5. CAP OR PLUG AT THE PROPERTY LINE SHALL BE ADEQUATELY BRACED TO WITHSTAND TESTING PRESSURE.
6. FOR NEW CONNECTIONS, INSERTA-NEE OR APPROVED ON THE SPIGOT END OF PIPE THAT PIPE IS LAID.
7. APPROVED CUT-IN TOOL MUST BE USED FOR FIELD MADE CONNECTIONS.
8. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

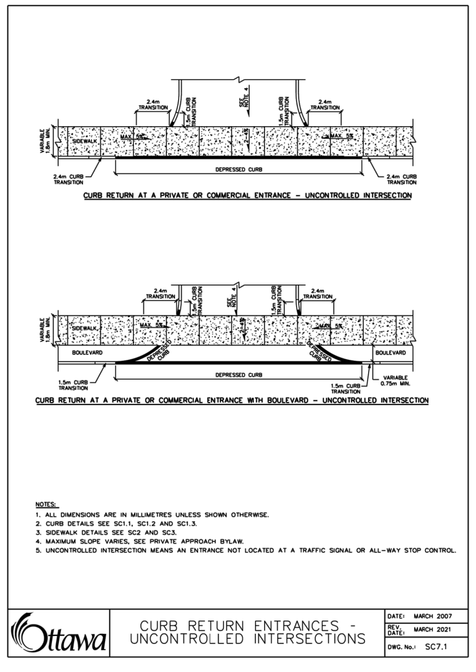
N.T.S.

Ottawa	SEWER SERVICE CONNECTIONS FOR RIGID MAIN SEWER PIPE (MODIFIED OPSD-1006.010)	DATE:	MARCH 2008
		REV. DATE:	MARCH 2014
		DWG. No.	S11



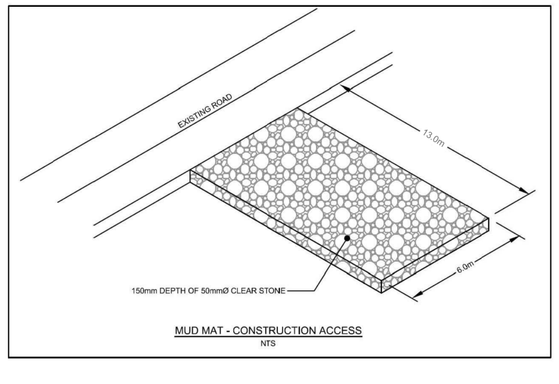
NOTE:
A All dimensions are in millimetres unless otherwise shown.

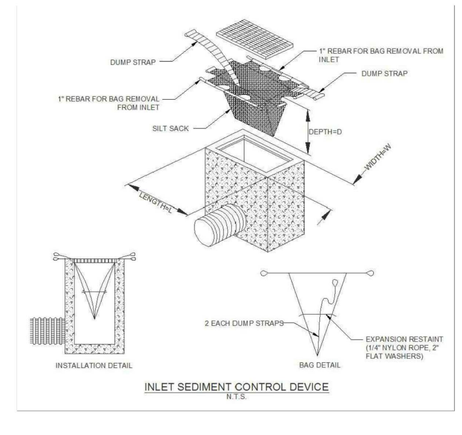
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 4
CAST IRON, SQUARE FRAME WITH CIRCULAR WATERTIGHT COVER FOR MAINTENANCE HOLES		
	OPSD 401.030	



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 MEANS 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





USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE USE AND INTENT OF THE DRAWING. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA, AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS IF REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND INSTALLED SIMILARLY AS WORK SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

AS INSTRUMENTS OF SERVICE, ALL DRAWINGS, SPECIFICATIONS, CADD FILES OR OTHER ELECTRONIC MEDIA AND COPIED THERE OF FURNISHED BY THE ENGINEER ARE HIS PROPERTY. THEY ARE TO BE USED ONLY FOR THIS PROJECT AND ARE NOT TO BE USED ON ANY OTHER PROJECT, INCLUDING REPEATS OF THE PROJECT. CHANGES TO THE DRAWINGS MAY ONLY BE MADE BY THE ENGINEER.

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THESE DRAWINGS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

THESE DRAWINGS ILLUSTRATES THE WORK TO BE DONE. THE ENGINEER IS NOT RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES USED TO DO THE WORK, OR THE SAFETY ASPECTS OF CONSTRUCTION, AND NOTHING ON THESE DRAWINGS EXPRESSED OR IMPLIED CHANGES THIS CONDITION. CONTRACTOR SHALL DETERMINE ALL CONDITIONS AT THE SITE AND SHALL BE RESPONSIBLE FOR KNOWING HOW TO AFFECT THIS WORK. SUBMITTAL OF A BID TO PERFORM THIS WORK IS ACKNOWLEDGEMENT OF THE RESPONSIBILITIES, AND THAT THEY HAVE BEEN FULLY CONSIDERED IN PLANNING OF THE WORK, AND THE BID PRICE. NO CLAIMS FOR EXTRA CHANGES DUE TO THESE CONDITIONS WILL BE FORTHCOMING.

UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY LRL ASSOCIATES LTD. (LRL) WITHOUT OBTAINING LRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES. THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST LRL AND TO RELEASE LRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

IN ADDITION, THE CLIENT AGREES, TO THE FULLEST EXTENT PERMITTED BY LAW, TO INDEMNIFY AND HOLD HARMLESS LRL FROM ANY DAMAGES, LIABILITIES OR COST, INCLUDING REASONABLE ATTORNEY'S FEES AND COST OF DEFENSE, ARISING FROM SUCH CHANGES.

IN ADDITION, THE CLIENT AGREES TO INCLUDE IN ANY CONTRACTS FOR CONSTRUCTION APPROPRIATE LANGUAGE THAT PROHIBITS THE CONTRACTOR OR ANY SUBCONTRACTORS OF ANY TIER FROM MAKING ANY CHANGES OR MODIFICATIONS TO LRL'S CONSTRUCTION DOCUMENTS WITHOUT THE PRIOR WRITTEN APPROVAL OF LRL AND THAT FURTHER REQUIRES THE CONTRACTOR TO INDEMNIFY BOTH LRL AND THE CLIENT FROM ANY LIABILITY OR COST ARISING FROM SUCH CHANGES MADE WITHOUT SUCH PROPER AUTHORIZATION.

GENERAL NOTES:

EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT MAY NOT BE COMPLETE OR TO DATE. CONTRACTOR SHALL VERIFY IN FIELD FOR LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING OR PERFORMING WORK.

CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS BEFORE START OF CONSTRUCTION.

THE ENGINEER WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THESE PLANS, SPECIFICATIONS AND THE DESIGN INTENT THEY CONVEY, OR FOR PROBLEMS WHICH ARISE FROM OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE ENGINEER'S GUIDANCE WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES AMBIGUITIES OR CONFLICTS WHICH ARE ALLEGED.

CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.

NOT FOR CONSTRUCTION TENDER OR PERMIT

No.	REVISIONS	BY	DATE
04	RE-ISSUED FOR APPROVAL	P.P.	17 NOV 2022
03	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	13 JULY 2022
02	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	23 JUNE 2022
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER M. BASNET 100501996 2022/11/17 PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT
HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
CONSTRUCTION DETAIL PLAN

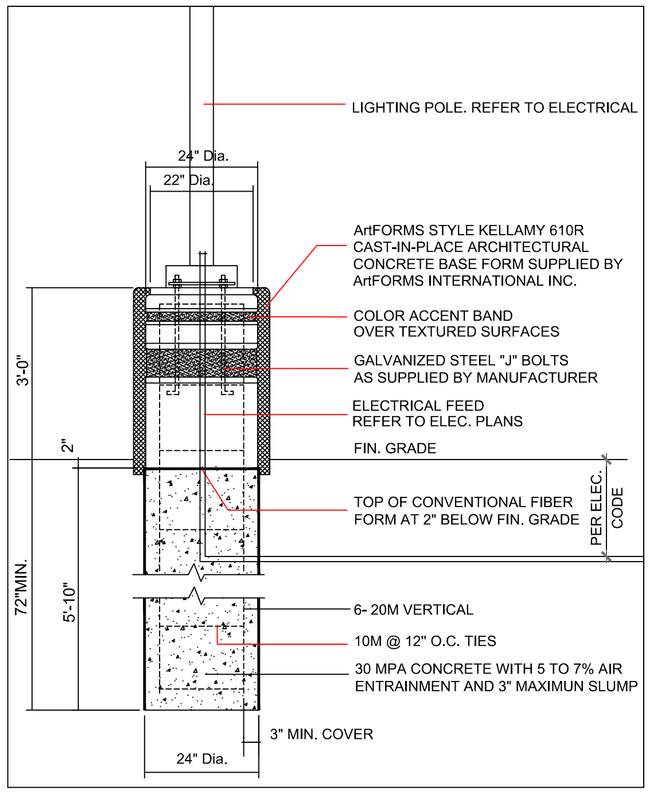
PROJECT NO.
210691

DATE
JANUARY 2022

C901

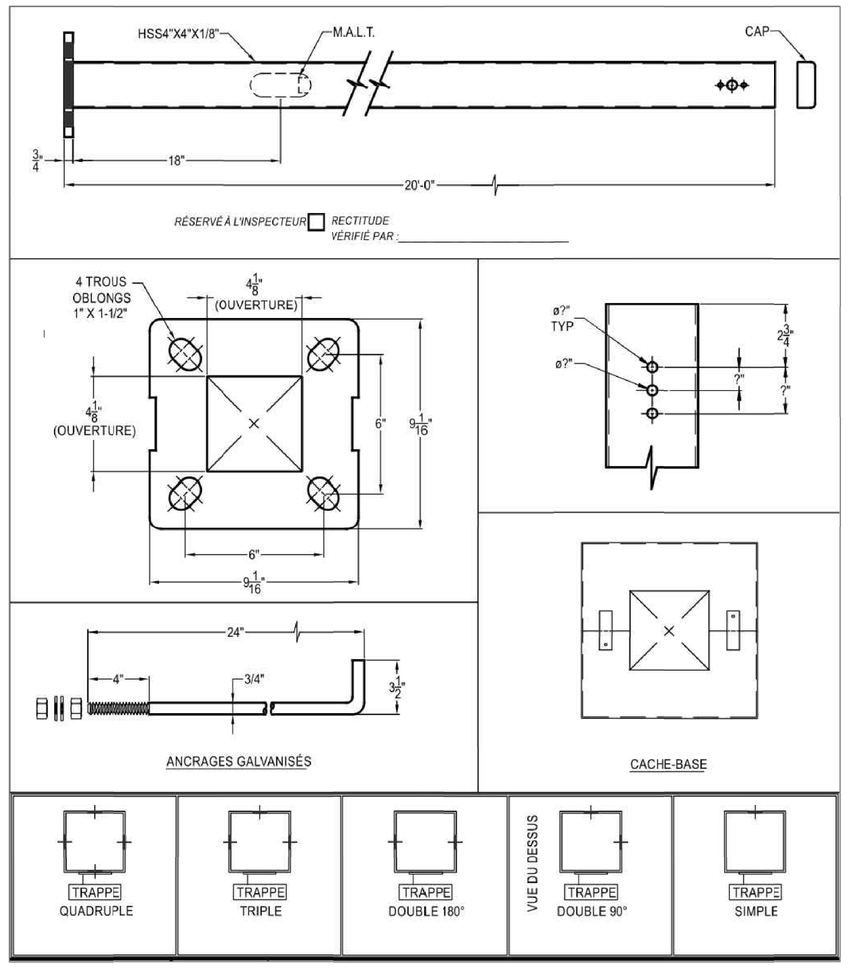
D07-12-22-0085

#18788



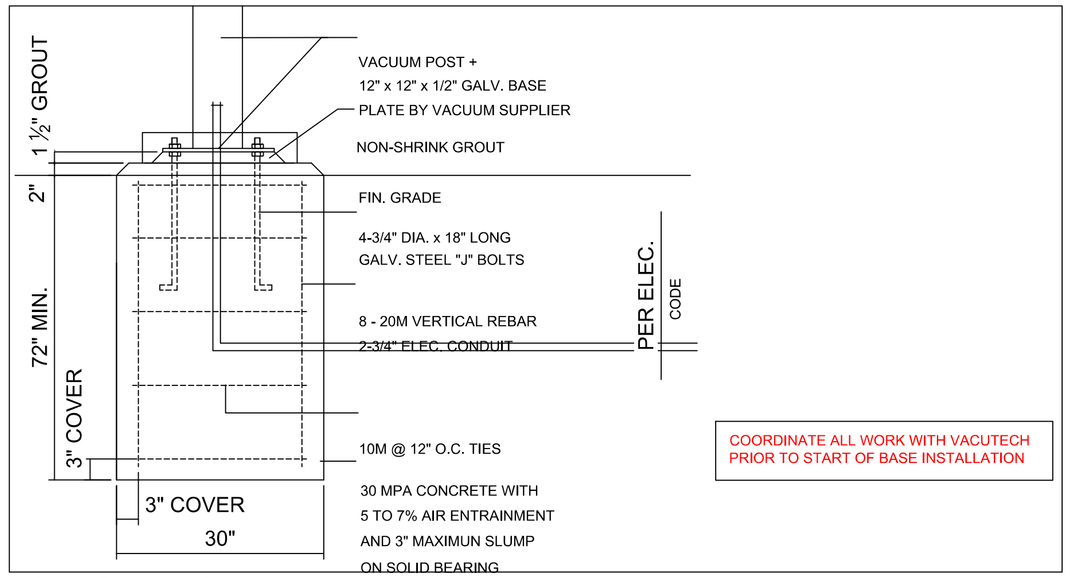
LIGHT STANDARD BASE DETAIL

N.T.S.



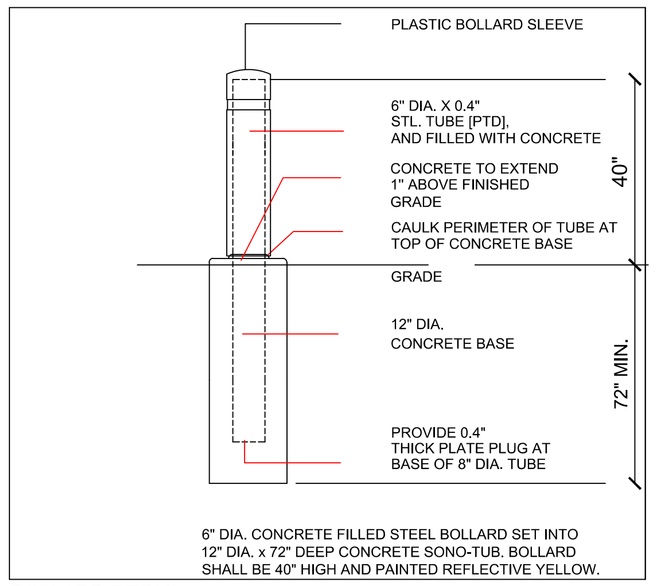
LIGHT STANDARD BASE ANCHOR CAGE DETAIL (SUPPLIED BY OWNER)

N.T.S.



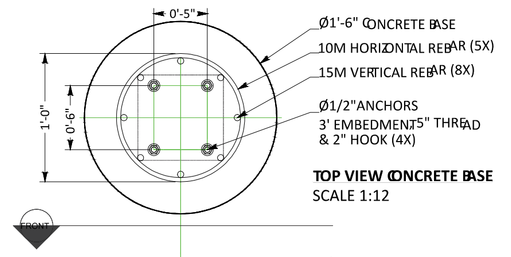
VACUUM STAND BASE

N.T.S.

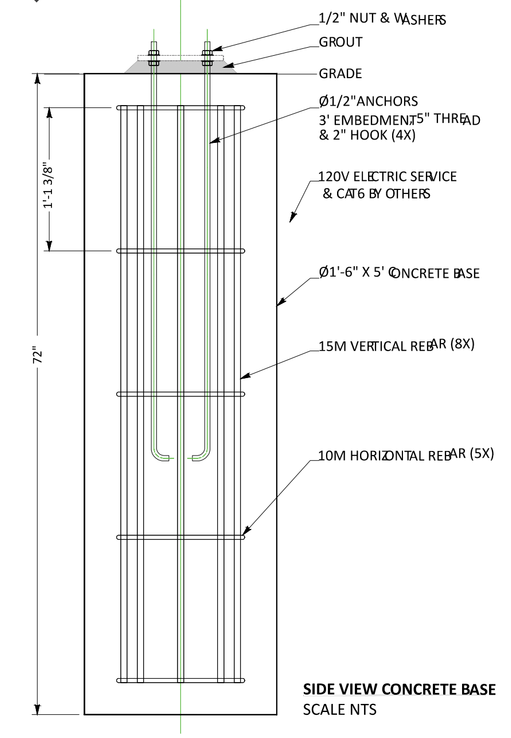


BOLLARD DETAIL

N.T.S.



TOP VIEW CONCRETE BASE
SCALE 1:12



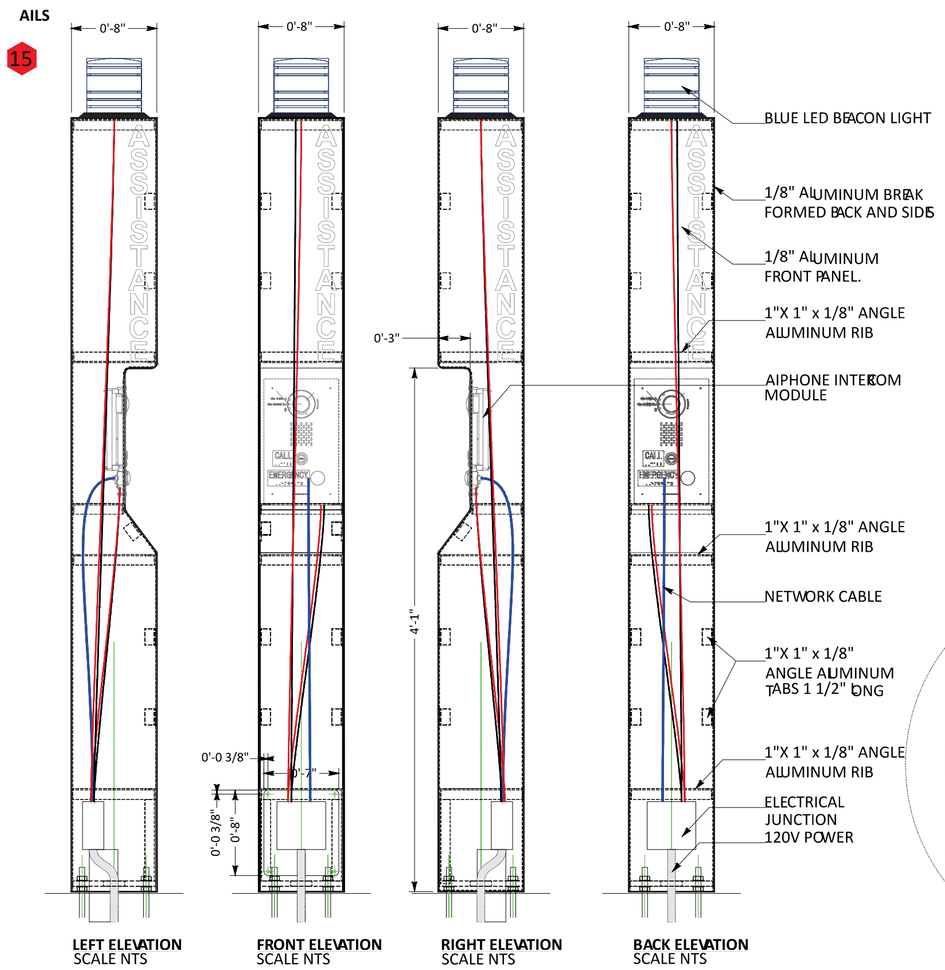
SIDE VIEW CONCRETE BASE
SCALE NTS

ASSISTANCE INTERCOM STATIONS

N.T.S.

AILS

15

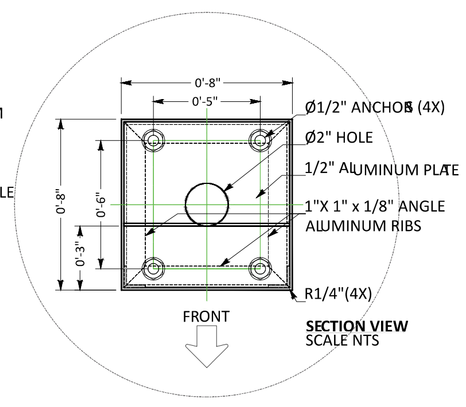


LEFT ELEVATION
SCALE NTS

FRONT ELEVATION
SCALE NTS

RIGHT ELEVATION
SCALE NTS

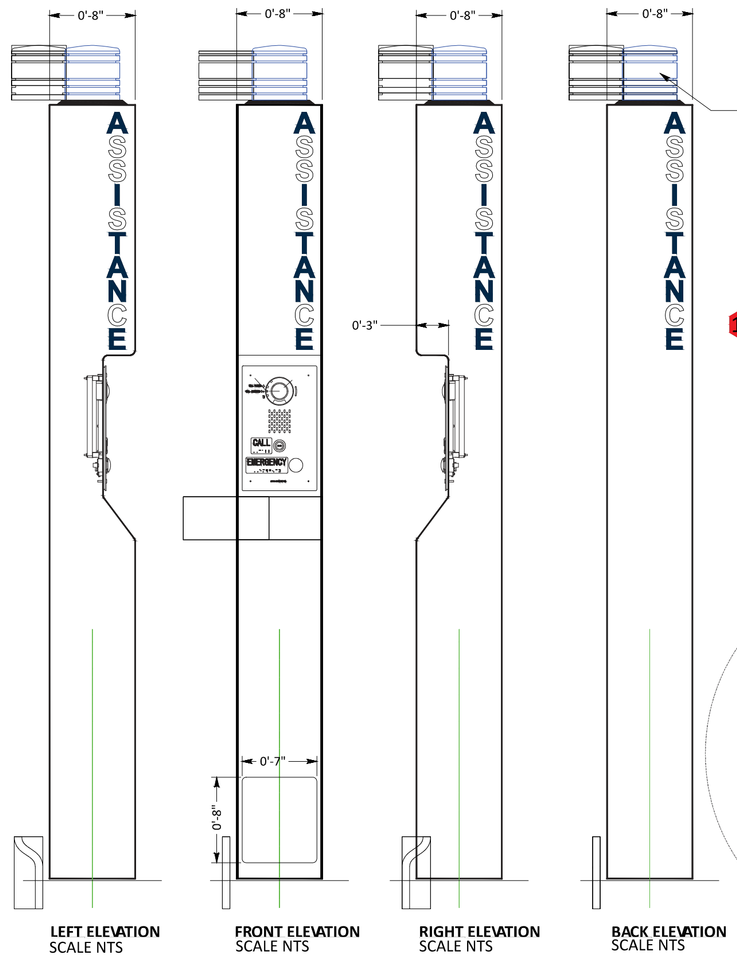
BACK ELEVATION
SCALE NTS



SECTION VIEW
SCALE NTS

ASSISTANCE INTERCOM STATIONS

N.T.S.



15 ASSISTANCE STATION

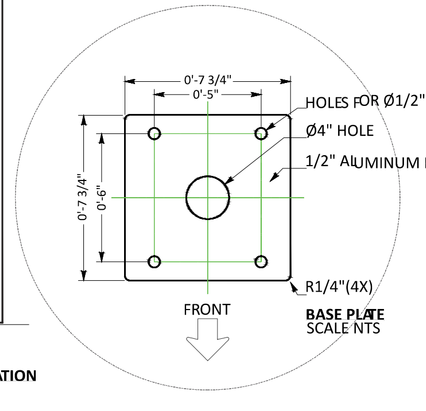
ROUTER AND BREAK
FORMED 1/8" ALUMINUM
SIGN
1/8" ALUMINUM FRONT,
TOP PANELS MECHANICALLY
SECURE
PAINTED YELLOW
WITH VINYL GRAPHICS

LEFT ELEVATION
SCALE NTS

FRONT ELEVATION
SCALE NTS

RIGHT ELEVATION
SCALE NTS

BACK ELEVATION
SCALE NTS



BASE PLATE
SCALE NTS

ASSISTANCE INTERCOM STATIONS

N.T.S.

NOTE:
DETAIL TO BE VERIFIED AND STAMPED BY A STRUCTURAL ENGINEER PRIOR TO CONSTRUCTION

USE AND INTERPRETATION OF DRAWINGS

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IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY LRL ASSOCIATES LTD. (LRL) WITHOUT OBTAINING LRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES, THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST LRL AND TO RELEASE LRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

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NOT FOR CONSTRUCTION TENDER OR PERMIT

No.	REVISIONS	BY	DATE
04	RE-ISSUED FOR APPROVAL	P.P.	17 NOV 2022
03	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	13 JULY 2022
02	REVISED FLOOR AREA FOR MV. APPLICATION	P.P.	23 JUNE 2022
01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
S. LECLERC
90439027
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road I Ottawa, ON, K1J 9G2
www.lrl.ca I (613) 842-3434

CLIENT

HALO CAR WASH INC.

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L. / P.P.	M.L.	M.B.

PROJECT

HALO CAR WASH
3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE

CONSTRUCTION DETAIL PLAN

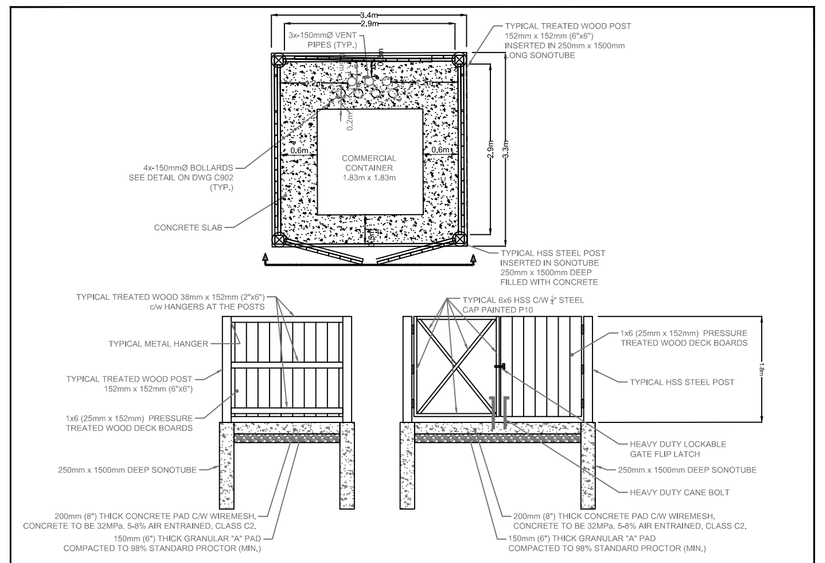
PROJECT NO.
210691

DATE
JANUARY 2022

C902

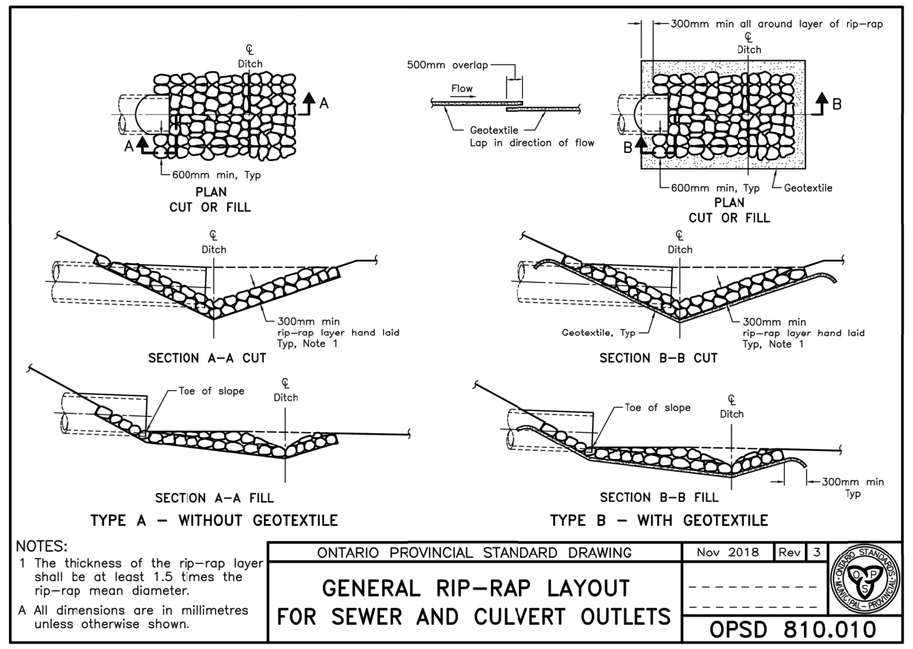
D07-12-22-0085

#18788



GARBAGE ENCLOSURE DETAIL

N.T.S.



NOTES:

1 The thickness of the rip-rap layer shall be at least 1.5 times the rip-rap mean diameter.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
GENERAL RIP-RAP LAYOUT FOR SEWER AND CULVERT OUTLETS		
	OPSD 810.010	

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01	ISSUED FOR APPROVAL	M.L.	22 APR 2022

LICENSED PROFESSIONAL ENGINEER
M. BASNET
100501996
2022/11/17
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road I Ottawa, ON, K1J 9G2
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M.L. / P.P.	M.L.	M.B.

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3535 BORRISOKANE RD
BARRHAVEN, ON

DRAWING TITLE
CONSTRUCTION DETAIL PLAN

PROJECT NO.
210691

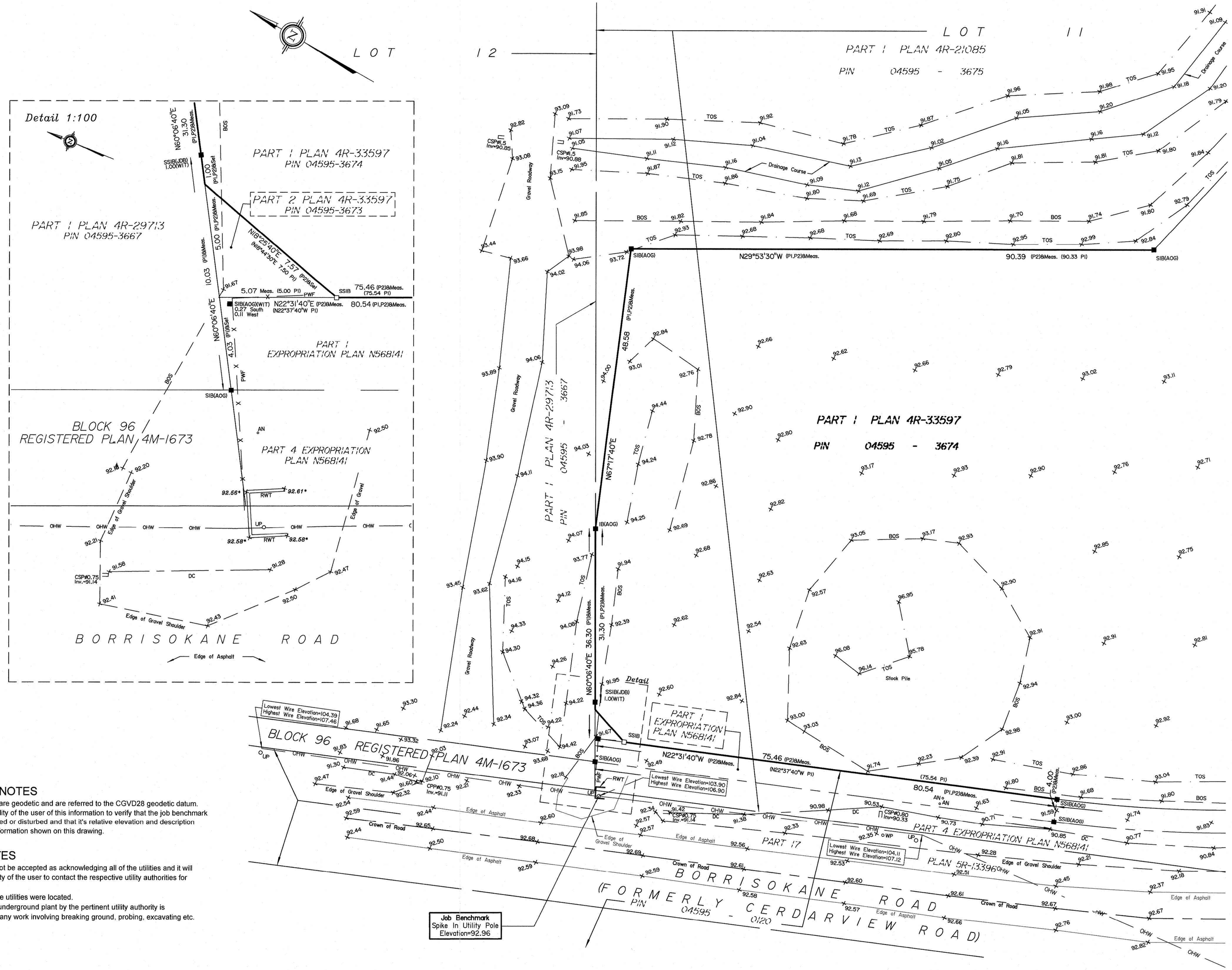
DATE
JANUARY 2022

C903

D07-12-22-0085

#18788

APPENDIX F
Survey



TOPOGRAPHICAL PLAN OF SURVEY OF

PART OF LOT 11
CONCESSION 3 (RIDEAU FRONT)
Geographic Township of Nepean
CITY OF OTTAWA

Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

Scale 1 : 400

16 12 8 4 0 8 16 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 19th day of January, 2022.

JAN 21/22
Date

T. Hartwick
Ontario Land Surveyor

Notes & Legend

	Denotes	
⊡	"	Survey Monument Planted
■	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
IB	"	Iron Bar
CC	"	Cut Cross
(WIT)	"	Witness
Meas.	"	Measured
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(P1)	"	Plan 4R-33597
(P2)	"	(AOG) Plan dated October 29, 2021.
OHW	"	Overhead Wires
CSP	"	Corrugated Steel Pipe
CPP	"	Corrugated Plastic Pipe
CCP	"	Concrete Pipe
CLF	"	Chain Link Fence
PWF	"	Post and Wire Fence
BOS	"	Bottom of Slope
TOS	"	Top of Slope
DC	"	Ditch Centerline
Inv.	"	Invert
RWT	"	Timber Retaining Wall
WP	"	Wood Pole
UP	"	Utility Pole
AN	"	Anchor
Ø	"	Diameter
+ 65.00	"	Location of Elevations
+ 65.00*	"	Top of Retaining Wall Elevation

Distances shown on this plan are ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.999933.

Bearings are grid, derived from Can-Net 2016 Real Time Network GPS observations referenced to Specified Control Points 01919791338 and 01919871649, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
V-22497

THIS PLAN IS NOT VALID UNLESS IT IS AN EMBOSSED ORIGINAL COPY ISSUED BY THE SURVEYOR In accordance with Regulation 1026, Section 29 (3).

ELEVATION NOTES

1. Elevations shown are geodetic and are referred to the CGVD28 geodetic datum.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors

Job No. 22410-21 Borrisokane January21_2022(2) | JA/CA