FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

WINDMILL DEVELOPMENT GROUP LTD. DOMTAR LANDS REDEVELOPMENT – PHASE 1

CITY OF OTTAWA

PROJECT NO.: 14-717

SEPTEMBER 2017 – REV 2

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FOR
WINDMILL DEVELOPMENT GROUP LTD.
DOMTAR LANDS REDEVELOPMENT – PHASE 1

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1.0 INTRODUCTION

David Schaeffer Engineering Ltd. (DSEL) has been retained to prepare a Functional Servicing and Stormwater Management Report (FSR) for the proposed Domtar Lands Redevelopment in support of Windmill Development Group's application for Site Plan Control (SPC) for Phase 1 of the development.

The subject property consist of lands within the City of Ottawa urban boundary. The applicant also owns lands within Gatineau, Quebec that are planned to be designed and constructed concurrently with the proposed development within Ottawa. The Ontario and Quebec developments will be serviced independently, the following FSR is solely in support of the Phase 1 of the Ontario Site.

As illustrated in ***Figure 1***, the subject property is located on parts of Chaudière and Albert Islands within the Ottawa River, it is accessible via Booth Street and the Chaudière Bridge. The following FSR is to support the development of Phase 1 only, as indicated in ***Figure 1,*** which measures approximately ***1.09 ha.*** Phase 1 is generally bounded by Booth Street to the east, Albert Island to the south and Energy Ottawa owned lands on Chaudière Island to the north, see site plan in ***Drawings/Figures*** for limits of Phase 1.

The subject site is currently comprised of thirteen parcels of land with two civic addresses, 3 & 4 Booth Street, herein referred to as the site.

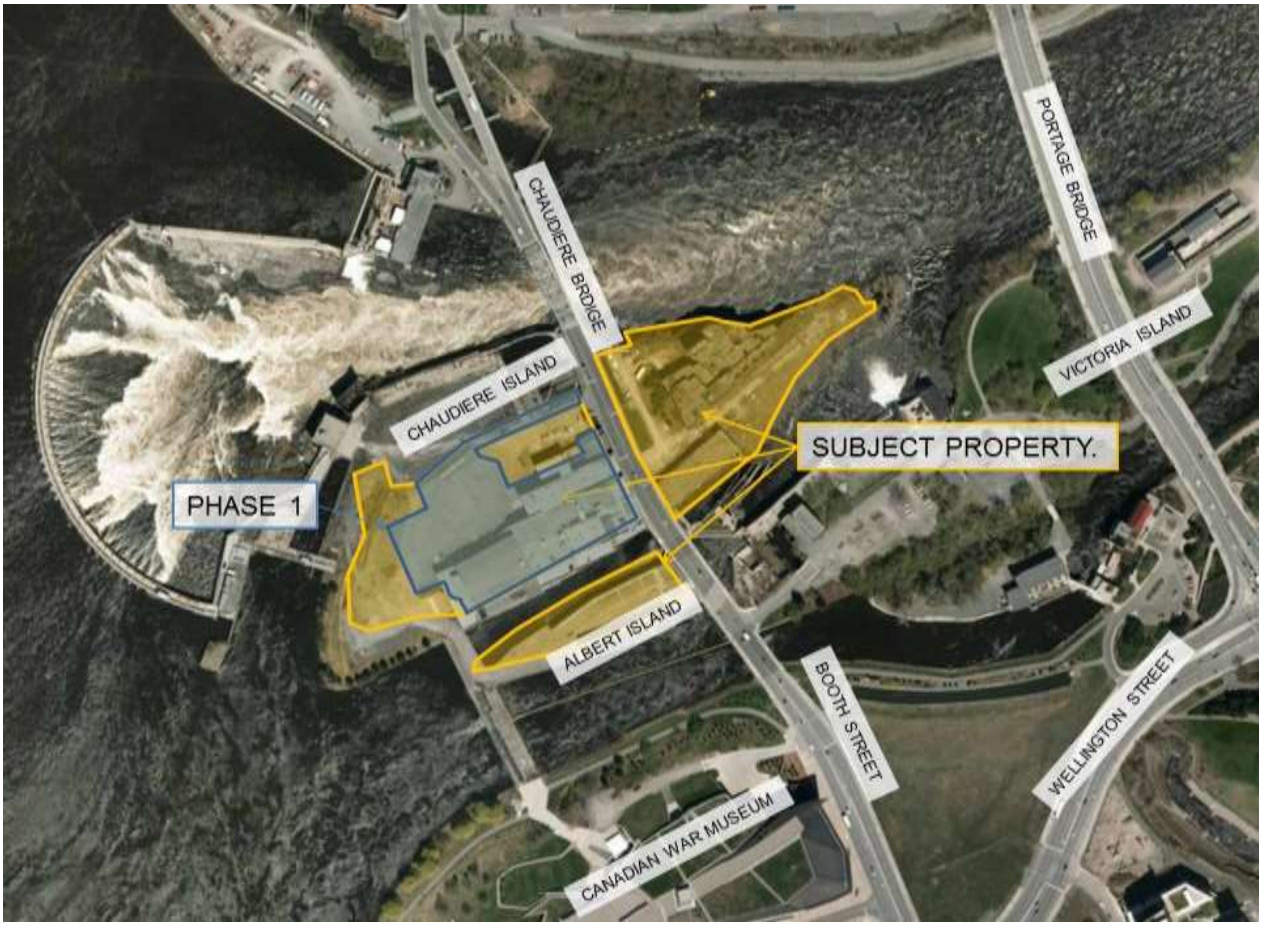

Figure 1: Site Location

The proposed development of Phase 1 involves the construction of a total of ***3523m²*** of retail, commercial and office space, approximately ***71*** residential units and associated roadways, surface and underground parking.

The objective of this report is to support the application for Site Plan Approval by providing sufficient detail to demonstrate that the development is supported by existing municipal servicing infrastructure and that the contemplated site design conforms to current City of Ottawa design standards, in addition to, state of the art design strategies to meet the client's "One Planet" strategy.

Servicing and grading presented in the detailed design of Phase 1 is consistent with the *Master Servicing Plan – Domtar Redevelopment Lands*, prepared by DSEL (March 2016), servicing and grading will be updated to reflect any future changes to the Master Servicing Plan.

1.1 Existing Conditions

A detailed survey was completed by Fairhall Moffat & Woodland Limited on December 11, 2014. As per the topographic survey, elevations vary from ***46.20m*** at the east edge of the Chaudière Island to ***54.85m*** to the west.

The subject site currently consists of several vacant industrial facilities, historically part of a paper mill that was in operation until 2007.

The site is made up of existing building footprint and gravel covered vacant lands. A portion of the Chaudière Island lands west of Booth Street consist of grassed and landscaped area.

Sewer and watermain mapping, along with as-recorded drawings, collected from the City of Ottawa indicate that the following services exist across the property frontages within the adjacent municipal right-of-ways:

Booth Street

- 203mm diameter ductile iron watermain (North of Middle Street)
- 305mm diameter PVC watermain (South of Middle Street)
- 250mm diameter sanitary sewer
- 1200mm diameter storm sewer

Middle Street

- 203mm diameter ductile iron watermain
- 250mm diameter sanitary sewer
- 300mm diameter storm sewer
- Sanitary pumping station northwest corner of the Portage Bridge and Middle Street

Portage Bridge

- 100mm diameter sanitary forcemain
- Sanitary pumping station, northwest of the Portage Bridge and Wellington Street intersection
- 450mm diameter storm sewer

1.2 Required Permits / Approvals

Development of the site is subject to the City of Ottawa Planning and Development Approvals process. The City of Ottawa must approve detailed engineering design drawings and reports, prepared to support the proposed development plan.

1.3 Pre-consultation

Pre-Consultation was conducted with the City of Ottawa and Rideau Valley Conservation Authority via email, along with a formal pre-consultation meeting held between the client and City staff on December 20, 2013. Correspondence and a servicing guidelines checklist are included in ***Appendix A***.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following studies were utilized in the preparation of this report.

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002**,*** October 2012.
  (City Standards)

- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, October 2012
  (Water Supply Guidelines)

-
  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    (*ISD-2010-2*)

  - **Technical Bulletin ISDTD-2014-2**
    City of Ottawa, May 27, 2014.
    (*ISDTD-2014-2*)

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

- **Ontario Building Code Compendium**
  Ministry of Municipal Affairs and Housing Building Development Branch, January 1, 2010 Update
  (OBC)

- **Low Impact Development Stormwater Management Planning and Design Guide**
  Toronto Region Conservation Authority (TRCA) & Credit Valley Conservation Authority (CVC),
  2010
  (LID Manual)

- **Master Servicing Study – Domtar Redevelopment Lands**
  DSEL
  July 2015
  (MSS – Domtar Redevelopment)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa 1W pressure zone. A 300mm diameter watermains exist within the Booth Street crossing underneath the Bronson Channel to connect to a 203mm watermain within Middle Street. The subject site is fed by 203mm watermains within Middle Street and Booth Street (North of the Bronson Channel). Drawings ***EX-1*** illustrate the existing water distribution network.

Historically, the site would have been serviced via several 203mm diameter service laterals connecting to the 203mm diameter watermain within Booth Street. As discussed previously, the historical conditions of the site up until 2007 was entirely industrial.

Table 1 summarizes the ***Water Supply Guidelines*** employed in the preparation of the historical and proposed water demand estimate.

Table 1
Water Supply Design Criteria

Design Parameter	Value
Industrial – Heavy	55,000 L/gross ha/d
Restaurant Demand	125 L/seat/d
Residential Average Apartment Demand	1.8 person/unit
Residential Daily Average	350 L/person/d
Residential Maximum Daily Demand*	Varies
Residential Maximum Hourly*	Varies
Commercial-Floor space	2.5 L/m^2/d
Commercial-Industrial Maximum Daily Demand	1.5 x avg. day L/gross ha/d
Commercial-Industrial Maximum Hour Demand	1.8 x avg. day L/gross ha/d
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350kPa and 480kPa
During normal operating conditions pressure must not drop below	275kPa
During normal operating conditions pressure shall not exceed	552kPa
During fire flow operating pressure must not drop below	140kPa
** Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3, see calculations in Appendix B for peaking factors for Phase 1 and Phase 1A* **** Table updated to reflect ISD-2010-2*	

Table 2 Summarizes the historical water demand based on the current City of Ottawa ***Water Supply Guidelines***.

Table 2
Water Demand - Historical Site Conditions

Design Parameter	Historical Water Demand[1] (L/min)
Average Daily Demand	216.6
Max Day	324.8
Peak Hour	584.7
1) Water demand calculations per ***Water Supply Guidelines***. Refer to ***Appendix B*** for detailed calculations.	

3.2 Water Supply Servicing Design

The proposed water servicing will consist of a new 300mm watermain within Booth Street, connected at the 300mm by 200mm tee within Middle Street. A watermain connection across the Portage Bridge will connect to the exiting watermain within Middle Street. As the total water demand is less than $50m^3$/day, Phase 1 will be constructed prior to the redundant connection across the Portrage Bridge and will be serviced by the existing 305mm watermain running under the Bronson Channel.

The existing watermain connection underneath the Bronson Channel that feeds the subject property was constructed in 1995. As per City recommendations a leakage test will not be required, see correspondence in ***Appendix A***.

Each building will be serviced independently via connections to the private watermain network. Fire hydrants will be provided internally to provide adequate fire protection coverage as per the ***Water Supply Guidelines***. Fire flow for the proposed and re-purposed building was estimated with the ***FUS***. Block 205-A resulted in the highest fire flow of ***17,000 L/min***, see ***Appendix B*** for detailed calculations. The pipe sizes have been sufficient sized to provide fire flow for all buildings in the ultimate condition.

To provide additional redundancy for fire protection in Phase 1, 2 dry hydrants are provided, see drawing ***SSP-1*** for locations of the hydrants. In the case where fire protection is required and the primary source of water on Booth is interrupted, the above described dry hydrants will be used to draw water directly from the Ottawa River to provide fire protection to the buildings

Table 3 summarize the anticipated water demand and boundary conditions for the proposed development, calculated using the ***Water Supply Guidelines***.

Table 3
Water Demand – Proposed Site Conditions

Design Parameter	Anticipated Demand[1] Phase 1 (L/min)	Boundary Condition[2] ($m H_2O$ / kPa) Connection @ Booth Street		Boundary Condition[2] ($m H_2O$ / kPa) Connection @ Wellington Street	
Average Daily Demand	34.7	61.7	605.3	58.6	574.9
Max Day + Fire Flow	146.5 + 17,000 = 17,146.5	50.3	493.4	52.5	515.0
Peak Hour	224.2	54.7	536.6	51.6	506.2

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
2) Boundary conditions supplied by the City of Ottawa for demands as indicated in correspondence. Assumed ground elevation @ Booth Street ***53.4m***, @ Wellington Street ***56.5m***, See ***Appendix B.***

The boundary conditions summarized in ***Table 3*** are based water demands for phase 1 development. After further information was received on commercial, retail, office and community space, the resulting water demands decreased.

EPANet was utilized to determine the availability of pressures throughout the system during average day demand, max day plus fire flow, and peak hour demands. Additionally, the model was used to assess maximum pressure for the future conditions. This static model determines pressures based on the available head provided by the City of Ottawa boundary conditions. The model utilizes the Hazen-Williams equation to determine pressure drop, while the pipe properties have been selected in accordance with ***Water Supply Guidelines***. The model was prepared to assess the available pressure at the finished first floor of each building.

To ensure that adequate pressure is available during the fire flow scenario, additional hydrants have been proposed to provide fire protection. Fire protection for Block 205-A will be provided by both hydrant FH 2 & FH 3. Both were modeled assuming a flow of ***8,500 L/min*** totaling ***17,000 L/min*** as per the ***FUS*** estimated fire demand.

Table 4 summarizes the pressures in each scenario including the fire flow scenario yielding the lowest pressure. ***Appendix B*** contains output reports and model schematics for each scenario.

Table 4
Model Simulation Output Summary – Phase 1

Location	Average Day (kPa)	Max Day + Fire Flow (kPa)	Peak Hour (kPa)
Block 205-A	589.1	312.9	520.1
Block 208	590.1	342.2	521.2
FH 3	597.4	207.0	528.6
FH 4	613.4	204.1	544.5
Note: FH3 & FH4 modelled assuming a fire flow of ***10,000 L/min*** demand at each hydrant to service Block 206			

As demonstrated in ***Table 4***, the anticipated pressures during the average day simulations are higher than allowable pressures in ***Table 1***. Pressure reducing valves are recommended. The recommended pressures from the ***Water Supply Guidelines*** are respected during peak hour and max day + fire flow scenarios.

The model predicted that water will flow in all areas of the system and no ‘dead’ zones were found.

It should be noted that the pressures in ***Table 4*** represent the available pressure at the building meter. The mechanical designer must ensure that the internal distribution system is designed in accordance with the OBC.

3.3 Water Supply Conclusion

The site will be serviced by a connection to the Booth Street watermain as the total water demand for Phase 1 is less than $50m^3$/day a single connection is proposed.

An EPANet model was prepared based on boundary conditions received from the City of Ottawa. Pressures in average day and peak hour scenario exceed the recommended pressures as per the ***Water Supply Guidelines,*** pressure reducing valves are recommended. The proposed system is sufficiently sized to provide fire flow at minimum pressures.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject site, based on City of Ottawa's infrastructure maps & utility plans, is connected to the 250mm sanitary sewer within Middle Street. To accomplish this connection, a series of pumps stations direct flow to a single private pump station within the subject lands east of Booth Street. This existing private pump station discharge via a forcemain to the Middle Street sanitary sewer. A figure, prepared by Greenough Environmental Consulting Inc. for Domtar Inc., showing the location of on-site pump stations and forcemains can be found in ***Drawings/Figures*****.** The Middle Street sanitary sewer discharges via gravity flow to an existing pump station northwest of the intersection of Middle Street and The Portage Bridge. A 100mm forcemain directs sanitary flow to a second pump station to the south, across the Bronson Channel. The south pump station discharges via a 100mm forcemain to the 1830mm diameter interceptor sewer (IS) north of Sparks Street. Both pump stations are owned and operated by the NCC and service commercial and recreational development on Victoria Island.

Refer to drawings ***EX-1*** for existing wastewater services.

A field investigation of the existing main pump station on Chaudière Island was completed by DSEL on June 30, 2015. The field investigation was to determine the existing condition of the pump station including wet well size, start and stop elevations, pump type and model and existing pump discharge. A flow rate of ***6.7 L/s*** was observed during operation of the pump through the existing flow meter connected to the forcemain. The pump curve based on the existing pumps was obtained from the manufacturer. The pump curve suggests that the observed flow rate would result in the pump operating in an overloaded condition. See existing pump curve in ***Appendix C*** a technical memo by HMM.

Table 5 summarizes the ***City Standards*** employed in the estimate of available capacity within the municipal wastewater sewer systems, and in the calculation of wastewater flow rates for the historical and proposed development.

A capacity analysis was completed by JFSA to determine the capacity of the existing sanitary sewer within the Ville De Gatineau to convey the flow from Zibi Ontario and Zibi Gatineau. It was concluded there is sufficient capacity within the sewer to convey the ultimate flow from the subject site, see ***Appendix A*** for the full report.

Table 5
Wastewater Design Criteria

Design Parameter	Value
Industrial-Heavy	55,000 L/gross ha/d
Restaurant Demand	125 L/seat/d
Industrial Peaking Factor*	4.75
Residential 1 Bedroom Apartment Demand	1.4 person/unit
Residential 2 Bedroom Apartment Demand	2.1 person/unit
Residential Average Apartment Demand	1.8 person/unit
Residential Daily Average	350 L/person/d
Commercial Floor Space	5 L/m²/d
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Infiltration and Inflow Allowance	0.28L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sanitary Sewer Lateral	135mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s

** Industrial Peaking Factor determined as per MOE Guidelines for the Design of Sanitary Sewers, Typical Industrial Sewage Flow Peaking Factors Graph.*
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012.

4.2 Wastewater Design

Wastewater servicing will be accomplished for Phase 1 through a centralized temporary pump station located within Building 525. A proposed forcemain will convey flow from the pump station across the Union Bridge span to the gravity sanitary sewers part of Zibi Gatineau Phase 1 development. Wastewater will ultimately be directed to existing sanitary sewers within Rue Laurier. The Ville de Gatineau has confirmed that the Phase 1 and ultimate flow can be directed to the existing sanitary sewers, pending confirmation of the capacity of the 900mm sanitary sewer within Rue Laurier, see ***Appendix A*** for correspondence.

Individual buildings within the proposed development will be serviced internally via gravity draining sanitary sewer network; detailed layout and sizing is shown by drawing ***SSP-1*** included with this report.

Table 6 below summarizes the anticipated wastewater discharge from the proposed development based on criteria found in ***Table 5***.

Table 6
Summary of Anticipated Wastewater Discharge

Design Parameter	Phase 1 Flow (L/s)
Average Dry Weather Flow Rate	0.8
Peak Dry Weather Flow Rate	2.4
Peak Wet Weather Flow Rate	2.7

A conceptual pump station design report has been prepared by Hatch, dated April 2016. The pump station design contemplates a peak flow rate of ***11.9 L/s*** for Phase 1. Further information on the scope of Phase 1 proposed sanitary discharge from has lowered this to a peak wet weather flow rate of ***2.7 L/s***. The design contemplates a 100mm sanitary forcemain directing flow from the pump station to the gravity sewers within Zibi Gatineau. As discussed in ***Section 4.1***, there is sufficient capacity within the Gatineau sanitary system to convey the ultimate flows form the Zibi Ontario and Zibi Gatineau developments. The design contemplates new pumps and re-using the existing wet well located within Building 525.

In the event of service interruption, mobile pumper trucks will be employed until the service is restored.

For further detail on the proposed pump station design, please refer to Conceptual Design Report prepared by Hatch found in ***Appendix C***.

4.3 Wastewater Servicing Conclusion

Existing sanitary servicing is provided by a centralized pump station located on Chaudière Island, discharging to a series of gravity and pump stations until eventually discharging to the Interceptor Sewer.

The proposed development will discharge to a temporary pump station located within Building 525 and be conveyed via a 100mm forcemain to the gravity sewers within Zibi Gatineau's site, eventually discharging to the Ville de Gatineau sewers within Rue Laurier.

The proposed wastewater design conforms to all relevant ***City Standards***.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Stormwater runoff from the existing subject property is directed uncontrolled to the Ottawa River. The major and minor flow is directed to the Ottawa River overland with a small portion of flow directed by catch basins along Booth Street. The site currently consists of varying sloped topography (0.5% to >5%) and mostly impervious building footprint or associated parking area.

The existing site contains no stormwater management quality controls or controls for flow attenuation.

Runoff from the site is directed to the Ottawa River directly downstream of the Chaudière Falls which has a drop and breadth of 15 and 60m, respectively. The dam is used by Hydro Ottawa and Hydro-Quebec to produce electricity. The dam is also monitored and controlled by the Ottawa River Regulation and Planning Board for flood control.

5.2 Post-development Stormwater Management Targets

Stormwater management requirements for the proposed development are based on relevant ***City Standards*** and pre-consultation with City of Ottawa staff. It has been established that the following criteria apply:

- Increase to flood risk and flood levels in the Ottawa River will not be impacted by the proposed development and therefore stormwater quantity controls are not required
- Based on the consultation with the City & RVCA, stormwater quality controls will be required to achieve an "enhanced" level of quality control as per the ***SWMP Design Manual***, 80% reduction in Total Suspended Solids (TSS) prior to release to the Ottawa River

5.3 Stormwater Management System

The stormwater management system will consist of a private storm sewer system, outlasting at the north edge of Chaudière Island, east of Booth Street.

The private stormwater sewer system has been sized to convey an uncontrolled 5-year storm runoff rate in accordance with the ***City Standards***. Detailed layout and sizing is illustrated by ***SSP-1*** is included with this report.

The Rational Method was utilized to calculate the runoff from the storm sewer catchment areas; Rational Method "C" values for the catchment areas were derived using "*Table 5.7 Runoff Coefficients for Various Soil Conditions"* from the ***City Standards***.

To meet the specified stormwater quality criteria an end of pipe oil/grit separator (OGS) unit will be designed to provide a TSS reduction of at least 80% achieving an "enhanced" level of quality control as per the ***SWMP Design Manual***. Building runoff is considered clean, therefore, buildings adjacent to the shoreline will have roof leaders discharge directly the Ottawa River. It is proposed to provide a Stormceptor ***STC4000*** (or approved equivalent) prior to discharge to the Ottawa River.

Buildings adjacent to the Ottawa River will discharge clean roof runoff directly to the River without additional quality control as per pre-consultation with the RVCA.

5.4 Stormwater Servicing Conclusions

Stormwater runoff will be captured by a private storm sewer system conveyed to an outlet to the Ottawa River east of Booth Street.

Private storm sewer designed to convey the uncontrolled 5-year runoff rate in accordance with the ***City Standards.***

To achieve the runoff quality criteria identified through consultation, an end of pipe oil/grit separator will provide an "enhanced" level of treatment as per the ***SWMP Design Manual***.

The design of the proposed storm sewer system conforms to all relevant ***City Standards***.

6.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. The extent of erosion losses is exaggerated during construction where vegetation has been removed and the top layer of soil becomes agitated.

Prior to topsoil stripping, earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

Silt fence will be installed around the perimeter of the site and will be cleaned and maintained throughout construction. Silt fence will remain in place until the working areas have been stabilized and re-vegetated.

Catchbasins will have a *Siltsack* or approved equivalent installed under the grate during construction to protect silt from entering the storm sewer system. Inlet catchbasins will have *Inletsoxx* or approved equivalent installed during construction to protect silt from entering the storm sewer system

A mud mat will be installed at the construction access in order to prevent mud tracking onto adjacent roads.

Erosion and sediment controls must be in place during construction, See ***EC-1*** for detailed erosion and sediment control measures. The following recommendations to the contractor will be included in contract documents.

- Limit extent of exposed soils at any given time.
- Re-vegetate exposed areas as soon as possible.
- Minimize the area to be cleared and grubbed.
- Protect exposed slopes with plastic or synthetic mulches.
- Install silt fence to prevent sediment from entering existing ditches.
- No refueling or cleaning of equipment near existing watercourses.
- Provide sediment traps during dewatering.
- Install appropriate catch basins inlet protection.
- Plan construction at proper time to avoid flooding.

Establish material stockpiles away from watercourses, so that barriers and filters may be installed.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not flowing under silt barriers.
- Clean and replace Siltsack as needed at catch basins.

In addition to the above mentioned erosion and sediment controls, the storm sewer system and OGS shall be installed prior to extensive site works. All runoff will be directed to the OGS prior to discharge to the Ottawa River. Daily inspection of the OGS and pumping, if required, shall be implemented during the entire duration of the site works.

7.0 UTILITIES

Existing underground hydro ducts within Booth and Middle Street providing connection to hydro powerhouses on Victoria and Chaudière Island.

Existing gas mains are located within Booth Street right-of-way

Existing Bell cable located within Booth Street right-of-way and the Portage Bridge

Utility servicing has been coordinated with the individual utility companies prior to site development.

8.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained to prepare a Functional Servicing and Stormwater Management Report to support the proposed development of Domtar Lands Redevelopment in support of Windmill Development Group's application for Site Plan Control (SPC).

- An internal water distribution model was completed that verified pressures during average day and peak hour scenarios, pressure reducing control are recommended based on the resulting pressures;
- Fire hydrants have are proposed to provide adequate fire protection at each building in Phase 1;
- Sanitary servicing is to be provided by a temporary pump station within Building 525 conveying flow to the Ville de Gatineau sanitary sewer system.
- A minimum TSS removal of 80% will be required for post-development stormwater runoff from the site, provided by an end of pipe oil/grit separator;
- Utility services will need to be coordinated with utility companies prior to development;
- Based on the preceding report, adequate servicing capacity exists to support the proposed development

Prepared by,
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Per: Steven L. Merrick, P.Eng.

Reviewed by,
David Schaeffer Engineering Ltd.

Per: Adam D. Fobert, P.Eng

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

14-717 17/04/2014

4.1 General Content		
☐	Executive Summary (for larger reports only).	N/A
☒	Date and revision number of the report.	Report Cover Sheet
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	Drawings/Figures
☒	Plan showing the site and location of all existing services.	Figure 1
☒	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.3
☒	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Section 2.1
☒	Statement of objectives and servicing criteria.	Section 1.0
☒	Identification of existing and proposed infrastructure available in the immediate area.	Sections 3.1, 4.1, 5.1
☒	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Section 5.0
☒	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	GP-1
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐	Proposed phasing of the development, if applicable.	N/A
☒	Reference to geotechnical studies and recommendations concerning servicing.	Section 1.4
☒	All preliminary and formal site plan submissions should have the following information: -Metric scale -North arrow (including construction North) -Key plan -Name and contact information of applicant and property owner -Property limits including bearings and dimensions -Existing and proposed structures and parking areas -Easements, road widening and rights-of-way -Adjacent street names	SSP-1

4.2 Development Servicing Report: Water		
☐	Confirm consistency with Master Servicing Study, if available	N/A
☒	Availability of public infrastructure to service proposed development	Section 3.1
☒	Identification of system constraints	Section 3.1
☒	Identify boundary conditions	Section 3.1, 3.2
☒	Confirmation of adequate domestic supply and pressure	Section 3.3

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 3.2
☒	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	Section 3.2
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐	Address reliability requirements such as appropriate location of shut-off valves	N/A
☐	Check on the necessity of a pressure zone boundary modification	N/A
☒	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 3.2, 3.3
☒	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Section 3.2
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

☒	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 4.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 4.1
☒	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 4.2
☒	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 4.2, Appendix C
☒	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 4.2
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	Section 4.0
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

☒	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 5.1
☒	Analysis of available capacity in existing public infrastructure.	Section 5.1, Appendix D
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	EX-1
☒	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 5.2
☒	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 5.2
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information	Section 5.3
☐	Set-back from private sewage disposal systems.	N/A
☒	Watercourse and hazard lands setbacks.	GP-1
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix A
☒	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	Section 5.2
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 5.3
☒	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	Section 6.0
☒	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 5.1, 5.3
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
☒	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	Appendix D
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A
☐	Identification of potential impacts to receiving watercourses	N/A
☐	Identification of municipal drains and related approval requirements.	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 5.3
☒	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	SWM-1
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 7.0
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

☒	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement ct. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	Section 1.2
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

☒	Clearly stated conclusions and recommendations	Section 9.0
☒	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	Attached Response Letter
☐	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

Steve Merrick

To: Adam Fobert
Subject: RE: NCC Support for Redundant Water Access

From: Gaspar, Fred
Sent: Wednesday, August 27, 2014 03:43 PM Eastern Standard Time
To: 'Jonathan Westeinde' <JonathanW@windmilldevelopments.com>
Cc: Willis, Stephen; Zanetti, Marco; Miner, Chantal; 'Rodney Wilts' <rodney@windmilldevelopments.com>; Chakraburtty, Bina; Comtois, Jean-Gilles; Barakengera, Martin
Subject: NCC Support for Redundant Water Access

Good afternoon Jonathan.

This email serves to confirm the National Capital Commission's commitment to work with Windmill Development Group Ltd. towards finalizing an agreement for the use of NCC-owned lands primarily along Middle Street on Victoria Island (your option #3 attached) for the purpose of achieving the redundant water servicing requirement being requested by the City of Ottawa as part of its Planning review of your development proposal.

Please understand that NCC staff do not have the authority to bind the organization on these matters at this point. Authority for Federal Land Use & Transaction Approvals rests exclusively with our Board of Directors. Additionally, further authorities may be required for certain commercial terms that may be concluded.

Having reviewed the three options you provided to us earlier, NCC staff have determined that option 3 offers the best opportunity for success insofar as it best supports our common objectives and therefore represents an appropriate use of federal lands, subject to a final design plan to be reviewed and approved by the NCC, as well as the successful conclusion of negotiations on mutually-acceptable commercially fair and reasonable terms. Once that is concluded, NCC staff will positively recommend this option to our Board for Approval.

On this basis, please feel free to share this email with the City of Ottawa as necessary and appropriate to confirm our support for your redundant water servicing requirements.

I trust this meets your immediate requirements. Please let me know if you require further information or clarification.

Best regards,

Fred Gaspar
Director, Planning, Approvals and Environmental Management
202 – 40 rue Elgin Street
OTTAWA ON K1P 1C7
613.239.5678x5776

NCC CCN Canada

Steve Merrick

Subject: RE: Watermain testing Booth Street

From: Dover, Steve [mailto:Steve.Dover@ottawa.ca]
Sent: June 16, 2015 1:19 PM
To: 'Adam Fobert'
Cc: Buchanan, Richard; Smadella, Karin
Subject: RE: Watermain testing Booth Street

Hi Adam,

Should the City require that a leakage test is undertaken on Booth Street under the water channel for 305 mm PVC watermain installed in 1995, the City's Water Distribution staff would undertake the test since the test would require operation of valves as well as notification of water service disruption.

Based on the age and watermain material installed I see no reason to undertake a leakage test of this section of watermain.

Regards,

Steve Dover
Project Manager
Environmental Engineering, City of Ottawa
951 Clyde Avenue, Ottawa, ON K1Z 5A6
Tel: (613) 580-2424 Ext.13613
Cell: (613) 266-3809
Fax: (613) 728-4183
e-mail: steve.dover@ottawa.ca

From: Adam Fobert [mailto:afobert@dsel.ca]
Sent: Tuesday, June 16, 2015 11:12 AM
To: Dover, Steve
Cc: Buchanan, Richard
Subject: Watermain testing

Hello Steve,

It was nice to finally meet you face to face on Friday regarding the Windmill project.

You had mentioned a couple of names of companies that could perform a leakage test of that existing 300mm PVC main crossing the river. Could you pass those names on?

Also, I'm assuming that we'd have to shut the main down to do this test. Is there a protocol for informing users of the shut down? Are there specifications that I need to pass onto the contractor performing the leakage test? And lastly, I'm assuming that we'll need a City watermain inspector present since they'll be touching a piece of municipal infrastructure. Correct?

Thanks for your help.

******* PLEASE NOTE THE CHANGES TO THE PHONE NUMBER AND UNIT NUMBER *******

Adam Fobert, P.Eng.
Manager of Site Plan Design

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

direct: (613) 836-0626
cell: (613) 222-9493
email: afobert@DSEL.ca

This e-mail originates from the City of Ottawa e-mail system. Any distribution, use or copying of this e-mail or the information it contains by other than the intended recipient(s) is unauthorized. Thank you.

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Steve Merrick

To: Mottalib, Abdul
Subject: RE: 717: Windmill Zibi - Preliminary responses to City comments

---

From: Mottalib, Abdul [mailto:Abdul.Mottalib@ottawa.ca]
Sent: January-12-16 4:16 PM
To: 'Steve Merrick' <smerrick@dsel.ca>
Cc: 'Dan Clement' <dan@windmilldevelopments.com>; Scott Bentley <scottbentley@windmilldevelopments.com>; 'Kristen Jorgensen' <kristen@windmilldevelopments.com>; 'Miguel Tremblay' <tremblay@fotenn.com>; Paul Black <black@fotenn.com>; Nitsche, Kersten <Kersten.Nitsche@ottawa.ca>; Buchanan, Richard <Richard.Buchanan@ottawa.ca>; Adam Fobert <afobert@dsel.ca>; Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: RE: 717: Windmill Zibi - Preliminary responses to City comments

Hi Steve,

We have reviewed the sketch and we are okay with the fire hydrant locations as shown on the sketch. We are also fine with the maximum fire flow rate shown on the sketch provided the shown flow is available during firefighting. The consultant has to discuss this issue in detail with respect to their water model created for the site in the related section of the revised study.

Regarding item 3:

We are still reviewing this concern and will get back to you as soon as possible.

Thanks,

Abdul Mottalib, P. Eng.

From: Steve Merrick [mailto:smerrick@dsel.ca]
Sent: January 07, 2016 2:31 PM
To: Mottalib, Abdul
Cc: 'Dan Clement'; Scott Bentley; 'Kristen Jorgensen'; 'Miguel Tremblay'; Paul Black; Nitsche, Kersten; Buchanan, Richard; Adam Fobert
Subject: RE: 717: Windmill Zibi - Preliminary responses to City comments

Hi Abdul,

To follow up on our meeting yesterday, please find attached sketch showing hydrant locations and proximity of the buildings to be serviced. The sketch also indicates the maximum flow rate proposed at each hydrant.

Feel free to call to discuss if you have any questions or concerns.

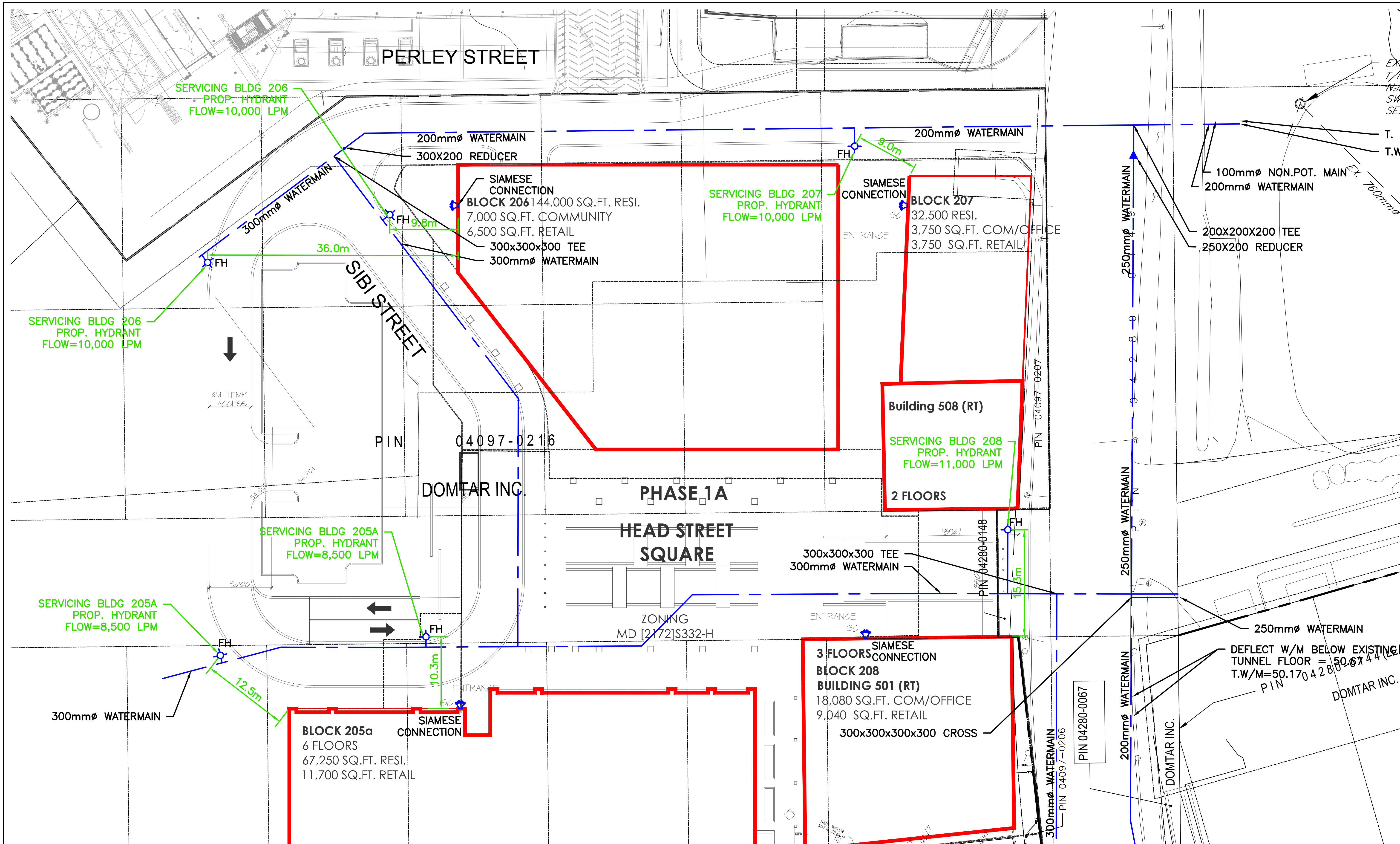
Steve Merrick, EIT.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103

Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 561
cell: (613) 222-7816
email: smerrick@DSEL.ca



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HYDRANT PROXIMITY TO PROPOSED BUILDINGS

PROJ NO.:	14-717
DRAWN BY:	SLM
DATE:	2015-01-07
SCALE:	1:500
FIGURE NO.:	HYD-1

z:\projects\14-717_windmill-the_isles\b_design\b2_drawings\b2-5_sketches and figures\2015-01-07_hydrant-distance\2016-01-07_717_slm.dwg

Steve Merrick

To: Adam Fobert
Subject: RE: Zibi Ontario - Potential Servicing via Gatineau Due Diligence

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From: Desforges, Mario [mailto:desforges.mario@gatineau.ca]
Sent: March-04-16 10:33 AM
To: Marc-André Gélinas <marc-andre.gelinas@quadrivium.biz>
Cc: 'Dan Clement' <dan@windmilldevelopments.com>; 'Scott Bentley' <scottbentley@windmilldevelopments.com>; Adam Fobert <afobert@dsel.ca>; Robert Freel <rfreel@dsel.ca>; Cadieux, André <cadieux.andre@gatineau.ca>
Subject: RE: Zibi Ontario - Potential Servicing via Gatineau Due Diligence

Bonjour Marc-André

Tel que mentionné suite à cette rencontre du 12 février dernier, et tel que mentionné un peu plus tôt cette semaine, le débit d'eaux usées de pointe (52 l/sec) prévu pour le projet Zibi-Ottawa, est beaucoup plus élevé que celui qui m'avait été fourni (10 l/sec) lorsqu'on nous a demandé si nous étions prêts à regarder les possibilités de recevoir et traiter les eaux usées de ce projet.

Ainsi, bien qu'à première vue, le réseau de la ville de Gatineau semble avoir de façon général la capacité suffisante pour accepter ce débit, il y a tout de même un tronçon d'égout de 900 mm de diamètre dont la capacité résiduelle devra être vérifié afin de déterminer si il elle est suffisante pour véhiculer les eaux usée du projet Zibi-Ottawa. Ce tronçon est indiqué avec une flèche rouge ci-après et est le tronçon d'égout situé entre le point de rejet du projet Zibi-Gatineau, et le collecteur principale d'égout.

Nous demandons donc à la compagnie Windmill de faire évaluer la capacité résiduelle de ce tronçon d'égout afin de déterminer si elle est suffisante pour recevoir les eaux usées du projet Zibi-Ottawa. Lors de cette analyse, il faudra tenir compte des débits d'eaux usées actuels dans le bassin de desserte ainsi que des débits générés par la densification qui se fait actuellement au centre-ville de Gatineau.

Également, tel que mentionné lors de la rencontre du 12 février dernier, la compagnie Windmill devra surdimensionner le réseau d'égout sanitaire prévu dans la phase 1 du projet Zibi-Gatineau afin de pouvoir accepter les eaux usées du projet Zibi-Ottawa. Compte tenu des échéanciers de réalisation de la phase 1 du projet, la compagnie Windmill devra probablement surdimensionner le réseau d'égout sanitaire du projet Zibi-Gatineau, sans avoir la certitude qu'une entente sera conclu afin que les eaux usées du projet Zibi-Ottawa puisse être traiter par les installation de la ville de Gatineau. La compagnie Windmill devra dons assumer ce risque.

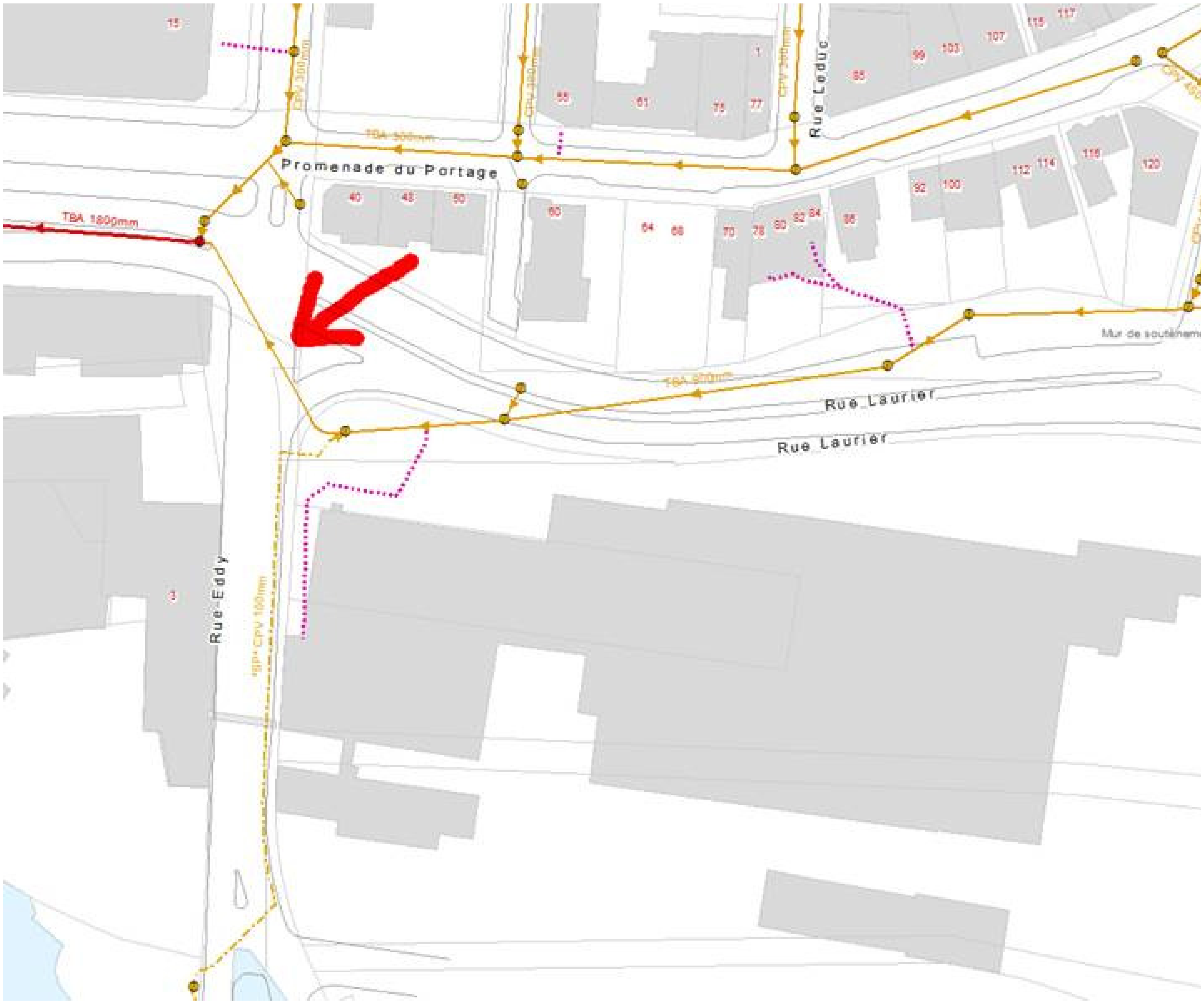
Finalement, si la ville de Gatineau accepte de recevoir les eaux usées du projet Zibi-Ottawa, il faudra évaluer la quote-part du coût des infrastructures existantes et futures requises pour transporter et traiter ces eaux usées et qui devra être payée par la compagnie Windmill à la ville de Gatineau . Il faudra également évaluer les coûts d'opération annuelle pour traiter les eaux usées.

Si tu as des questions concernant le présente courriel, n'hésite pas à m'appeler.

Salutations sincères

Mario Desforges, ing

Coordonnateur - développement des réseaux
Gestion du territoire - Service des infrastructures
Réseaux et aménagements urbains
Ville de Gatineau
Tél.: 819-243-2345 poste 4307
Télec.: 819-595-7321



De : Marc-André Gélinas [mailto:marc-andre.gelinas@quadrivium.biz]
Envoyé : 12 février 2016 15:06
À : Desforges, Mario
Cc : 'Dan Clement'; 'Scott Bentley'; Adam Fobert; Robert Freel
Objet : TR: Zibi Ontario - Potential Servicing via Gatineau Due Diligence

Bonjour Mario,

Pour faire suite à notre rencontre de cet après-midi, tu trouveras ci-joint les plans montrant les différentes options pour desservir le projet Zibi-Ottawa par le projet Zibi-Gatineau. De plus, tu trouveras ci-dessous les débits estimés provenant du projet Zibi-Ottawa.

Comme discuté, svp nous informer si vos installations existantes sont en mesure de recevoir ce débit additionnel.

Pour de plus amples renseignements, n'hésite pas à m'appeler.

Merci et bonne de semaine,

Marc-André Gélinas, ing., P.Eng.
Directeur
Infrastructures

Téléphone : 819-243-4474 poste 259
Courriel : marc-andre.gelinas@quadrivium.biz

QUADRIVIUM | L'ingénierie avec passion
290 boulevard St-Joseph, unité 2, Gatineau (Québec) J8Y 3Y3
Téléphone : 819-243-4474 |Télécopieur : 819-243-4482
www.quadrivium.biz

De : Adam Fobert [mailto:afobert@dsel.ca]
Envoyé : 8 février 2016 12:15
À : 'Scott Bentley' <scottbentley@windmilldevelopments.com>; Marc-André Gélinas <marc-andre.gelinas@quadrivium.biz>
Cc : 'Chris Stacey' <chris@windmilldevelopments.com>; 'Paul Rankin' <paul@windmilldevelopments.com>; 'Dan Clement' <dan@windmilldevelopments.com>; 'Carola Lima' <carola@windmilldevelopments.com>
Objet : RE: Zibi Ontario - Potential Servicing via Gatineau Due Diligence

Hello Scotty and Marc-Andre,

We have estimated that the full buildout will have the following flows:

Wastewater (ie Sanitary Pump station): Peak flow = 52L/s

Water:
Average Day = 720L/min
Maximum Day = 1660L/min
Peak Hour = 3570L/min

Fire Flow:
Min required: 9,000L/min
Max required: 22,000L/min

Marc-Andre, can you coordinate the available water pressures for the above? Please note that we require the pressure available during Average Day, Maximum Day + Fire Flow, and Peak hour. Thank you.

Adam Fobert, P.Eng.
Manager of Site Plan Design

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103

Stittsville, ON K2S 1E9

office: (613) 836-0856
direct: (613) 836-0626
cell: (613) 222-9493
email: afobert@DSEL.ca

From: Scott Bentley [mailto:scottbentley@windmilldevelopments.com]
Sent: February-01-16 12:48 PM
To: Adam Fobert <afobert@dsel.ca>; 'Marc-André Gélinas' <marc-andre.gelinas@quadrivium.biz>; Glencor Engineering Ltd <glencor@on.aibn.com>; Scott Funnell <scott.funnell@wspgroup.com>; Robert Lefebvre <rlefebvre@gwal.com>
Cc: Chris Stacey <chris@windmilldevelopments.com>; Paul Rankin <paul@windmilldevelopments.com>; Dan Clement <dan@windmilldevelopments.com>; Carola Lima <carola@windmilldevelopments.com>
Subject: Zibi Ontario - Potential Servicing via Gatineau Due Diligence
Importance: High

Good Afternoon Team,

I want to follow up from last week's meeting to get a sense of the direction we are headed and what obstacles remain. We want to have this all wrapped up by **4 March 2016**. Below are a quick list of tasks, rough order of completion, and the main points of contact:

- Meeting with Ville de Gatineau to discuss feasibility: **Marc-Andre** (please confirm as soon as you have met)
- Water Modelling to verify pressures: **Adam and Marc-Andre**
- Prelim Concept of Services Pipeline: **Adam and Robert**
- Meeting with Public Services for Union Bridge feasibility: **Adam and Scott F** (tentatively scheduled for 8th to 12th of Feb)
- Corrosion Inspection of Chaudiere Crossing Pipeline Structures: **Dave**
- Structural Inspection of Chaudiere Crossing Pipeline Structures: **Scott F**
- Follow up with the City of Ottawa: **Adam**

For the on-site inspections, I'd ask you schedule/coordinate access with Chris Stacy.

Lastly, if you haven't already submitted a services proposal, please get something into my hands ASAP!

Thank-you

Scotty

Scott Bentley, CD CTech
Project Manager
Zibi District Thermal System & Ontario Infrastructure
WINDMILL DEVELOPMENT GROUP
Suite 201, 1306 Wellington Street West
Ottawa, ON K1Y 3B2
t: 613.820.5600 x (121)
c: 613.864.8206

scottbentley@windmilldevelopments.com
www.windmilldevelopments.com

JFSA Experts-conseils en ressources hydriques et en environnement

J.F. Sabourin et associés inc.
2368 St-Louis, unité 101, Gatineau, QC J8V 1A2
tél.: 819.243.6858, téléc.: 819.243.8194

Ville de Gatineau
C.P. 1970, Succursale B
Gatineau, Québec
J8X 3Y9

13 mai 2016
Notre dossier : 1163-04

Attention : M. Mario Desforges, ing., Coordonnateur – développement des réseaux

Objet : Plan directeur des bassins 56 à 58 du secteur Hull à Gatineau

---

Monsieur,

Les services de JFSA ont été retenus afin d'élaborer un plan directeur de drainage permettant de cibler la capacité résiduelle du réseau pseudo-domestique afin d'examiner la possibilité de recevoir les eaux usées en provenance du projet de développement Zibi-Ottawa. Ainsi, un plan directeur des bassins 56 à 58 délimités dans le plan directeur sanitaire fait par JFSA en 2013 est nécessaire afin d'évaluer les débits d'eaux usées actuels dans le bassin ainsi qu'à l'ultime, le tout, en intégrant les débits apportés par le projet domiciliaire Zibi –Ottawa et Gatineau.

Sans s'y limiter, le mandat confié à JFSA comprend les tâches et les livrables suivants :

1. Inventaire et collecte des données;
2. Calcul et établissement des débits « intrants » dans les bassins versants;
3. Modélisation hydrologique SWMHYMO;
4. Modélisation hydraulique PCSWMM;
5. Analyse du secteur actuel et à l'ultime;
6. Rédaction d'une lettre-rapport.

LOCALISATION ET TYPE DE RÉSEAU

Le secteur à l'étude est compris dans le quadrilatère formé des bassins 56 à 58 en provenance du plan directeur d'égout sanitaire (JFSA, 2013). L'ensemble du réseau compris dans les bassins 56 et 57 est desservi par un réseau pseudo-domestique. Quant au bassin 58, celui-ci est desservi par un réseau sanitaire. La Figure 1 illustre l'emplacement de ces sous-bassins à l'étude en rouge. Il est à noter que les projets domiciliaires Zibi – Ottawa et Zibi –Québec sont illustrés en jaune et en vert respectivement dans la Figure 1.

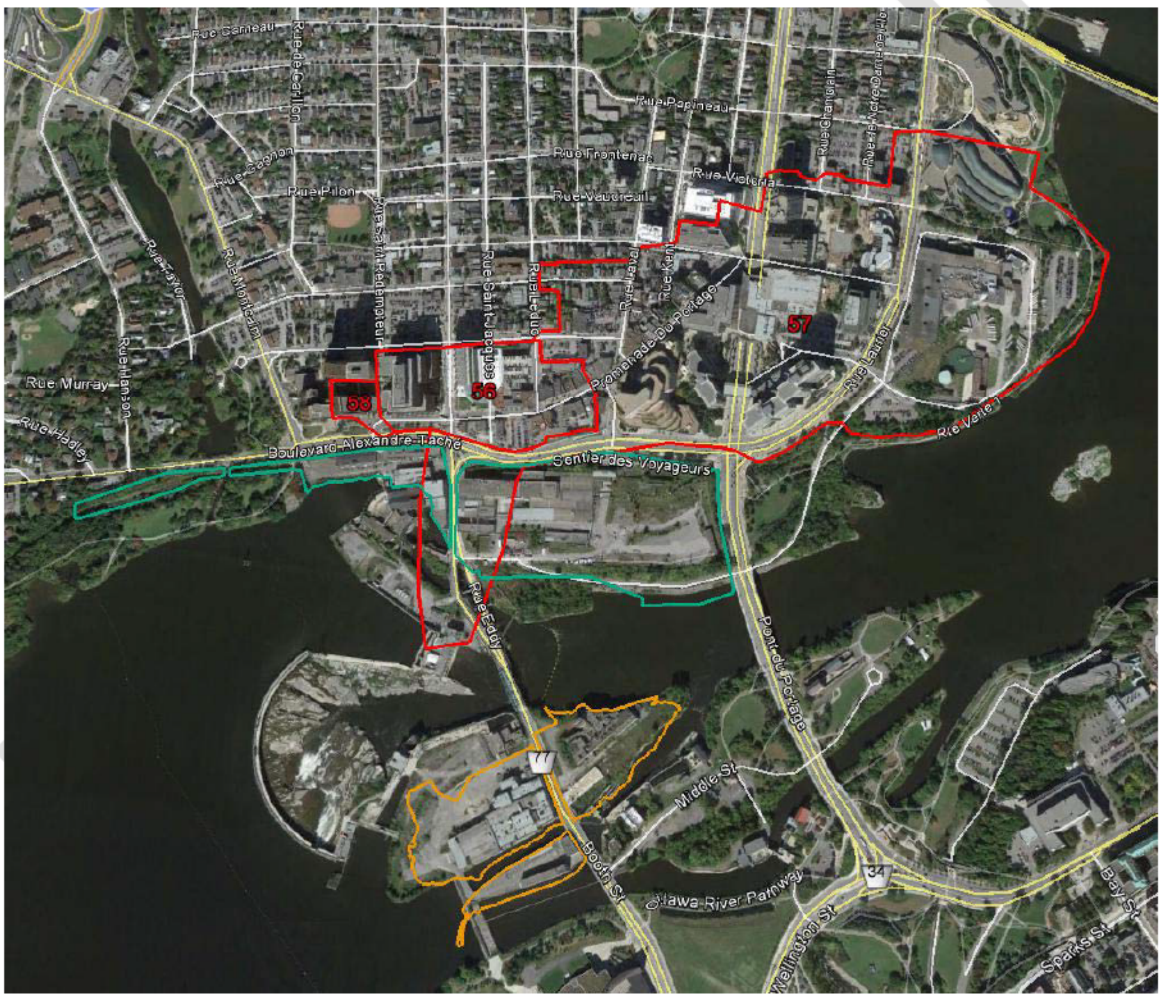


Figure 1 : Emplacement du secteur à l'étude

Développement des modèles hydrologiques et hydrauliques

Sources d'information

Les informations utilisées pour développer les modèles hydrologiques et hydrauliques proviennent principalement de la base de données de la ville de Gatineau. Ces données comprennent, sans s'y limiter :

- Base de données GIS de la ville de Gatineau comprenant la liste des conduites, des regards, des puisards, des rues et des bâtiments existants dans le secteur à l'étude ;
- Plan directeur d'égout sanitaire de la ville de Gatineau (JFSA, 2013).

Descriptions des modèles utilisés

Pour l'analyse de la portion pseudodomestique du secteur à l'étude, le modèle SWMHYMO et le modèle PCSWMM ont été utilisés. Le premier est un modèle hydrologique possédant des routines spécifiquement développées pour la simulation des eaux usées domestiques, commerciales ainsi qu'industrielles et des eaux parasitaires (infiltration, captage, drains français) présentes dans les réseaux séparés et pseudoséparés. Le second est un modèle hydraulique dynamique qui reprend les hydrogrammes calculés par le modèle hydrologique afin de simuler les effets de laminage et les conditions de surcharge (profils piézométriques) sur la longueur de chaque conduite du réseau étudié.

SWMHYMO

Le modèle SWMHYMO, tout comme ses prédécesseurs HYMO et OTTHYMO, est un modèle mathématique complexe utilisé pour simuler la réponse hydrologique de grands et petits bassins versants. Le modèle repose sur des paramètres physiques simples de bassins ruraux ou urbains qui sont facilement estimés. De plus, diverses pratiques de drainage peuvent être représentées (ex : bassins de rétention, acheminement dans de longues conduites ou ruisseau, captage partiel par les régulateurs de débits dans les puisards). Le modèle peut utiliser des événements de pluies synthétiques ou bien des données horaires de pluies réelles. Il peut également être utilisé pour simuler la réponse hydrologique des réseaux d'égout. SWMHYMO possède des routines spécifiquement développées pour la simulation des eaux usées domestiques, commerciales ainsi qu'industrielles et des eaux parasitaires (infiltration, captage, drains français) présentes dans les réseaux séparés et pseudoséparés. Les apports d'eau simulés par les calculs du modèle SWMHYMO peuvent être décrits comme suit :

En temps sec, SWMHYMO calcule :

i. L'infiltration plus ou moins constante en provenance de la nappe phréatique, basée sur des mesures de débits, ou sur d'anciens rapports ÉPIC, lorsque disponibles;
ii. La variation horaire et journalière des apports des eaux usées causée par l'utilisation domestique;
iii. Les apports des eaux usées en provenance des commerces, industries et institutions. Étant donné la nature de ce type de débit, seuls des débits constants sont actuellement considérés.

En temps de pluie, SWMHYMO calcule :

i. Le ruissellement et le captage de celui-ci, en provenance des surfaces directement reliées au réseau d'égout (ex. toiture, gouttière, entrée en contrepente, regard placé dans un point bas de la rue, etc.);
ii. Le ruissellement et le captage de celui-ci, en provenance des superficies drainées par les drains de fondation;
iii. Le ruissellement et le captage de celui-ci, en provenance des surfaces drainées par les fissures et les joints non étanches des conduites et des cheminées aux points d'accès.

PCSWMM

La modélisation hydraulique du réseau sanitaire et pseudo-domestique a été effectuée à partir du logiciel PCSWMM. Ce dernier a été employé afin de déterminer l'hydraulique des réseaux existants et projetés ainsi que la capacité résiduelle des réseaux existants.

Selon le tableau 10-4 du guide de gestion des eaux pluviales du MDDELCC, le logiciel PCSWMM convient adéquatement pour la modélisation dynamique du comportement d'un réseau d'égout.

Le modèle hydraulique dynamique reprend les hydrogrammes générés par le modèle hydrologique (SWMHYMO) afin de simuler les effets de laminage et les conditions de surcharge (profils piézométriques) sur la longueur de chaque conduite étudiée. Le modèle repose sur des paramètres physiques simples tels la géométrie des conduites, la pente, la longueur, le coefficient de rugosité, le coefficient de perte de charge entre les conduites, etc.

MÉTHODOLOGIE

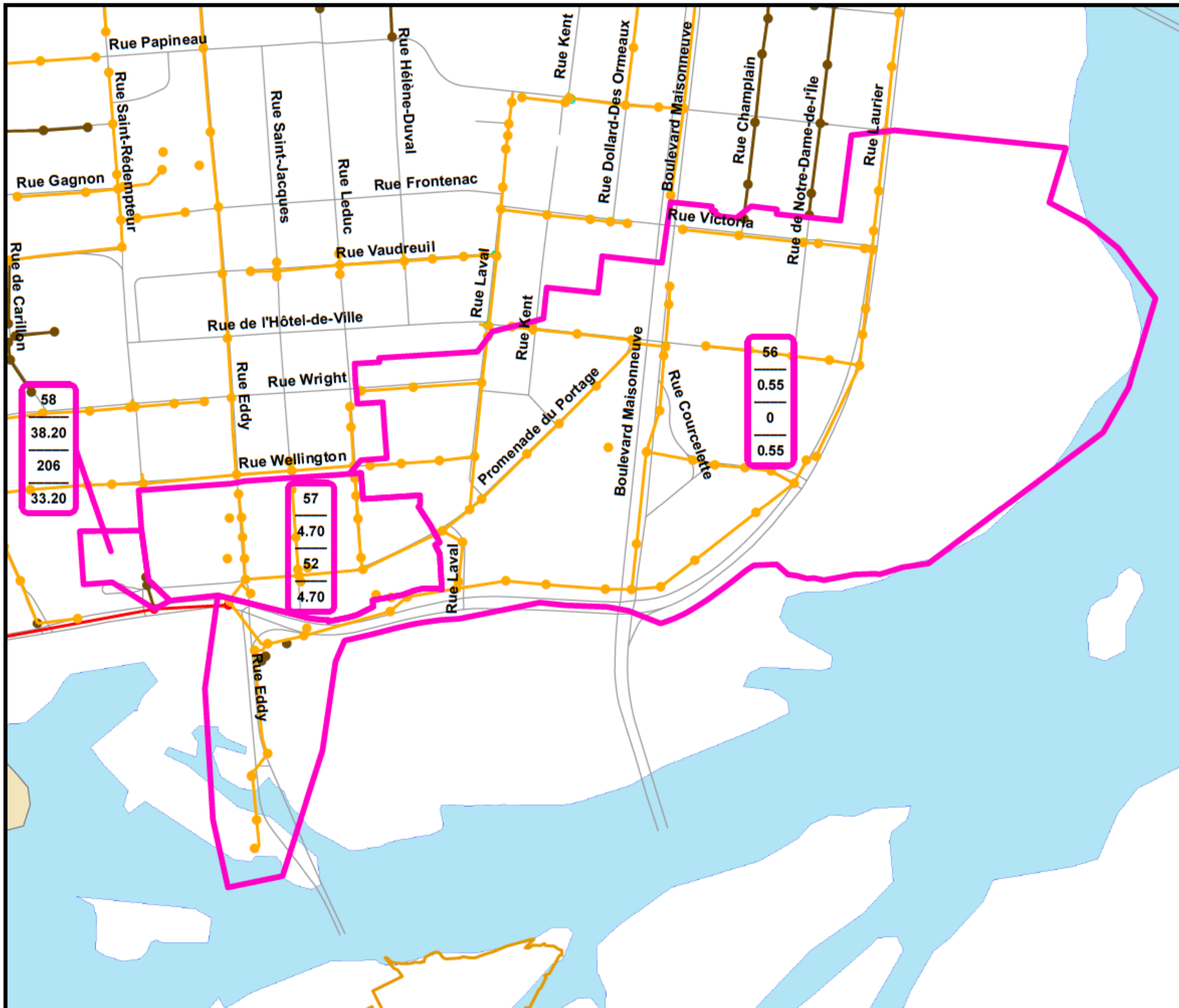
Les modèles hydrologiques et hydrauliques du réseau permettront, dans un premier temps de comprendre le comportement du secteur ainsi que l'interaction entre les réseaux et d'évaluer la capacité résiduelle actuelle du réseau. Les lignes directrices suivies pour la réalisation du mandat peuvent se résumer comme suit et sont décrites en détail dans les sections suivantes :

1. Caractérisation des bassins versants: Cueillette d'informations, validation des limites du bassin versant, découpage en surface de drainage en fonction du réseau et de la topographie du terrain;
2. Modélisation et évaluation des conditions existantes et ultimes : Sélection des paramètres pour les modélisations hydrologiques et hydrauliques, simulation des pluies synthétiques, établissement des conditions existantes et ultimes;
3. Synthèse des conclusions et des recommandations.

MODÈLE HYDROLOGIQUE

Une pluie synthétique d'une récurrence 1 dans 100 ans d'une durée de 4 heures a été utilisée pour simuler l'apport d'eau provenant des drains français. Cette pluie de type Chicago a été dérivée des courbes IDF de l'aéroport international d'Ottawa présentée à l'Annexe A. Celle-ci a été modifiée afin de tenir compte de l'effet des changements climatiques. Cette modification s'est effectuée en majorant les intensités des courbes IDF à 10 % pour un événement centenaire, tel que recommandé par le Guide de gestion des eaux pluviales (MDDEP et MAMROT, 2011, Guide de Gestion des eaux pluviales, Chapitre 2-19.).

Le découpage des surfaces de drainage du secteur à l'étude pour la modélisation SWMHYMO du réseau pseudo-domestique existant et à l'ultime, présenté à la Figure 2 et 3 respectivement, est essentiellement celle en provenance du plan directeur sanitaire fait par JFSA, en 2013 ainsi que leur superficie en hectares. Au total, 3 surfaces de drainage ont été définies. Le nom, la superficie en hectare, la population et la superficie du secteur commercial sont tous des éléments présentés à l'intérieur des Figures 2 et 3. Les fichiers d'entrées et de sorties du modèle SWMHYMO sont présentés à l'Annexe B.



Notes:

Par: JFSA Experts-conseils en ressources hydriques et en environnement

Client: Ville de Gatineau

Projet : **Plan directeur des bassins 56, 57 et 58**

Titre : **Découpage des bassins Scénario actuel**

Avril 2016

FIGURE 2

NO. PROJ	1163-04
DESSINÉ:	VCP
CONÇU :	VCP
RÉVISION:	MR
VÉRIF.	MR

DESSIN REF. Y:\Proj\1163\04 (Plan directeur)\Design\GIS\MXD

Légende

- Regard_Pseudo
- Regard_Collecteur
- Regard_Sanitaire
- Conduite_Pseudo
- Conduite_Collecteur
- Conduite_Sanitaire

58	Nom du sous-bassin
38.20	Superficie totale (ha)
1675	Population
33.20	Superficie commerciale (ha)

N

Notes:

0 40 80 160 240 320 Mètres

Par: JFSA Experts-conseils en ressources hydriques et en environnement

Client: Ville de Gatineau

Projet : **Plan directeur des bassins 56, 57 et 58**

Titre : **Découpage des bassins Scénario 2051**

Avril 2016	NO. PROJ	1163-04
FIGURE 3	DÉSSINÉ:	VCP
	CONÇU :	VCP
	RÉVISION:	MR
DESSIN REF. Y:\Proj\1163\04 (Plan directeur)\Design\GIS\MXD	VÉRIF.	MR

Le Tableau 1 montre les paramètres utilisés dans la codification du modèle SWMHYMO. Une description détaillée de chacun d'entre eux est présentée à la suite de ce tableau.

Tableau 1 : Paramètres du modèle hydrologique SWMHYMO

Description des paramètres	Nom des paramètres et valeurs
Débit journalier moyen associé à la population	ADFp= 320 (L/personne/jour)
Nombre de personnes par résidence	2.1 personnes/résidences
Facteur de pointe associé au ADFp	PKFp = 4
Ratio de l'aire commerciale, industrielle et institutionnelle sur l'aire totale	Xacom = variable selon l'utilisation de la surface de drainage
Débit journalier moyen associé aux aires industrielles, commerciales et institutionnelles	ADFa = variable selon l'utilisation de la surface de drainage (L/ha/jour)
Facteur de pointe associé au ADFa	PKFa = 1 (constant)
Ratio de l'aire totale utilisée dans le calcul de l'infiltration	XAgwf = 1
Débit journalier moyen associé à l'infiltration quasi constante	ADFg = 12 000 (L/ha/jour) Réseau domestique
	ADFg = 16 000 (L/ha/jour) Réseau pseudo-domestique
Facteur de pointe associé au ADFg	PKFg = 1
Rapport de la surface totale imperméable directement connectée à l'égout	C_DCON = 0.02
Longueur du débit hydrologique moyen des aires directement connectées définies par C_DCON	AVGLEN = 0
Ratio de l'aire totale contribuant à l'infiltration rapide par des drains français	C_WEEP = 2% selon la surface de drainage résidentielle
Temps requis pour l'infiltration de l'eau dans le sol au-dessus des drains français	K_WEEP = 0.75 h (réseaux pseudo)
Ratio de l'aire totale contribuant à l'infiltration lente (ex: conduites craquées)	C_SLOW = 0.003
Temps requis pour l'infiltration de l'eau dans le sol au-dessus du système	K_SLOWi = 10 hr
Augmentation de la valeur de K_SLOWi considérant le temps de parcours dans le réseau	K_SLOWii = 0.005 (hr/ha)

Les débits domestiques journaliers sont basés sur un apport d'eau de 320 L/personne/jour pour un bassin versant résidentiel mixte (Ministère de l'Environnement, 1982, Directive 004, section 6.1.1). Le facteur de pointe (PKFp) a été déterminé en fonction du débit moyen généré par chaque superficie de drainage (Ministère de l'Environnement, 1982, Directive 004, figure 6.1.3.1, section 6.1.5).

Des taux de 12 000 et de 16 000 l/ha/jour ont été utilisés pour simuler l'infiltration des réseaux domestique et pseudo-domestique respectivement. Ces taux proviennent du chapitre 6.1.2.1 de la Directive no.004 « Réseau d'égout ».

En ce qui concerne les apports d'eau en provenance des commerces et usages institutionnels, les valeurs basées sur le tableau 2.1 Débit domestique de conception basé sur la littérature (Ministère de l'Environnement, 2001, Guide pour l'étude des technologies conventionnelles de traitement des eaux usées d'origine domestique, Chapitre 2) ont été employées. Il est à noter que l'inventaire de l'ensemble des unités de logement, des commerces, des immeubles à bureau et des industries a été réalisé à l'aide de l'atlas de Gatineau et des outils géomatiques. De plus, pour ce qui est des édifices de nature fédéral, l'estimation du nombre d'employés a été réalisée avec les *Normes d'aménagement du gouvernement du Canada relative à l'initiative Milieu de travail 2.0* du Gouvernement du Canada. L'inventaire des bâtiments est présenté à l'Annexe C.

Le paramètre C_DCON, soit le pourcentage de captage direct, est déterminé par l'estimation du nombre d'entrées en contre-pente, le nombre de drains de toit et le nombre de gouttières de toitures directement branchées aux drains français. La valeur du paramètre C_DCON varie entre 0 et 0,2 %. Une hypothèse de 5% des drains de toit raccordé à l'égout pseudo-domestique a été faite en fonction de la superficie totale des toits présents dans les sous-bassins 56 et 57.

Le nombre de bâtiments pour lesquels les gouttières jettent un pourcentage de l'eau reçue sur la toiture sur une surface perméable a été utilisé afin d'estimer la valeur du paramètre C_WEEP. Le C_WEEP a donc été fixé à 0.0005. Pour des fins de conception, le temps requis (K_WEEP) par l'eau pour percoler dans le remblai et/ou le sol naturel se retrouvant près des drains de fondation ou des tuyaux de drainage a été estimé à 45 minutes.

Le paramètre C_SLOW, représentant le pourcentage de la superficie totale du bassin versant contribuant à l'apport de ruissellement par infiltration, a été supposé comme étant égal à 0.003 pour le secteur à l'étude. Le paramètre KSLOWi, défini comme étant le temps requis par l'eau pour s'infiltrer à travers les couches de sol au-dessus des conduites collectrices, a été évalué à 10 heures. Le paramètre KSLOWii, considérant le temps de transport à l'intérieur des conduites d'égouts, a été estimé à 0,005 heure/ha.

Modèle hydraulique

Les simulations hydrauliques ont été effectuées avec le modèle hydraulique PCSWMM tel que décrit précédemment. Celui-ci permet l'analyse complexe des écoulements qui varient entre des conditions à surface libre et en charge. Il est à noter que les données de base des conduites proviennent de la base de données de la ville de Gatineau.

L'élaboration du modèle hydraulique a été réalisée à l'aide de plusieurs hypothèses énoncées comme suit :

- L'apport d'eau usée de l'usine Kruger a été considéré comme une conduite de 600 mm d'une pente de 0.3% coulant pleine. Plus précisément, il s'agit d'un débit de 0.34 m³/s;
- Le modèle actuel tient compte de l'apport d'eaux usées des développements domiciliaire Zibi Gatineau (52.8 L/s pour les blocs 1 à 24 et 3L/s pour les blocs 25 à 26) et Ottawa (52 L/s);
- Les hydrogrammes ont été intégrés à l'intérieur d'un seul nœud pour chaque sous-bassin, et ce, en raison du manque d'information sur les raccordements de chacun des bâtiments existants. Il est à noter que cette façon d'étudier les conduites réceptrices est beaucoup plus conservatrice, car il y a beaucoup moins de laminage à l'intérieur du modèle hydraulique;
- Le modèle à l'ultime tient compte des projections de 2051, c'est-à-dire 100 logements/ hectares, et ce, pour tous les lots résidentiels et ceux ayant actuellement un stationnement.

Modélisation des conditions actuelles et ultimes

Dans l'optique que le débit d'eau usée des nouvelles conduites du projet domiciliaire du projet Zibi Ottawa va être reçu par le réseau de la ville de Gatineau, considérant que ce réseau fera l'objet de densification importante à l'ultime et considérant les objectifs du présent mandat, les scénarios étudiés se limitent aux éléments suivants :

1) Modélisation avec les conditions actuelles : Ajout de l'apport d'eau usée du projet Zibi Ottawa à l'égout pseudo-sanitaire (900 mm) sur la rue Eddy en tenant compte des conditions actuelles;
2) Modélisation avec les conditions à l'ultime : Ajout de l'apport d'eau usée du projet Zibi Ottawa à l'égout pseudo-sanitaire sur la rue Eddy (900 mm) avec un développement à l'ultime des bassins 56 à 58.

Par ailleurs, il est important de mentionner que puisqu'aucune mesure de débit n'est disponible pour les bassins versants 56 à 58, la calibration des modèles n'a donc pas été effectuée pour cette étude.

La Figure 4 illustre l'emplacement de la conduite pseudo-domestique réceptrice.

Modélisation avec les conditions actuelles

Dans un premier temps, la modélisation hydrologique et hydraulique des bassins 56 à 58 a permis d'évaluer la capacité hydraulique de la conduite réceptrice (# 11 231) d'un diamètre de 900 mm à recevoir l'apport d'eau usée en provenance du développement Zibi Ottawa. À noter que l'effet des changements climatiques a été intégré dans le modèle hydraulique du réseau existant pseudo-domestique considérant que le projet Zibi va être réalisé sur plusieurs phases. L'ajout du projet de développement Zibi Ottawa va générer un débit de pointe de 52 L/s.

La simulation hydraulique du secteur à l'étude, comprenant les conditions existantes, a donc été exécutée afin d'évaluer la performance locale du réseau actuel. Avec l'ajout des débits du projet Zibi Ottawa et Gatineau, une pluie de récurrence 1 :100 ans avec l'effet des changements climatiques ainsi que la contribution actuelle des bassins 56 à 58, les conduites ne démontrent aucune difficulté à transiter ces débits. De surcroît, la conduite réceptrice (# 11 231) est actuellement amplement capable de recevoir les débits puisque le niveau d'eau n'atteint pas la moitié de son diamètre, tel qu'illustré à l'Annexe D. Il est à noter que cette conduite se déverse dans le collecteur sanitaire qui possède un diamètre de 1800 mm.

Légende

- Conduite_Pseudo
- Conduite_Collecteur
- Conduite_Sanitaire
- Regard_Pseudo
- Regard_Collecteur
- Regard_Sanitaire

Notes:

0 5 10 20 30 40 Mètres

Par: JFSA Experts-conseils en ressources hydriques et en environnement

Client: Ville de Gatineau

Projet : **Plan directeur des bassins 56, 57 et 58**

Titre : **Localisation de la conduite réceptrice**

Mai 2016	NO. PROJ	1163-04
FIGURE 4	DÉSSINÉ:	VCP
	CONÇU :	VCP
	RÉVISION:	MR
DESSIN REF. Y:\Proj\1163\04 (Plan directeur)\Rapport	VÉRIF.	MR

En effet, le Tableau 2 montre la capacité de la conduite réceptrice et les débits de pointe d'eau usée des différents bassins et projet domiciliaire. La capacité résiduelle a été calculée par modélisation hydraulique en fonction des points d'entrée des débits dans le modèle PCSWMM. Il est à noter que les points d'entrées des bassins 56 à 58 sont près des exutoires de ceux-ci.

Tableau 2 : Débit intrants et capacité résiduelle de la conduite réceptrice

		Débit (m^3/s)
Capacité [1]	Conduite # 11 231	0.94
Apport en eaux usées	Bassin 56	0.145
	Bassin 57	0.033
	Bassin 58	0.001
	Usine Kruger (600Ø coulant plein)	0.340
	Zibi Ottawa	0.052
	Zibi Gatineau (bloc 1 à 24)	0.053
	Zibi Gatineau (bloc 25 à 26)	0.003
Capacité résiduelle		0.390

Note

1 Capacité coulant pleine obtenue par PCSWMM

Par ailleurs, il est important de mentionner que les conduites en provenance du projet Zibi-Gatineau devront être augmentées de diamètre afin de permettre de transiter les nouveaux apports prévus pour le projet de développement Zibi- Ottawa.

MODÉLISATION AVEC LES CONDITIONS À L'ULTIME

La modélisation hydraulique avec les conditions à l'ultime a été réalisée avec les projections du schéma d'aménagement de la ville de Gatineau qui prévoit une densité de 100 logements/ hectares, et ce, pour l'horizon 2051. Ainsi, les débits obtenus avec les superficies actuellement commerciale, institutionnelle et industrielle demeurent les mêmes. Cependant, les débits estimés avec les superficies à l'intérieur des bassins à l'étude caractérisés par des stationnements et des logements ont été estimés avec la densité de l'horizon 2051.

Une fois les débits intégrés dans le modèle hydraulique, la capacité de la conduite réceptrice (# 11 231) a pu être évaluée. Celle-ci a amplement la capacité de transiter les débits engendrés par un schéma d'aménagement à l'ultime, car l'eau atteint seulement la moitié du diamètre de la conduite, tel qu'illustré à l'Annexe D.

Afin d'avoir une meilleure compréhension de ce constat, le Tableau 3 présente la capacité de la conduite réceptrice et les débits de pointe d'eau usée des différents bassins et projet domiciliaire. La capacité résiduelle a été calculée par modélisation hydraulique en fonction des points d'entrée des débits dans le modèle PCSWMM. Tel qu'indiqué précédemment les points d'entrées des bassins 56 à 58 sont près des exutoires de ceux-ci. Il est à noter que seulement le bassin 56 a une légère augmentation du débit puisque celui-ci a dans ce scénario la densité prévue en 2051.

Tableau 3 : Débit intrant et capacité résiduelle de la conduite réceptrice

		Débit (m^3/s)
Capacité [1]	Conduite # 11 231	0.94
Apport en eaux usées	Bassin 56	0.150
	Bassin 57	0.033
	Bassin 58	0.001
	Usine Kruger (600Ø coulant plein)	0.340
	Zibi Ottawa	0.052
	Zibi Gatineau (bloc 1 à 24)	0.053
	Zibi Gatineau (bloc 25 à 26)	0.003
Capacité résiduelle		0.347

Note

1 Capacité coulant pleine obtenue par PCSWMM

CONCLUSION ET RECOMMANDATIONS

L'analyse effectuée du réseau situé sur l'île de Hull a permis de vérifier la capacité des conduites à recevoir les débits en provenance du développement Zibi à Ottawa qui se situe en partie sur les îles Chaudière et Albert. L'objectif du présent mandat était d'évaluer à l'aide de modèles hydrologique et hydraulique, la capacité des réseaux existants à recevoir les eaux usées du projet Zibi en condition actuelle et ultime.

La capacité des conduites existantes présentes dans la rue Eddy et le Boulevard Alexandre-Taché a ainsi été analysée dans ce présent rapport. En effet, la capacité des conduites est suffisante pour transiter le débit, sans être en charge, engendrée par le nouveau développement Zibi, soit de 52 L/s. La capacité résiduelle obtenue par modélisation est de 0.39 m^3/s. Lors des simulations en condition ultime, la capacité résiduelle s'est avérée légèrement moindre, c'est-à-dire de 0.35 m^3/s. Il est donc possible d'affirmer que cette conduite a amplement la capacité de recevoir le débit en provenance du projet domiciliaire Zibi-Ottawa.

Il est important de mentionner que les paramètres de modélisation hydrologique ont été estimés par des hypothèses et grâce à la connaissance de certaines caractéristiques du secteur. Cependant, si la Ville désire valider ces paramètres, une calibration à l'aide de mesure de débit ce doit d'être réalisée à quelques endroits clé du secteur à l'étude.

Parallèlement, l'accroissement du débit transité par les conduites réceptrices faisant partie du projet domiciliaire Zibi–Gatineau doit faire l'objet d'une mise à jour des diamètres puisque celles-ci reçoivent maintenant un débit supplémentaire de 52 L/s.

De cette manière, JFSA a permis d'identifier la capacité résiduelle de la conduite réceptrice du projet de développement Zibi ce qui permet l'atteinte des objectifs du présent mandat.

En espérant le tout à votre entière satisfaction, veuillez agréer, Monsieur Desforges, l'expression de nos sentiments les meilleurs.

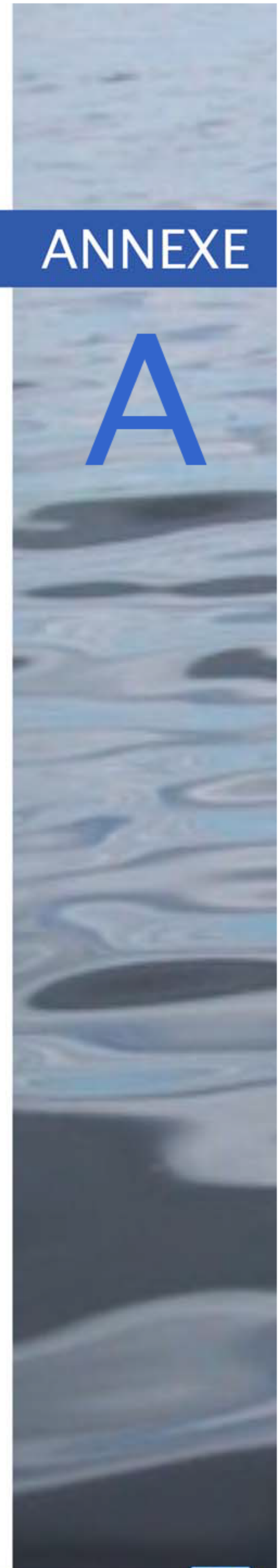
Benoit Doré, M. ing. P. Eng.

Vanesa Carolin Pereira, ing.
OIQ # 5045387

Marcel Roy, ing,
Directeur général de l'Outaouais
OIQ # 36996

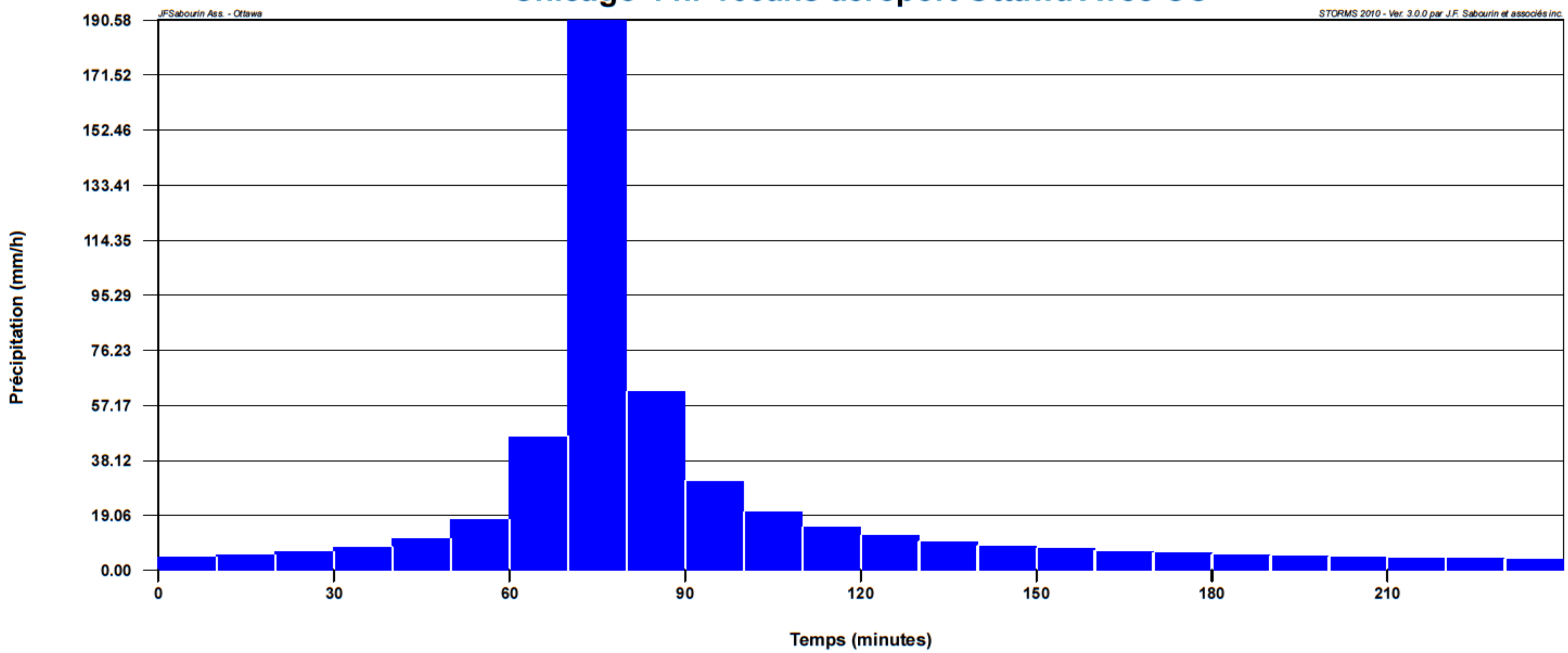
cc Jean-François Sabourin, M. ing, ing, JFSA inc.

ANNEXE A



Pluies synthétiques

Chicago 4 hr 100ans aeroport Ottawa Avec CC



Statistiques de l'événement:

Fichier de pluie: Y:\Proj\1163\04 (Plan directeur)\Design\SWMHYMO\M04Ch100.STM
Commentaire pour fichier de pluie: Chicago 4 hr 100ans aeroport Ottawa Avec CC

Pluie totale	=	82.25 (mm)
Durée de l'événement (h)	=	4:00:00
Pas de temps	=	10 (minutes)
Intensité moy.	=	20.56 (mm/h)
Intensité max.	=	190.58 (mm/h) à 80.00 (minutes)

Intensités Maximum Moyennes: (mm/h)

Durées	5 min	10 min	15 min	30 min	1 hre	2 hres	3 hres	6 hres	12 hres	24 hres
Intensité moy. (mm/h)	190.58	190.58	147.66	99.58	61.21	35.92	25.97	13.71	6.85	3.43

ANNEXE

B

MODÈLE HYDROLOGIQUE
SWMHYMO

```
20    Metric units / ID numbers OFF
*#****************************************************************************
*#  Project Name: [Plan directeur - bassin 56 à 58-]    Project Number: [1163-04]
*#  Date         : 02/05/2016
*#  Modeller     : [VCP]
*#  Company      : JFSA
*#  License #    : 4706892
*#****************************************************************************
*#  Secteur Hull - Windmill- Condition Existante
*#
*#  Pluies Chicago 4hrs MacDonald Cartier avec l'effet des CC
*#
*# -Simulation d'une semaine estivale (sans école): Valeur de PKFp=-121
*# -ADFg=5600 l/ha/day selon le chapitre 6.1.2.2 de la Directive no.001 "Captage
*#  et distribution de l'eau"
*# -Population basé sur un taux de 2.1 personnes/logement selon le recensement
*#  2011
*# -Édifices n'ont pas de drains français, mais seulement résidences et petits commerces
*# - Les drains de toit des édifices sont raccordés au pluvial, mais nous avons mis 5% dans le
*# -Taux d'infiltration pris du Tableau: Débit d'eaux d'infiltration observés dans les
*#  réseaux d'égouts du Québec devant faire l'objet de réfection (Brière, 2009)
*%-----------------|-------------------------------------------------------------|
START              TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[100]
                   ["M04Ch100.STM"] <--storm filename, one per line for NSTORM time
*%-----------------|-------------------------------------------------------------|
READ STORM         STORM_FILENAME=["STORM.001"]
*%-----------------|-------------------------------------------------------------|
SAVE ALL HYDS      ON=[1]
*%-----------------|-------------------------------------------------------------|
*# BASSIN NO       : 56
*# POINT D'ENTREE : 25985
*# SUPERFICIE      : 38.20 ha
*# UTILISATION     : 13.08% RESIDENTIEL, 86.92% COMMERCIAL ET INDUSTRIEL
*# EAUX PARASITES : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
*# TYPE DE CONDUITE : Pseudo
*# COMMENTAIRES      : C_WEEP est 2% des lot qui contribuent au secteur résidentiel
*#                   : C_DCON est estimé à 5% des drains de toit sont raccordés par erreur
*%-----------------|-------------------------------------------------------------|
COMPUTE DWF+WWF    NHYD=["25985"], DT=[1]min, AREA=[38.20](ha),
                   NDays=[0] (must be entered when no rainfall is provided)
                   ========== DRY WEATHER FLOW PARAMETERS =============
                   --- Residential (or Population) driven flows
                   POP =[206], ADFp=[320] (l/cap/day), PKFp=[-121]
                   --- Com / Ind / Inst (or Area) driven flows
                   XAcom=[0.8692], ADFa=[31605](l/ha/day), PKFa=[1]
                   --- Groundwater baseflow
                   XAgwf=[1], ADFg=[16000](l/ha/day), PKFg=[1]
                   ========== WET WEATHER FLOW (I/I) PARAMETERS ========
                   --- Direct connections
                   C_DCON=[0.02], AVGLEN=[0](m)
                   --- Weeping tile connections
                   C_WEEP=[0.0005], K_WEEP=[0.75](hrs)
                   --- Slow infiltration
                   C_SLOW=[0.003], K_SLOWi=[10](hrs), K_SLOWii=[0.005](hrs/ha)
                   END=-1
*%-----------------|-------------------------------------------------------------|
*# BASSIN NO       : 57
*# POINT D'ENTREE : 6
*# SUPERFICIE      : 4.6975
*# UTILISATION     : 100% COMMERCIAL
*# EAUX PARASITES : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
*# TYPE DE CONDUITE : Pseudo
*# COMMENTAIRE      : C_DCON est estimé à 5% des drains de toit sont raccordés par erreur
*%-------------------------------------------------------------------------------|
COMPUTE DWF+WWF    NHYD=["6"], DT=[1]min, AREA=[4.6975](ha),
                   NDays=[0] (must be entered when no rainfall is provided)
                   ========== DRY WEATHER FLOW PARAMETERS =============
                   --- Residential (or Population) driven flows
                   POP =[52], ADFp=[320] (l/cap/day), PKFp=[-121]
                   --- Com / Ind / Inst (or Area) driven flows
                   XAcom=[1], ADFa=[129617](l/ha/day), PKFa=[1]
```



```
                   --- Groundwater baseflow
                   XAgwf=[1], ADFg=[16000](l/ha/day), PKFg=[1]
                   ========== WET WEATHER FLOW (I/I) PARAMETERS ========
                   --- Direct connections
                   C_DCON=[0.02], AVGLEN=[0](m)
                   --- Weeping tile connections
                   C_WEEP=[0], K_WEEP=[0.75](hrs)
                   --- Slow infiltration
                   C_SLOW=[0.003], K_SLOWi=[10](hrs), K_SLOWii=[0.005](hrs/ha)
                   END=-1
*%-----------------|-------------------------------------------------------------|
*# BASSIN NO       : 58
*# POINT D'ENTREE : 21921
*# SUPERFICIE      : 0.5515
*# UTILISATION     : 100% COMMERCIAL
*# EAUX PARASITES : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
*# TYPE DE CONDUITE : Sanitaire
*%-------------------------------------------------------------------------------|
COMPUTE DWF+WWF    NHYD=["21921"], DT=[1]min, AREA=[0.5515](ha),
                   NDays=[0] (must be entered when no rainfall is provided)
                   ========== DRY WEATHER FLOW PARAMETERS =============
                   --- Residential (or Population) driven flows
                   POP =[0], ADFp=[320] (l/cap/day), PKFp=[-121]
                   --- Com / Ind / Inst (or Area) driven flows
                   XAcom=[1], ADFa=[126705.653](l/ha/day), PKFa=[1]
                   --- Groundwater baseflow
                   XAgwf=[1], ADFg=[12000](l/ha/day), PKFg=[1]
                   ========== WET WEATHER FLOW (I/I) PARAMETERS ========
                   --- Direct connections
                   C_DCON=[0], AVGLEN=[0](m)
                   --- Weeping tile connections
                   C_WEEP=[0], K_WEEP=[0](hrs)
                   --- Slow infiltration
                   C_SLOW=[0.003], K_SLOWi=[10](hrs), K_SLOWii=[0.005](hrs/ha)
                   END=-1
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
*%-----------------|-------------------------------------------------------------|
FINISH
```

```
================================================================================
 
SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO         222     000    11   333    =====
S       W W W   MM MM   H   H    Y Y    MM MM   O   O          2    0   0   11     3
SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O          2    0   0   11     3    Ver 5
    S    W W    M   M   H   H     Y     M   M   O   O        222    0   0   11   333    OCT 2
SSSSS    W W    M   M   H   H     Y     M   M    OOO         2      0   0   11     3    =====
                                                             2      0   0   11     3    # 254
      StormWater Management HYdrologic Model                  222     000    11   333    =====

*******************************************************************************************
*************************************** SWMHYMO Ver/5.500 *********************************
****************** A single event and continuous hydrologic simulation model **************
******************     based on the principles of HYMO and its successors     **************
******************                OTTHYMO-83 and OTTHYMO-89.                  **************
*******************************************************************************************
****************** Distributed by:  J.F. Sabourin and Associates Inc.         **************
******************                  Ottawa,  Ontario: (613) 836-3884          **************
******************                  Gatineau, Quebec: (819) 243-6858          **************
******************                  E-Mail: swmhymo@jfsa.Com                  **************
*******************************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++++++++++++++++ Licensed user: JFSAinc.                                   ++++++++++++++
++++++++++++++++++                 Ottawa                SERIAL#:2549237     ++++++++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************************
******************           ++++++ PROGRAM ARRAY DIMENSIONS ++++++          **************
******************           Maximum value for ID numbers  :     11           **************
******************           Max. number of rainfall points: 105408           **************
******************           Max. number of flow points    : 105408           **************
*******************************************************************************************


******************************  S U M M A R Y   O U T P U T  *****************************
*******************************************************************************************
*                RUN DATE: 2016-05-12     TIME: 09:32:28     RUN COUNTER: 000240
*******************************************************************************************
* Input   file: Y:\Proj\1163\04 (Plan directeur)\Design\SWMHYMO\Sani.dat
* Output  file: Y:\Proj\1163\04 (Plan directeur)\Design\SWMHYMO\Sani.out
* Summary file: Y:\Proj\1163\04 (Plan directeur)\Design\SWMHYMO\Sani.sum
* User comments:
* 1:_______________________________________________________________________________________
* 2:_______________________________________________________________________________________
* 3:_______________________________________________________________________________________
*******************************************************************************************


#***************************************************************************
#  Project Name: [Plan directeur - bassin 56 à 58-]    Project Number: [1163-04]
#  Date         : 02/05/2016
#  Modeller     : [VCP]
#  Company      : JFSA
#  License #    : 4706892
#***************************************************************************
#  Secteur Hull - Windmill- Condition Existante
#
#  Pluies Chicago 4hrs MacDonald Cartier avec l'effet des CC
#
# -Simulation d'une semaine estivale (sans école): Valeur de PKFp=-121
# -ADFg=5600 l/ha/day selon le chapitre 6.1.2.2 de la Directive no.001 "Captage
#  et distribution de l'eau"
# -Population basé sur un taux de 2.1 personnes/logement selon le recensement
#  2011
# -Édifices n'ont pas de drains français, mais seulement résidences et petits commerces
# - Les drains de toit des édifices sont raccordés au pluvial, mais nous avons mis 5% dans le p:
# -Taux d'infiltration pris du Tableau: Débit d'eaux d'infiltration observés dans les
#  réseaux d'égouts du Québec devant faire l'objet de réfection (Brière, 2009)
  ** END OF RUN :   99
```



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





 RUN#:COMMAND#
R0100:C00001-------------------------------------------------------------------------------
      START
       [TZERO =    .00 hrs on        0]
       [METOUT=   2    (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  = 0100 ]
#***************************************************************************
#  Project Name: [Plan directeur - bassin 56 à 58-]    Project Number: [1163-04]
#  Date         : 02/05/2016
#  Modeller     : [VCP]
#  Company      : JFSA
#  License #    : 4706892
#***************************************************************************
#  Secteur Hull - Windmill- Condition Existante
#
#  Pluies Chicago 4hrs MacDonald Cartier avec l'effet des CC
#
# -Simulation d'une semaine estivale (sans école): Valeur de PKFp=-121
# -ADFg=5600 l/ha/day selon le chapitre 6.1.2.2 de la Directive no.001 "Captage
#  et distribution de l'eau"
# -Population basé sur un taux de 2.1 personnes/logement selon le recensement
#  2011
# -Édifices n'ont pas de drains français, mais seulement résidences et petits commerces
# - Les drains de toit des édifices sont raccordés au pluvial, mais nous avons mis 5% dans le p:
# -Taux d'infiltration pris du Tableau: Débit d'eaux d'infiltration observés dans les
#  réseaux d'égouts du Québec devant faire l'objet de réfection (Brière, 2009)
R0100:C00002-------------------------------------------------------------------------------
      READ STORM
       Filename = STORM.001
       Comment  = Chicago 4 hr 100ans aeroport Ottawa Avec CC
       [SDT=10.00:SDUR=   4.00:PTOT=  82.25]
R0100:C00003-------------------------------------------------------------------------------
  -------------
  | SAVE HYD  |      START SAVING ALL SIMULATED HYDROGRAPHS.



  -------------
# BASSIN NO       : 56
# POINT D'ENTREE : 25985
# SUPERFICIE      : 38.20 ha
# UTILISATION     : 13.08% RESIDENTIEL, 86.92% COMMERCIAL ET INDUSTRIEL
# EAUX PARASITES : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
# TYPE DE CONDUITE : Pseudo
# COMMENTAIRES     : C_WEEP est 2% des lot qui contribuent au secteur résidentiel
#                   : C_DCON est estimé à 5% des drains de toit sont raccordés par erreur
R0100:C00004-----------DTmin-ID:NHYD---------AREAha-QPEAKcms-TpeakDate_hh:mm----RVmm-R.C.---DWI
     COMPUTE DWF+WWF       1.0 00:DWF          38.20     .020 No_date    7:55    4.51  n/a
                           1.0 01:25985        38.20     .145 No_date    1:50    6.39  n/a
# BASSIN NO       : 57
# POINT D'ENTREE : 6
# SUPERFICIE      : 4.6975
# UTILISATION     : 100% COMMERCIAL
# EAUX PARASITES : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
# TYPE DE CONDUITE : Pseudo
# COMMENTAIRE      : C_DCON est estimé à 5% des drains de toit sont raccordés par erreur
R0100:C00005-----------DTmin-ID:NHYD---------AREAha-QPEAKcms-TpeakDate_hh:mm----RVmm-R.C.---DWI
     COMPUTE DWF+WWF       1.0 00:DWF           4.70     .008 No_date    7:55   14.89  n/a
                           1.0 01:6             4.70     .033 No_date    1:31   16.74  n/a
# BASSIN NO       : 58
# POINT D'ENTREE : 21921
# SUPERFICIE      : 0.5515
# UTILISATION     : 100% COMMERCIAL
# EAUX PARASITES : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
```



```
# TYPE DE CONDUITE : Sanitaire
R0100:C00006-----------DTmin-ID:NHYD---------AREAha-QPEAKcms-TpeakDate_hh:mm----RVmm-R.C.---DWI
     COMPUTE DWF+WWF       1.0 00:DWF            .55     .001 No_date    0:00   13.85  n/a
                           1.0 01:21921          .55     .001 No_date   11:31   14.06  n/a
R0100:C00007-------------------------------------------------------------------------------
     FINISH
-------------------------------------------------------------------------------------------
*******************************************************************************************
      WARNINGS / ERRORS / NOTES
      -------------------------
    Simulation ended on 2016-05-12     at 09:32:29
===========================================================================================
```

```
20    Metric units / ID numbers OFF
*#****************************************************************************
*#  Project Name: [Plan directeur - bassin 56 à 58-]    Project Number: [1163-04]
*#  Date        : 02/05/2016
*#  Modeller    : [VCP]
*#  Company     : JFSA
*#  License #   : 4706892
*#****************************************************************************
*#  Secteur Hull - Windmill- Condition à l'ultime
*#
*#  Pluies Chicago 4hrs MacDonald Cartier avec l'effet des CC
*#
*#  Simulation basée sur les prévisions de 2051, c'est-à-dire 100 log./ ha
*#
*# -Simulation d'une semaine estivale (sans école): Valeur de PKFp=-121
*# -ADFg=16000 l/ha/day selon le chapitre 6.1.2.1 de la Directive no.004 "Réseau
*#  d'égout"
*# -Population basé sur un taux de 2.1 personnes/logement selon le recensement
*#  2011
*# -Édifices n'ont pas de drains français, mais seulement résidences et petits commerces
*# - Les drains de toit des édifices sont raccordés au pluvial, mais nous avons mis 5% dans le ]
*# -Taux d'infiltration pris du Tableau: Débit d'eaux d'infiltration observés dans les
*#  réseaux d'égouts du Québec devant faire l'objet de réfection (Brière, 2009)
*%-----------------|-----------------------------------------------------------|
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[100]
                    ["M04Ch100.STM"] <--storm filename, one per line for NSTORM time
*%-----------------|-----------------------------------------------------------|
READ STORM          STORM_FILENAME=["STORM.001"]
*%-----------------|-----------------------------------------------------------|
SAVE ALL HYDS       ON=[1]
*%-----------------|-----------------------------------------------------------|
*# BASSIN NO       : 56
*# POINT D'ENTREE : 25985
*# SUPERFICIE      : 38.20 ha
*# UTILISATION     : 13.08% RESIDENTIEL, 86.92% COMMERCIAL ET INDUSTRIEL
*# EAUX PARASITES : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
*# TYPE DE CONDUITE : Pseudo
*# COMMENTAIRES    : Les stationnements (2.98 ha) ont été considérés comme résidentiel, et ce,
*#                 : C_WEEP est 2% des lot qui contribuent au secteur résidentiel
*#                 : C_DCON est estimé à 5% des drains de toit sont raccordés par erreur
*%-----------------------------------------------------------------------------|
COMPUTE DWF+WWF     NHYD=["25985"], DT=[1]min, AREA=[38.20](ha),
                    NDays=[0] (must be entered when no rainfall is provided)
                    ========== DRY WEATHER FLOW PARAMETERS ==============
                    --- Residential (or Population) driven flows
                    POP =[1675], ADFp=[320] (l/cap/day), PKFp=[-121]
                    --- Com / Ind / Inst (or Area) driven flows
                    XAcom=[0.8692], ADFa=[31605](l/ha/day), PKFa=[1]
                    --- Groundwater baseflow
                    XAgwf=[1], ADFg=[16000](l/ha/day), PKFg=[1]
                    ========== WET WEATHER FLOW (I/I) PARAMETERS ========
                    --- Direct connections
                    C_DCON=[0.02], AVGLEN=[0](m)
                    --- Weeping tile connections
                    C_WEEP=[0.0005], K_WEEP=[0.75](hrs)
                    --- Slow infiltration
                    C_SLOW=[0.003], K_SLOWi=[10](hrs), K_SLOWii=[0.005](hrs/ha)
                    END=-1
*%-----------------|-----------------------------------------------------------|
*# BASSIN NO       : 57
*# POINT D'ENTREE : 6
*# SUPERFICIE      : 4.6975
*# UTILISATION     : 100% COMMERCIAL
*# EAUX PARASITES : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
*# TYPE DE CONDUITE : Pseudo
*# COMMENTAIRES    : Les stationnements (0.512 ha) ont été considérés comme résidentiel, et ce,
*#                 : C_DCON est estimé à 5% des drains de toit sont raccordés par erreur
*%-----------------------------------------------------------------------------|
COMPUTE DWF+WWF     NHYD=["6"], DT=[1]min, AREA=[4.6975](ha),
                    NDays=[0] (must be entered when no rainfall is provided)
                    ========== DRY WEATHER FLOW PARAMETERS ==============
```



```
                    --- Residential (or Population) driven flows
                    POP =[160], ADFp=[320] (l/cap/day), PKFp=[-121]
                    --- Com / Ind / Inst (or Area) driven flows
                    XAcom=[1], ADFa=[129617](l/ha/day), PKFa=[1]
                    --- Groundwater baseflow
                    XAgwf=[1], ADFg=[16000](l/ha/day), PKFg=[1]
                    ========== WET WEATHER FLOW (I/I) PARAMETERS ========
                    --- Direct connections
                    C_DCON=[0.02], AVGLEN=[0](m)
                    --- Weeping tile connections
                    C_WEEP=[0], K_WEEP=[0.75](hrs)
                    --- Slow infiltration
                    C_SLOW=[0.003], K_SLOWi=[10](hrs), K_SLOWii=[0.005](hrs/ha)
                    END=-1
*%-----------------|-----------------------------------------------------------|
*# BASSIN NO       : 58
*# POINT D'ENTREE : 21921
*# SUPERFICIE      : 0.5515
*# UTILISATION     : 100% COMMERCIAL
*# EAUX PARASITES : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
*# TYPE DE CONDUITE : Sanitaire
*# COMMENTAIRE     : Pas de stationnement
*%-----------------------------------------------------------------------------|
COMPUTE DWF+WWF     NHYD=["21921"], DT=[1]min, AREA=[0.5515](ha),
                    NDays=[0] (must be entered when no rainfall is provided)
                    ========== DRY WEATHER FLOW PARAMETERS ==============
                    --- Residential (or Population) driven flows
                    POP =[0], ADFp=[320] (l/cap/day), PKFp=[-121]
                    --- Com / Ind / Inst (or Area) driven flows
                    XAcom=[1], ADFa=[117860](l/ha/day), PKFa=[1]
                    --- Groundwater baseflow
                    XAgwf=[1], ADFg=[12000](l/ha/day), PKFg=[1]
                    ========== WET WEATHER FLOW (I/I) PARAMETERS ========
                    --- Direct connections
                    C_DCON=[0], AVGLEN=[0](m)
                    --- Weeping tile connections
                    C_WEEP=[0], K_WEEP=[0](hrs)
                    --- Slow infiltration
                    C_SLOW=[0.003], K_SLOWi=[10](hrs), K_SLOWii=[0.005](hrs/ha)
                    END=-1
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
*%-----------------|-----------------------------------------------------------|
FINISH
```

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

SSSSS   W   W   M   M   H   H   Y   Y   M   M    OOO          222     000     11    333    =====
S       W W W   MM MM   H   H    Y Y    MM MM   O   O           2    0   0    11      3
SSSSS   W W W   M M M   HHHHH     Y     M M M   O   O           2    0   0    11      3    Ver 5
    S    W W    M   M   H   H     Y     M   M   O   O         222    0   0    11    333    OCT 2
SSSSS    W W    M   M   H   H     Y     M   M    OOO          2      0   0    11      3    =====
                                                              2      0   0    11      3    # 254
      StormWater Management HYdrologic Model                  222     000     11    333    =====

**************************************************************************************************
*************************************  SWMHYMO Ver/5.500  ****************************************
******************  A single event and continuous hydrologic simulation model  *******************
******************     based on the principles of HYMO and its successors      *******************
******************                 OTTHYMO-83 and OTTHYMO-89.                  *******************
**************************************************************************************************
****************** Distributed by:  J.F. Sabourin and Associates Inc.          *******************
******************                  Ottawa,  Ontario: (613) 836-3884           *******************
******************                  Gatineau, Quebec: (819) 243-6858           *******************
******************                  E-Mail: swmhymo@jfsa.Com                   *******************
**************************************************************************************************

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++++++++++++ Licensed user: JFSAinc.                                      +++++++++++++++++++
+++++++++++++++++                Ottawa                 SERIAL#:2549237        +++++++++++++++++++
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

**************************************************************************************************
******************              ++++++ PROGRAM ARRAY DIMENSIONS ++++++         *******************
******************              Maximum value for ID numbers   :     11        *******************
******************              Max. number of rainfall points: 105408         *******************
******************              Max. number of flow points     : 105408        *******************
**************************************************************************************************


******************************  S U M M A R Y   O U T P U T  *************************************
**************************************************************************************************
*                  RUN DATE: 2016-05-12     TIME: 09:43:19     RUN COUNTER: 000241
**************************************************************************************************
* Input   file: Y:\Proj\1163\04 (Plan directeur)\Design\SWMHYMO\Prévision 2051\Sani_prev2051.da
* Output  file: Y:\Proj\1163\04 (Plan directeur)\Design\SWMHYMO\Prévision 2051\Sani_prev2051.ou
* Summary file: Y:\Proj\1163\04 (Plan directeur)\Design\SWMHYMO\Prévision 2051\Sani_prev2051.su
* User comments:
* 1:_______________________________________________________________________________________________
* 2:_______________________________________________________________________________________________
* 3:_______________________________________________________________________________________________
**************************************************************************************************


#*****************************************************************************
#  Project Name: [Plan directeur - bassin 56 à 58-]    Project Number: [1163-04]
#  Date          : 02/05/2016
#  Modeller      : [VCP]
#  Company       : JFSA
#  License #     : 4706892
#*****************************************************************************
#  Secteur Hull - Windmill- Condition à l'ultime
#
#  Pluies Chicago 4hrs MacDonald Cartier avec l'effet des CC
#
#  Simulation basée sur les prévisions de 2051, c'est-à-dire 100 log./ ha
#
# -Simulation d'une semaine estivale (sans école): Valeur de PKFp=-121
# -ADFg=16000 l/ha/day selon le chapitre 6.1.2.1 de la Directive no.004 "Réseau
#  d'égout"
# -Population basé sur un taux de 2.1 personnes/logement selon le recensement
#  2011
# -Édifices n'ont pas de drains français, mais seulement résidences et petits commerces
# - Les drains de toit des édifices sont raccordés au pluvial, mais nous avons mis 5% dans le p:
# -Taux d'infiltration pris du Tableau: Débit d'eaux d'infiltration observés dans les
#  réseaux d'égouts du Québec devant faire l'objet de réfection (Brière, 2009)
```



```
  ** END OF RUN :   99

**************************************************************************************************





 RUN#:COMMAND#
R0100:C00001--------------------------------------------------------------------------------------
      START
       [TZERO =     .00 hrs on         0]
       [METOUT=   2     (1=imperial, 2=metric output)]
       [NSTORM=   1 ]
       [NRUN  = 0100 ]
#*****************************************************************************
#  Project Name: [Plan directeur - bassin 56 à 58-]    Project Number: [1163-04]
#  Date          : 02/05/2016
#  Modeller      : [VCP]
#  Company       : JFSA
#  License #     : 4706892
#*****************************************************************************
#  Secteur Hull - Windmill- Condition à l'ultime
#
#  Pluies Chicago 4hrs MacDonald Cartier avec l'effet des CC
#
#  Simulation basée sur les prévisions de 2051, c'est-à-dire 100 log./ ha
#
# -Simulation d'une semaine estivale (sans école): Valeur de PKFp=-121
# -ADFg=16000 l/ha/day selon le chapitre 6.1.2.1 de la Directive no.004 "Réseau
#  d'égout"
# -Population basé sur un taux de 2.1 personnes/logement selon le recensement
#  2011
# -Édifices n'ont pas de drains français, mais seulement résidences et petits commerces
# - Les drains de toit des édifices sont raccordés au pluvial, mais nous avons mis 5% dans le p:
# -Taux d'infiltration pris du Tableau: Débit d'eaux d'infiltration observés dans les
#  réseaux d'égouts du Québec devant faire l'objet de réfection (Brière, 2009)
R0100:C00002--------------------------------------------------------------------------------------
      READ STORM
       Filename = STORM.001
       Comment  = Chicago 4 hr 100ans aeroport Ottawa Avec CC
       [SDT=10.00:SDUR=   4.00:PTOT=  82.25]
R0100:C00003--------------------------------------------------------------------------------------
  -------------
  | SAVE HYD  |       START SAVING ALL SIMULATED HYDROGRAPHS.



  -------------
# BASSIN NO       : 56
# POINT D'ENTREE  : 25985
# SUPERFICIE      : 38.20 ha
# UTILISATION     : 13.08% RESIDENTIEL, 86.92% COMMERCIAL ET INDUSTRIEL
# EAUX PARASITES  : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
# TYPE DE CONDUITE : Pseudo
# COMMENTAIRES     : Les stationnements (2.98 ha) ont été considérés comme résidentiel, et ce, :
#                    : C_WEEP est 2% des lot qui contribuent au secteur résidentiel
#                    : C_DCON est estimé à 5% des drains de toit sont raccordés par erreur
R0100:C00004-----------DTmin-ID:NHYD---------AREAha-QPEAKcms-TpeakDate_hh:mm----RVmm-R.C.---DWI
    COMPUTE DWF+WWF       1.0 00:DWF           38.20      .028 No_date    7:50     5.74  n/a
                          1.0 01:25985         38.20      .148 No_date    1:50     7.62  n/a
# BASSIN NO       : 57
# POINT D'ENTREE  : 6
# SUPERFICIE      : 4.6975
# UTILISATION     : 100% COMMERCIAL
# EAUX PARASITES  : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
# TYPE DE CONDUITE : Pseudo
# COMMENTAIRES     : Les stationnements (0.512 ha) ont été considérés comme résidentiel, et ce,
#                    : C_DCON est estimé à 5% des drains de toit sont raccordés par erreur
R0100:C00005-----------DTmin-ID:NHYD---------AREAha-QPEAKcms-TpeakDate_hh:mm----RVmm-R.C.---DWI
    COMPUTE DWF+WWF       1.0 00:DWF            4.70      .009 No_date    7:55    15.63  n/a
```



```
                          1.0 01:6              4.70      .033 No_date    1:31    17.47  n/a
# BASSIN NO       : 58
# POINT D'ENTREE  : 21921
# SUPERFICIE      : 0.5515
# UTILISATION     : 100% COMMERCIAL
# EAUX PARASITES  : 0 DRAIN DANS SOL, 0 TOIT PLATS, 0 TOIT EN PENTE
# TYPE DE CONDUITE : Sanitaire
# COMMENTAIRE     : Pas de stationnement
R0100:C00006-----------DTmin-ID:NHYD---------AREAha-QPEAKcms-TpeakDate_hh:mm----RVmm-R.C.---DWI
    COMPUTE DWF+WWF       1.0 00:DWF             .55      .001 No_date    0:00    12.97  n/a
                          1.0 01:21921           .55      .001 No_date   11:32    13.17  n/a
R0100:C00007--------------------------------------------------------------------------------------
    FINISH
--------------------------------------------------------------------------------------------------
**************************************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2016-05-12     at 09:43:19
==================================================================================================
```

ANNEXE

C

INVENTAIRE DES BÂTIMENTS

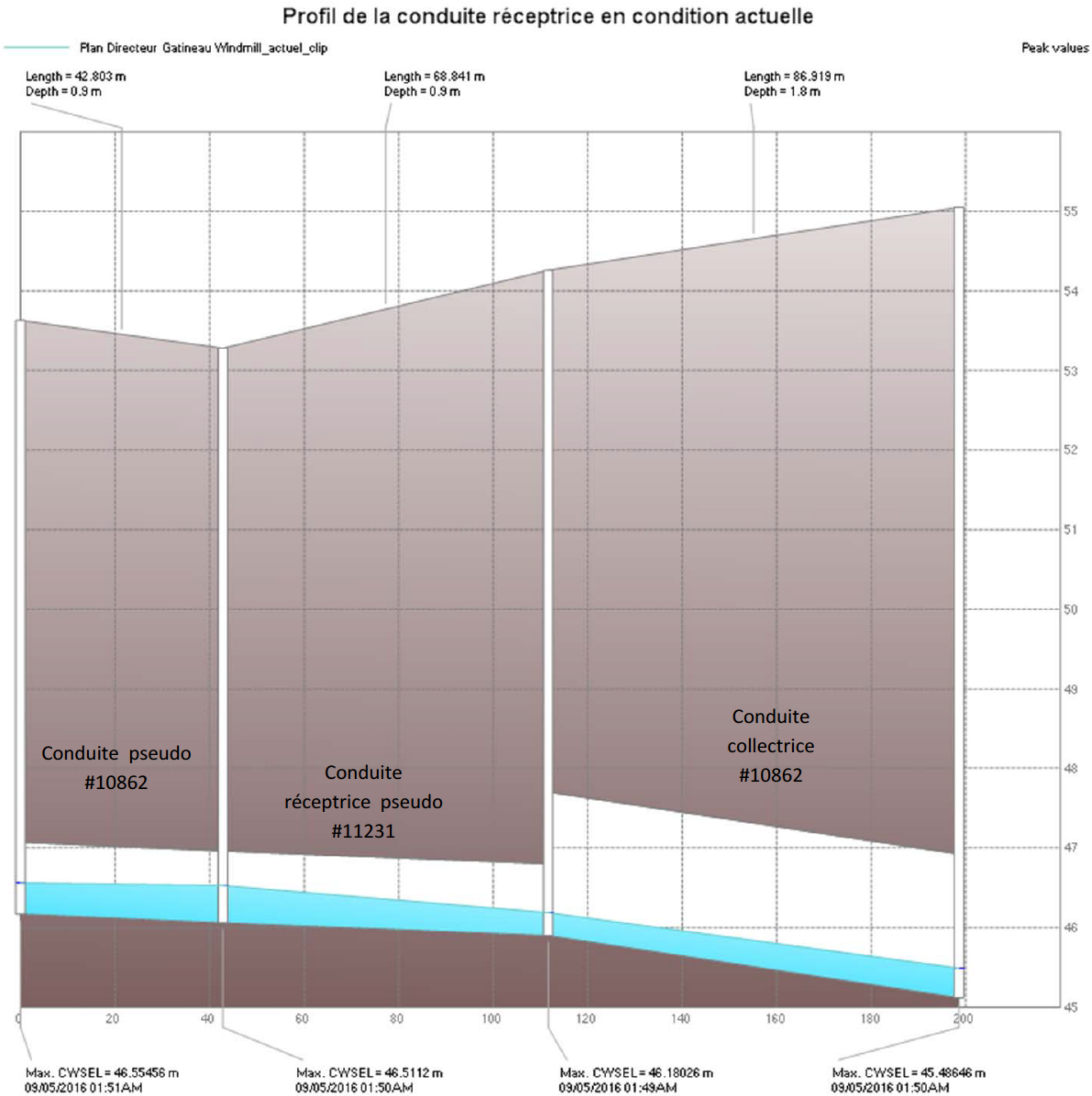
Bassin	Rue	Identification	Type	Débit commercial (L/j)	Débit résidentiel (L/j)
56	Laurier	Musée Canadien de l'histoire	Cinéma	4425	
			Musée	125000	
56	Laurier	Hôtel Four point	Hôtel	60300	
56	Laurier	Resto-Bar l'Ardoise	Restaurant	6250	
56	Laurier	Usine Kruger	Industriel		
56	Laurier	Maison du citoyen	Bureaux (6 étages)	22500	
		Salles de théatre	Théâtre	22980	
		Salles de réunion	Salle	3195	
		École	École	300	
56	Laurier	Édifice Jos Montferrand -Palais de justice	Bureaux	41250	
56	Laurier	Édifice Portage III	Bureaux	337500	
56	Victoria	Place du Portage I (50 Victoria)	Bureaux	165000	
56	Victoria	Bistro Vitalie 67 Victoria	Restaurant	3125	
56	Victoria	61-63 rue Victoria	Logement		2880
56	Victoria	85 rue Victoria	Bureaux (3 étages)	3000	
56	Victoria	95-97 rue Victoria (immeuble à logement)	Logement		2880
56	Hôtel-de-Ville	Édifice du Portage II	Bureaux	67500	
56	Hôtel-de-Ville	105, Hôtel-de-Ville (Place Bell)	Bureaux	11250	
56	Hôtel-de-Ville	Planète poutine	Restaurant	3125	
56	Hôtel-de-Ville	CrocoBento	Restaurant	3125	
56	Hôtel-de-Ville	Nettoyeur à sec	Magasin au détail	200	
56	Hôtel-de-Ville	Avintage	Magasin au détail	200	
56	Hôtel-de-Ville	Point de départ	Club sportif	250	
56	Hôtel-de-Ville	Duvernay Studio et suite	Logement		20160
56	Wright	115 Wright - Delev, Beaudoin Avocat	Bureaux	500	
56	Wright	Duplex-triplex rue Wright	Logement		26240
56	Wright	Novalogix	Bureaux	500	
56	Wright	136 Wrigth	Bureaux	1000	
56	Wellington	147 rue Wellington	Bureaux	1000	
56	Wellington	Duplex-triplex rue Wellington	Logement		3520
56	Wellington	149 rue Wellington	Bureaux	500	
56	Wellington	160-168 rue Wellington	Bureaux	1500	
56	Wellington	165 rue Wellington	Magasin commercial	600	
56	Laval	45 à 47 rue Laval	Restaurant	6250	
			Magasin commercial	200	
56	Laval	41 à 43 rue Laval	Restaurant	3125	
			Salon de beauté	3250	
56	Laval	39 rue Laval	Restaurant	3125	
56	Laval	37 rue Laval (Vivazen)	Salon de beauté	3250	
56	Laval	35 rue Laval (Vision centre-ville)	Bureaux	500	
56	Laval	33 rue Laval (Groupe Marc Dubé)	Bureaux	500	
56	Laval	31 rue Laval (tatouage Hellbound)	Magasin commercial	200	
56	Laval	36 rue Laval (Bar)	Bar	6250	
56	Laval	42-44 rue Laval	Bar	6250	
			Logement		1600
56	Laval	48-50 rue Laval	Logement		1600
56	Aubry	2 rue Aubry	Logement		1600
56	Aubry	3-9 rue Aubry	Restaurants - Bar	6250	
56	Kent	3 rue Kent (Le Bistro)	Bar	6250	
56	Promenade du Portage	123-125 Promenade du Portage	Restaurant	3125	
56	Promenade du Portage	127-131 Promenade du Portage	Magasin commercial	400	
			Logement		960
			Restaurant	3125	
56	Promenade du Portage	133-141 Promenade du Portage	Magasin commercial	1400	
56	Promenade du Portage	143-147 Promenade du Portage	Magasin commercial	400	
56	Promenade du Portage	149 Promenade du Portage	Magasin commercial	200	
56	Promenade du Portage	153 Promenade du Portage	Centre dentaire	1825	
56	Promenade du Portage	155 Promenade du Portage	Magasin commercial	200	
56	Promenade du Portage	157 Promenade du Portage	Magasin commercial	200	
56	Promenade du Portage	159 Promenade du Portage	Magasin commercial	200	
56	Promenade du Portage	161 Promenade du Portage	Magasin commercial	200	
56	Promenade du Portage	163 Promenade du Portage	Restaurant	3125	
			Magasin commercial	400	
56	Promenade du Portage	169 Promenade du Portage	Logement		2880
			Magasin commercial	200	
56	Promenade du Portage	171 Promenade du Portage	Restaurant	1875	

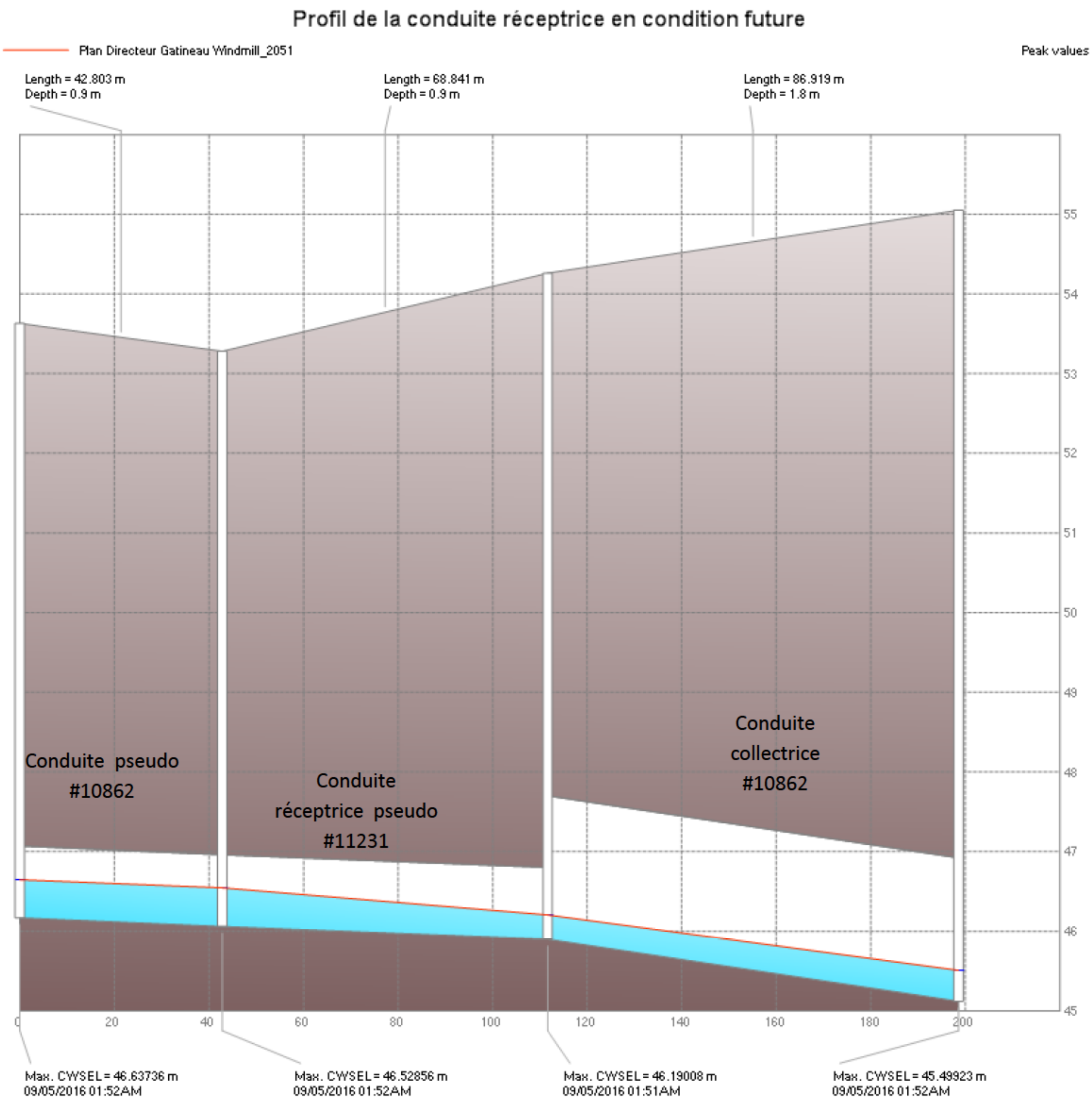
Bassin	Rue	Identification	Type	Débit commercial (L/j)	Débit résidentiel (L/j)
56	Promenade du Portage	173 Promenade du Portage	Magasin commercial	200	
			Logement		1600
56	Promenade du Portage	175 Promenade du Portage	Magasin commercial	200	
			Restaurant	9375	
56	Promenade du Portage	177 Promenade du Portage	Magasin commercial	200	
			Magasin commercial	800	
56	Promenade du Portage	179 (Coiffure Chez Henri)	Bureaux	4000	
			Salon de coiffure	6500	
56	Promenade du Portage	191 (Place des Explorateurs)	Bureaux	6000	
56	Promenade du Portage	200 (Place du Centre)	Bureaux	67500	
57	Leduc	8-10 rue Leduc	Cinéma	4425	
			Magasin commercial	200	
57	Eddy	Terrasse Chaudière (19 étages)	Bureaux	260000	
57	Eddy	22 rue Eddy	Bureaux	225000	
57	Promenade du Portage	40 Promenade du Portage			
		Galo piri piri	Restaurant	3125	
		Howard's pawn shop	Magasin commercial	200	
		subway	Restaurant	3125	
57	Promenade du Portage	48 Promenade du Portage			
		studio palm beach, salon de bronzage	Magasin commercial	200	
		Dermabronze	Magasin commercial	200	
57	Promenade du Portage	50 Promenade du Portage			
		Le Petit Chicago	Bar	6250	
57	Promenade du Portage	Nouveau commerces	Magasin commercial	2000	
57	Promenade du Portage	51 Promenade du Portage			
		Université du Mexique	École	45000	
57	Promenade du Portage	60 Promenade du Portage	Magasin commercial	600	
57	Promenade du Portage	61 Promenade du Portage			
		Banque Scotia	Bureaux	4500	
57	Promenade du Portage	70 Promenade du Portage			
		Le pub du bon vivant	Restaurant	6250	
57	Promenade du Portage	75 Promenade du Portage	Magasin commercial	800	
57	Promenade du Portage	77 Promenade du Portage	Restaurant	3125	
			Logement		2880
57	Promenade du Portage	78-84 Promenade du Portage	Restaurant	6250	
			Logement		4160
57	Promenade du Portage	85 Promenade du Portage	Magasin commercial	600	
			Logement		5440
57	Promenade du Portage	86-92 Promenade du Portage	Bureaux	9375	
		Clinique podiatrique	Clinique	750	
57	Promenade du Portage	99-103 Promenade du Portage	Restaurant	3125	
57			Restaurant	3125	
57			Logement		4160
57	Promenade du Portage	107 Promenade du Portage	Bureaux	3125	
57	Promenade du Portage	112 à 114 Promenade du Portage			
		Centre d'esthétique et d'électrolyse	Salon/spa	1950	
		Pizzeria	Restaurant	3125	
57	Promenade du Portage	115 Promenade du Portage	Bureaux	1250	
57	Promenade du Portage	116 Promenade du Portage	Bureaux	2500	
57	Promenade du Portage	117 Promenade du Portage (Mardi Gras)	Bar	6250	
57	Promenade du Portage	119 Promenade du Portage	Bureaux	1250	
57	Promenade du Portage	120 Promenade du Portage			
		Voyage intair Transit	Magasin commercial	400	
		Entreprise systems and solutions group	Magasin commercial	400	
		Locaux à louer	Magasin commercial	400	
58	Promenade du Portage	1 Promenade du Portage	Bureaux	65000	

ANNEXE

D

PROFIL HYDRAULIQUE


Profil de la conduite réceptrice en condition actuelle
Plan Directeur Gatineau Windmill_actuel_clip
Peak values
Length = 42.803 m
Depth = 0.9 m
Length = 68.841 m
Depth = 0.9 m
Length = 86.919 m
Depth = 1.8 m
Conduite pseudo #10862
Conduite réceptrice pseudo #11231
Conduite collectrice #10862
Max. CWSEL = 46.55456 m
09/05/2016 01:51AM
Max. CWSEL = 46.5112 m
09/05/2016 01:50AM
Max. CWSEL = 46.18026 m
09/05/2016 01:49AM
Max. CWSEL = 45.48646 m
09/05/2016 01:50AM


Profil de la conduite réceptrice en condition future
Plan Directeur Gatineau Windmill_2051
Peak values
Length = 42.803 m
Depth = 0.9 m
Length = 68.841 m
Depth = 0.9 m
Length = 86.919 m
Depth = 1.8 m
Conduite pseudo #10862
Conduite réceptrice pseudo #11231
Conduite collectrice #10862
Max. CWSEL = 46.63736 m
09/05/2016 01:52AM
Max. CWSEL = 46.52856 m
09/05/2016 01:52AM
Max. CWSEL = 46.19008 m
09/05/2016 01:51AM
Max. CWSEL = 45.49923 m
09/05/2016 01:52AM

APPENDIX B

Water Supply

Windmill
Zibi - Ontario
Phase 1A

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Phase	Block	Type	Unit Rate		No. of Units	Avg Day L/min	Max Day L/min	Peak Hour L/min
1	208	Office	75	L/p/d	140	0.8	1.2	2.1
1	208	Retail	2.5	$L/m^2/d$	1457	2.5	3.8	6.8
1	208	Restaurant	125	L/seat/d	8	0.7	1.0	1.9
1	205.5A	Res	563.5	L/unit/d	71	27.8	136.1	205.6
1	205.5A	Retail	2.5	$L/m^2/d$	768	1.3	2.0	3.6
Temp Office - Albert	EX	Office	75	L/p/d	30	1.6	2.3	4.2
					Total	**34.7**	**146.5**	**224.2**

Notes:
* Development stats per Windmill schedule dated 2016-02-01 and additional information received via email 2016-02-08.
* Office unit rate per Ontario Building Code 8.2.1.3.B. Assuming 1 employee per $9.3m^2$ of floor space.
* Residential Unit rate assuming 70% one bedroom (1.4p/unit), 30% two bedroom (2.1 p/unit)
* Windmill estimated maximum number of employees occupying Albert Island
* Energy Ottawa maximum employees to work at Chaudiere Office provided by EO via letter dated March 1, 2016

		Max Day PF	Peak Hour PF
Estimated Total Residential Population	115	4.9	7.4

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required - Block 205

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Composite 40% Wood Frame 60% Non-Combustible Construction

C 1.08 *Type of Construction Coefficient per FUS Part II, Section 1*
A 6250.0 m^2 *Total floor area based on FUS Part II section 1*

Fire Flow	18783.9 L/min	
	19000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible -15%

Fire Flow	**16150.0 L/min**

3. Reduction for Sprinkler Protection

Sprinklered -50%

Reduction	**-8075 L/min**

4. Increase for Separation Distance

N	3.1m-10m	20%	
S	3.1m-10m	20%	
E	10.1m-20m	15%	
W	>45m	0%	
	% Increase	**55%**	*value not to exceed 75% per FUS Part II, Section 4*

Increase	**8882.5 L/min**

Total Fire Flow

Fire Flow	16957.5 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	17000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _______________.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey
Water Supply For Public Fire Protection - 1999

Fire Flow Required - Block 208

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Composite 40% Wood Frame 60% Non-Combustible Construction

C 1.08 *Type of Construction Coefficient per FUS Part II, Section 1*
A 2533.0 m^2 *Total floor area based on FUS Part II section 1*

Fire Flow	11958.2 L/min	
	12000.0 L/min	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%
Fire Flow	**10200.0 L/min**

3. Reduction for Sprinkler Protection

Sprinklered	-50%
Reduction	**-5100 L/min**

4. Increase for Separation Distance

N	10.1m-20m	15%	
S	20.1m-30m	10%	
E	10.1m-20m	15%	
W	3.1m-10m	20%	
	% Increase	**60%**	*value not to exceed 75% per FUS Part II, Section 4*
	Increase	**6120.0 L/min**	

Total Fire Flow

Fire Flow	11220.0 L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	11000.0 L/min	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by ________________.
-Calculations based on Fire Underwriters Survey - Part II

Steve Merrick

Subject: RE: Chaudiere/Albert Island Development - Water Boundary Condition Request

From: Bazinet, Kristin [mailto:Kristin.Bazinet@ottawa.ca]
Sent: August-04-15 7:30 AM
To: Steve Merrick <smerrick@dsel.ca>; 'Adam Fobert' <afobert@DSEL.ca>
Cc: Buchanan, Richard <Richard.Buchanan@ottawa.ca>; Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: FW: Chaudiere/Albert Island Development - Water Boundary Condition Request

Hi Steve – find attached the boundary conditions as requested.

Thanks,
Kristin

Kristin Bazinet. P.Eng
Development Review
Examen des demandes d'aménagement

PLANNING AND GROWTH MANAGEMENT
URBANISME ET GESTION DE LA CROISSANCE

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 12180
ottawa.ca/planning / ottawa.ca/urbanisme

The following are boundary conditions, HGL, for hydraulic analysis at the Chaudière/Albert Islands Phase 1(Pressure Zone 1W), assumed to be connected to (see attached PDF for location):

1) 406mm on Wellington
2) 305mm on Booth

Minimum HGL = 108.0m (same at both locations)

Maximum HGL = 115.1m (same at both locations), the maximum pressure is estimated to be greater than 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.

Fire Flow*	Connection 1 (Wellington)
150 L/s	110.7m
217 L/s	110.1m
250 L/s	109.8m

300 L/s	109.2m
367 L/s	108.3m

*Includes Max Day demands of 2.49 L/s distributed evenly between both connection points (i.e. 1.75L/s at each connection point)

Fire Flow*	Connection 2 (Booth)
150 L/s	109.4m
217 L/s	107.4m
250 L/s	106.3m
300 L/s	104.2m
367 L/s	101.1m

*Includes Max Day demands of 2.49 L/s distributed evenly between both connection points (i.e. 1.75 L/s at each connection point)

These are for current conditions and are based on computer model simulation.

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.

From: Buchanan, Richard
Sent: July 28, 2015 2:46 PM
To: Bazinet, Kristin
Subject: FW: Chaudiere/Albert Island Development - Water Boundary Condition Request

Can you send this in for the boundary conditions and forward to DSEL?

Richard Buchanan, CET
Program Manager, Development Review
(Urban Services) Outer
Gestionaire de programme
(Secteur urbain) Exterieur

City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27801

ottawa.ca/planning / ottawa.ca/urbanisme

From: Steve Merrick [mailto:smerrick@dsel.ca]
Sent: July-28-15 1:17 PM
To: Abdul <Abdul.Mottalib@ottawa.ca>
Cc: Adam Fobert <afobert@dsel.ca>
Subject: RE: Chaudiere/Albert Island Development - Water Boundary Condition Request

Hi Abdul,

We require updated boundary conditions for Phase 1 of the above noted development. The connection locations are consistent with previous requests. Anticipated demands are as follows:

	L/min	L/s
Avg. Daily	69.6	1.16
Max Day	149.4	2.49
Peak Hour	228.7	3.81

Max Day + Fire Flow = 149.4 + 20,000 L/min

I hope you can expedite this process we are looking to submit as soon as possible.

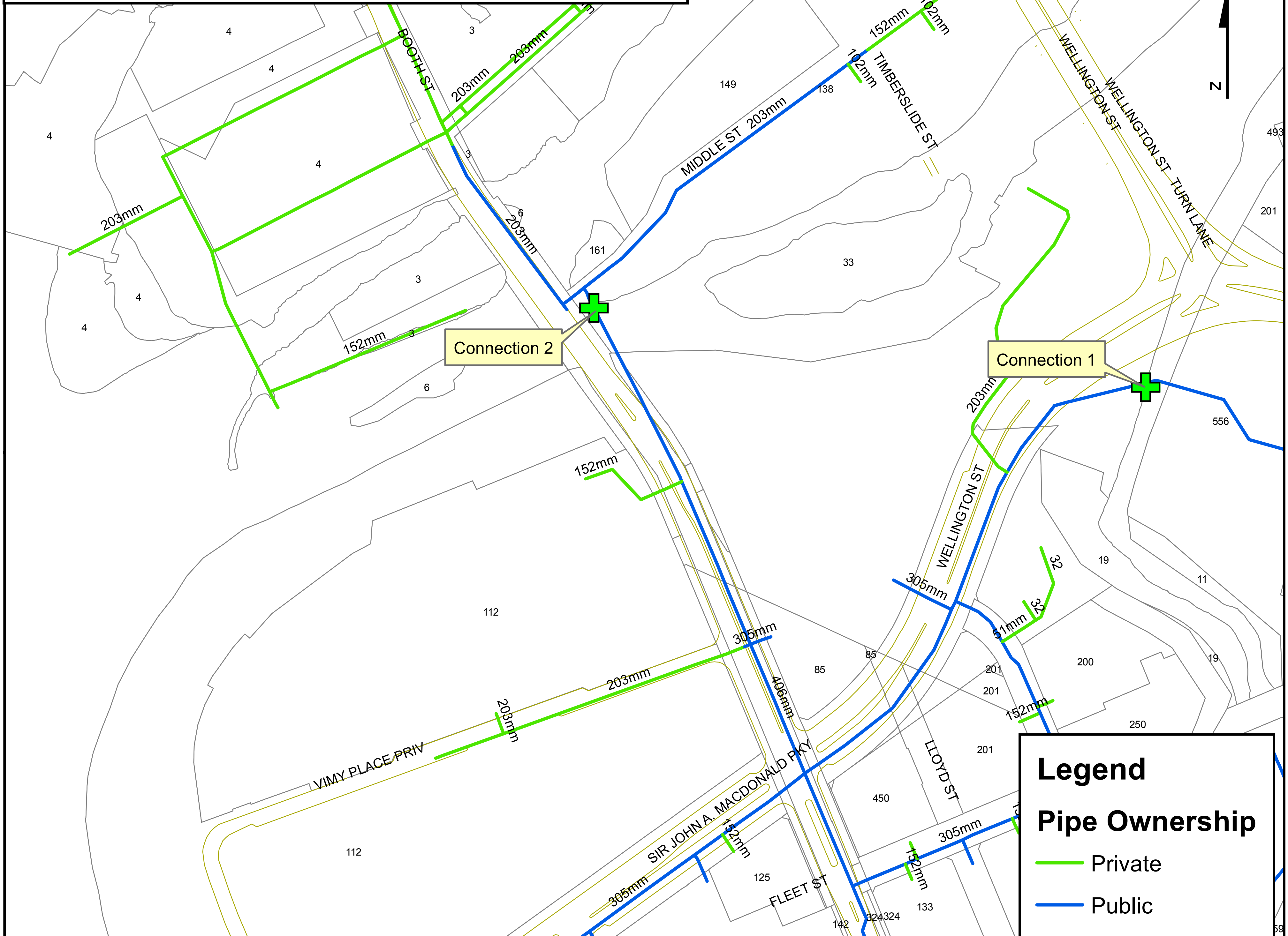
Steve Merrick, EIT.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

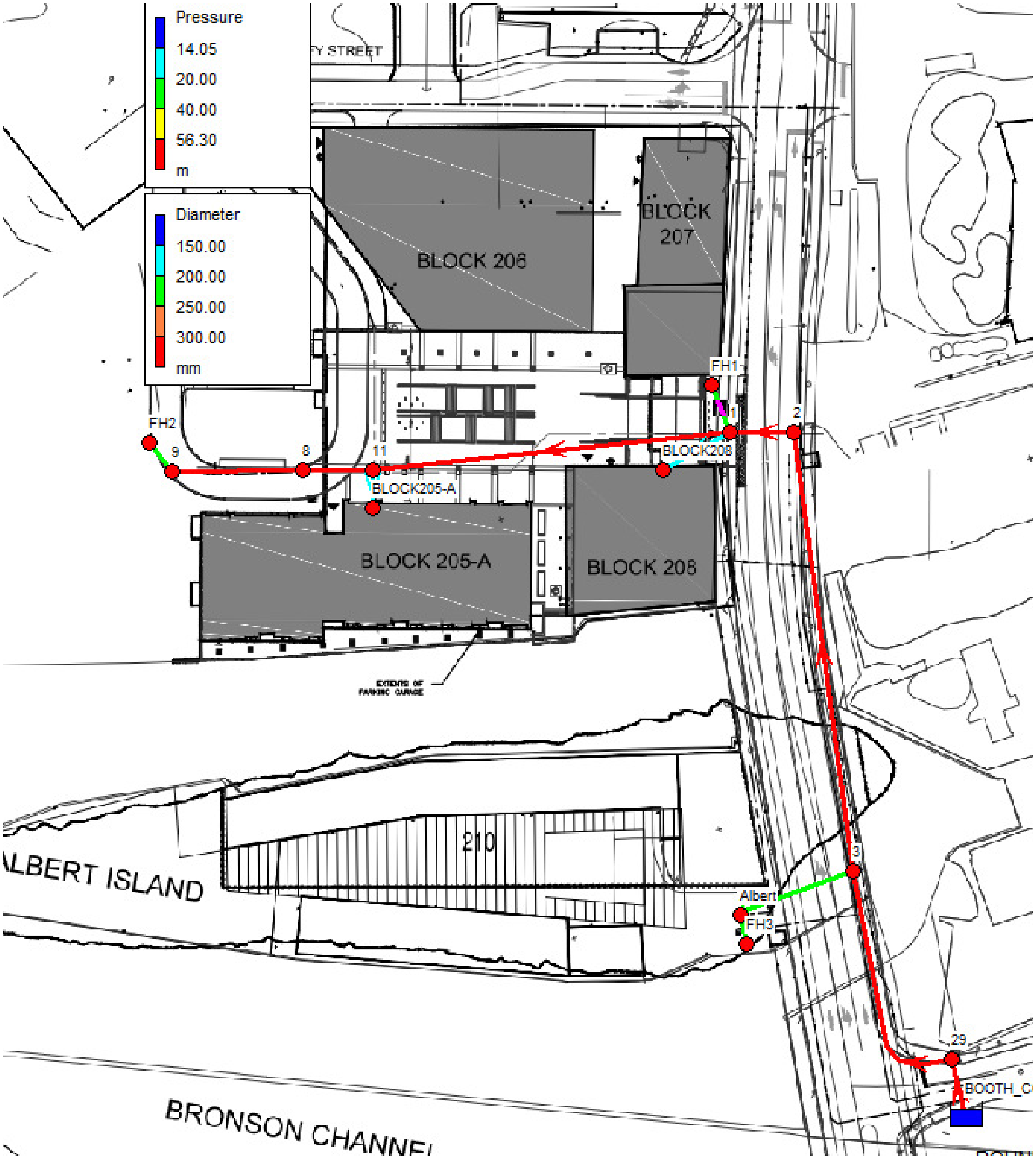
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 561
fax: (613) 836-7183
email: smerrick@DSEL.ca

Boundary Condition for Chaudiere/Albert Islands



AVERAGE DAY



Pressure
14.05
20.00
40.00
56.30
m
Diameter
150.00
200.00
250.00
300.00
mm
BLOCK 206
BLOCK 207
FH1
FH2
9
8
11
1
2
BLOCK208
BLOCK205-A
BLOCK 205-A
BLOCK 208
210
ALBERT ISLAND
3
Albert
FH3
29
BOOTH_C
BRONSON CHANNEL

```
**********************************************************************
*                            E P A N E T                             *
*                    Hydraulic and Water Quality                     *
*                    Analysis for Pipe Networks                      *
*                           Version 2.0                              *
**********************************************************************
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Input File: 2017-07-10_717_slm.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
43	29	BOOTH_CONNECTION	3	300
9	11	8	20	300
10	11	1	70	300
12	FH1	1	2.2	200
19	11	BLOCK205-A	10	150
21	1	BLOCK208	10	150
24	8	9	21	300
25	9	FH2	2	200
28	Albert	3	22	200
1	3	2	89	300
2	2	1	20	300
3	29	3	75	300
4	FH3	Albert	5	200

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours
29	0.00	115.10	62.35	0.00
1	0.00	115.10	63.99	0.00
8	0.00	115.10	62.45	0.00
FH1	0.00	115.10	61.14	0.00
11	0.00	115.10	62.70	0.00
BLOCK205-A	29.10	115.10	60.05	0.00
BLOCK208	4.00	115.10	60.15	0.00
FH2	0.00	115.10	59.82	0.00
9	0.00	115.10	62.67	0.00
Albert	1.60	115.10	61.35	0.00
3	0.00	115.10	61.35	0.00
2	0.00	115.10	64.10	0.00
FH3	0.00	115.10	61.35	0.00

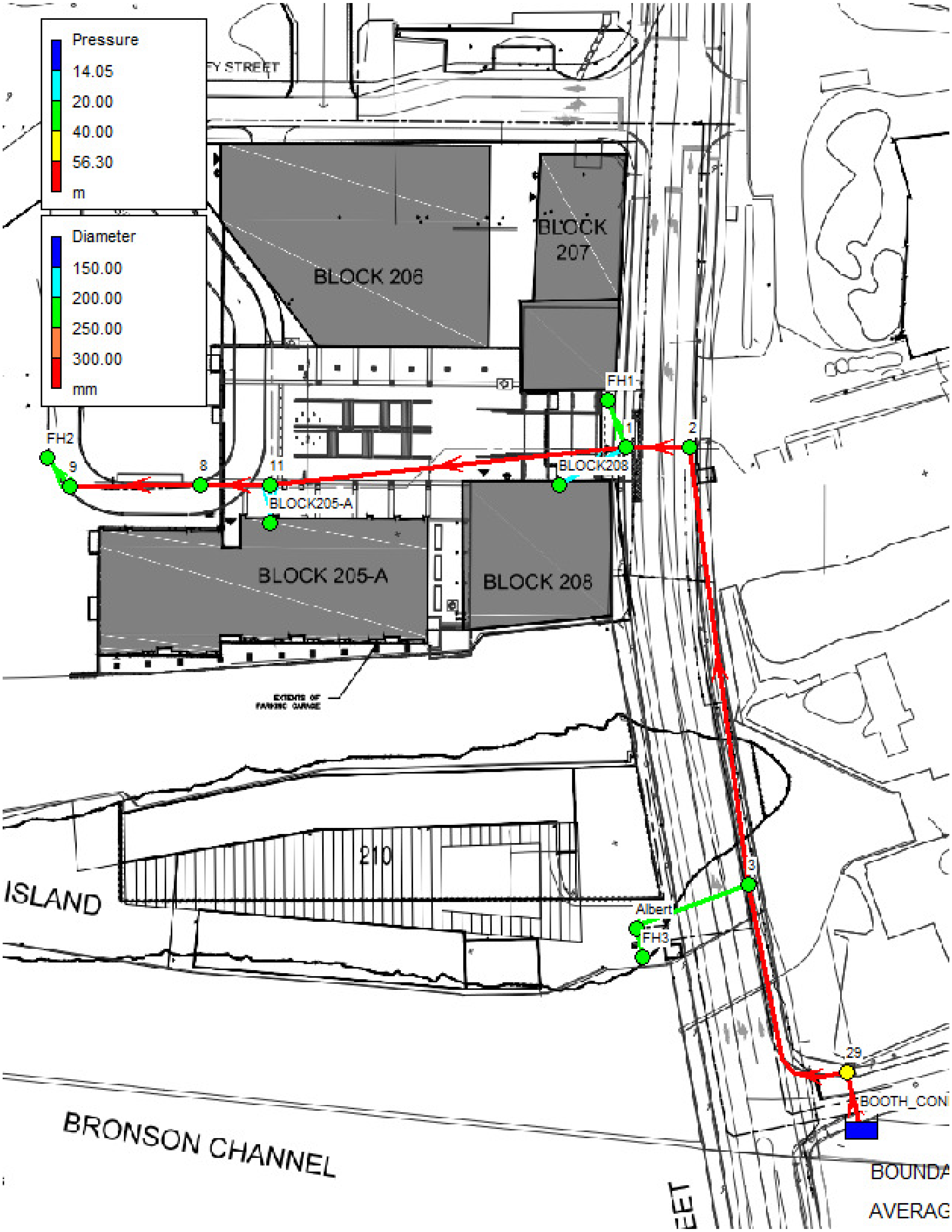
AVERAGE DAY

BOOTH_CONNECTION	-34.70	115.10	0.00	1.00 Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
43	-34.70	0.01	0.00	Open
9	0.00	0.00	0.00	Open
10	-29.10	0.01	0.00	Open
12	0.00	0.00	0.00	Open
19	29.10	0.03	0.02	Open
21	4.00	0.00	0.00	Open
24	0.00	0.00	0.00	Open
25	0.00	0.00	0.00	Open
28	-1.60	0.00	0.00	Open
1	33.10	0.01	0.00	Open
2	33.10	0.01	0.00	Open
3	34.70	0.01	0.00	Open
4	0.00	0.00	0.00	Open

MAX DAY + FIRE FLOW



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*                           E P A N E T                          *
*                   Hydraulic and Water Quality                  *
*                   Analysis for Pipe Networks                   *
*                         Version 2.0                            *
******************************************************************
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Input File: 2017-07-10_717_slm.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
43	29	BOOTH_CONNECTION	3	300
9	11	8	20	300
10	11	1	70	300
12	FH1	1	2.2	200
19	11	BLOCK205-A	10	150
21	1	BLOCK208	10	150
24	8	9	21	300
25	9	FH2	2	200
28	Albert	3	22	200
1	3	2	89	300
2	2	1	20	300
3	29	3	75	300
4	FH3	Albert	5	200

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours
29	0.00	104.04	51.29	0.00
1	0.00	85.63	34.52	0.00
8	0.00	83.81	31.16	0.00
FH1	8500.00	79.46	25.50	0.00
11	0.00	84.26	31.86	0.00
BLOCK205-A	138.10	84.26	29.21	0.00
BLOCK208	6.00	85.63	30.68	0.00
FH2	8500.00	77.25	21.97	0.00
9	0.00	83.39	30.96	0.00
Albert	2.30	93.14	39.39	0.00
3	0.00	93.14	39.39	0.00
2	0.00	88.17	37.17	0.00
FH3	0.00	93.14	39.39	0.00

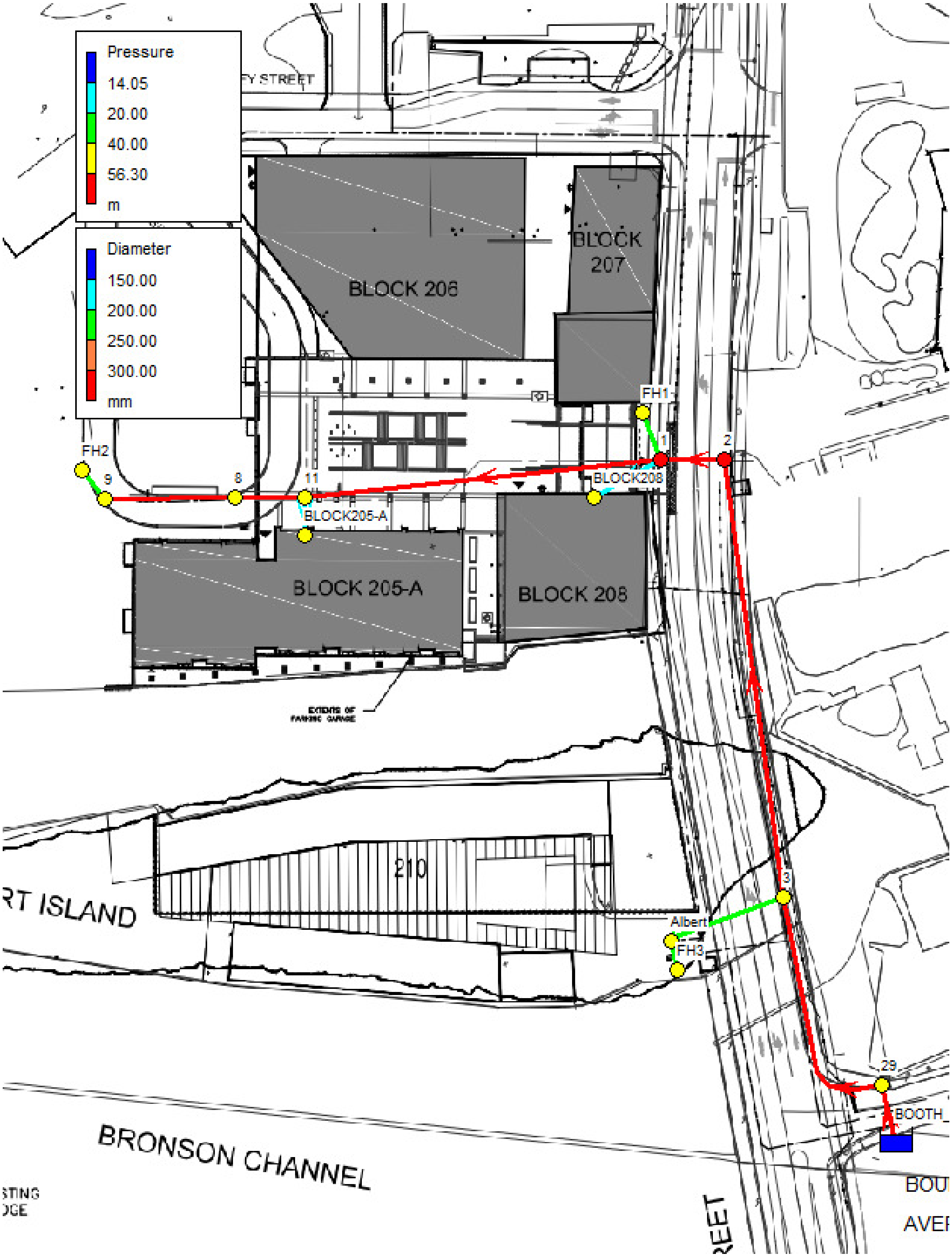
MAX DAY + FIRE FLOW

BOOTH_CONNECTION	-17146.40	104.20	0.00	1.00	Reservoir

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
43	-17146.40	4.04	52.11	Open
9	8500.00	2.00	22.39	Open
10	-8638.10	2.04	19.61	Open
12	-8500.00	4.51	2804.03	Open
19	138.10	0.13	0.46	Open
21	6.00	0.01	0.00	Open
24	8500.00	2.00	20.05	Open
25	8500.00	4.51	3072.40	Open
28	-2.30	0.00	0.00	Open
1	17144.10	4.04	55.83	Open
2	17144.10	4.04	127.01	Open
3	17146.40	4.04	145.36	Open
4	0.00	0.00	0.00	Open

PEAK HOUR



Pressure
14.05
20.00
40.00
56.30
m
Diameter
150.00
200.00
250.00
300.00
mm
BLOCK 206
BLOCK 207
BLOCK 205-A
BLOCK 208
FH1
FH2
FH3
BLOCK208
BLOCK205-A
Albert
BOOTH_
1
2
3
8
9
11
29
210
EXTENTS OF PARKING GARAGE
BRONSON CHANNEL
RT ISLAND
BOU
AVE

```
******************************************************************
*                         E P A N E T                            *
*                 Hydraulic and Water Quality                    *
*                 Analysis for Pipe Networks                     *
*                        Version 2.0                             *
******************************************************************
```

Input File: 2017-07-10_717_slm.net

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
43	29	BOOTH_CONNECTION	3	300
9	11	8	20	300
10	11	1	70	300
12	FH1	1	2.2	200
19	11	BLOCK205-A	10	150
21	1	BLOCK208	10	150
24	8	9	21	300
25	9	FH2	2	200
28	Albert	3	22	200
1	3	2	89	300
2	2	1	20	300
3	29	3	75	300
4	FH3	Albert	5	200

Node Results:

Node ID	Demand LPM	Head m	Pressure m	Quality hours
29	0.00	108.10	55.35	0.00
1	0.00	108.10	56.99	0.00
8	0.00	108.09	55.44	0.00
FH1	0.00	108.10	54.14	0.00
11	0.00	108.09	55.69	0.00
BLOCK205-A	209.20	108.08	53.03	0.00
BLOCK208	10.80	108.10	53.15	0.00
FH2	0.00	108.09	52.81	0.00
9	0.00	108.09	55.66	0.00
Albert	4.20	108.10	54.35	0.00
3	0.00	108.10	54.35	0.00
2	0.00	108.10	57.10	0.00
FH3	0.00	108.10	54.35	0.00

PEAK HOUR

BOOTH_CONNECTION	-224.20	108.10	0.00	1.00	Reservoir

Page 2

Link Results:

Link ID	Flow LPM	VelocityUnit m/s	Headloss m/km	Status
43	-224.20	0.05	0.02	Open
9	0.00	0.00	0.00	Open
10	-209.20	0.05	0.02	Open
12	0.00	0.00	0.00	Open
19	209.20	0.20	1.01	Open
21	10.80	0.01	0.00	Open
24	0.00	0.00	0.00	Open
25	0.00	0.00	0.00	Open
28	-4.20	0.00	0.00	Open
1	220.00	0.05	0.02	Open
2	220.00	0.05	0.03	Open
3	224.20	0.05	0.03	Open
4	0.00	0.00	0.00	Open

APPENDIX C

Wastewater Collection

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area	1.09 **ha**		**Peak Flow**
		Extraneous Flow Allowances	0.3

Phase	Block	Type	Unit Rate		No. of Units	Average Flow (L/s)	Peaking Factor (-)	Peak Flow (L/s)
1	208	Office	75	L/p/d	140	0.1	1.5	0.2
1	208	Retail	5	$L/m^2/d$	1457	0.1	1.5	0.1
1	208	Restaurant	125	L/seat/d	8	0.0	1.5	0.0
1	205.5A	Res	563.5	L/unit/d	71	0.5	4.0	1.9
1	205.5A	Retail	5	$L/m^2/d$	768	0.1	1.5	0.1
Temp	209	Office	75	L/p/d	30	0.03	1.50	0.04
					Total	**0.8**		**2.4**
					Total Wetweather Flow Estimate			**2.7**

Notes:
* Development stats per Windmill schedule dated 2016-02-01 and additional information received via email 2016-02-08.
* Office unit rate per Ontario Building Code 8.2.1.3.B. assuming $9.3m^2/p$
* Residential Unit rate assuming 70% one bedroom (1.4p/unit), 30% two bedroom (2.1 p/unit)
* Number of residential units from Site Plan by Hobin Architecture dated August 9, 2017
* Retail unit rate per City of Ottawa sewer design guidelines and assumes a 12 hour commercial operation
* Special Event area washrooms only per Windmill email 2016-02-08.

		P.F.
Estimated Total Residential Population	115	4.0

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April 25, 2016

Mr. Adam Fobert, P.Eng.
Senior Design Engineer
David Schaeffer Engineering Ltd.
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

Dear Adam:

Subject: Conceptual Design for a Temporary Pumping Station to Service the Zibi / Windmill Development on Chaudière Island - City of Ottawa

Hatch is pleased to present Draft #1 of the Conceptual Design Report for the Zibi / Windmill Temporary Pumping Station in the City of Ottawa. We understand that the ultimate discharge location is located in Gatineau, QC, and that approvals for the pumping station may be required from multiple agencies in Ontario and Quebec.

We trust this report is sufficient for your review and approval. Should you have any further questions, please do not hesitate to contact us.

Very truly yours,

Peter Rüsch, M.Eng., P.Eng., PMP

Senior Project Manager
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Zibi / Windmill Development, Chaudière Island, City of Ottawa

Conceptual Design Report

HATCH

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Revision and Version Tracking

Report Title: Zibi / Windmill Development, Chaudière Island, City of Ottawa – Conceptual Design Report

Submission Date: April 25, 2016

Version #	Filename:	Author	Checker	Approver	Date:
V0.50	Zibi_Temp_PS-Draft-1 Report	P. Rüsch	J. Black	P. Rüsch	April 25, 2016

This document has been formatted for double side printing.

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Appendix 1: Figures

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Appendix 2: Calculations

Appendix 3: Flygt Pump Data Sheet

Appendix 4: E-mail from DSEL (S. Merrick, August4, 2015 5:00pm)

1 Introduction

This report has been prepared for David Schaeffer Engineering Ltd. (DSEL) for the conceptual design of a temporary sewage pumping station on Chaudière Island in the City of Ottawa that will utilize as much as possible of the existing pumping station. The pumping station will service an initial part of the planned development on Chaudière Island.

The existing pumping station is located in an old paper mill building on Chaudière Island in Ottawa. Hatch staff visited the Pumping Station on June 30, 2015, in the presence of Steve Merrick from DSEL and Kristen Jorgensen from Windmill Development Group Ltd. For the purpose of this report the proposed pumping station will be called the Temporary Zibi Sanitary Pumping Station (TZSPS). The analysis in this report is in part based on the information gathered during the site visit and from additional sources as indicated.

The internal collection system will collect sewage by gravity to the existing wet well. The proposed pumps / forcemain combination will lift the collected sewage to a manhole located in Gatineau, QC, to be treated elsewhere.

The purpose of this report is to:

- Provide the design criteria and rational used to provide a conceptual design for the sewage pumping station;
- List specific requirements incorporated in the design;
- Confirm the hydraulic size and material assumed for the forcemain used to complete the hydraulic design for coordination with the forcemain design.

This report is to be submitted to the owner, and as required, to the Cities of Ottawa and Gatineau for review and comments for inclusion into the final design.

It is assumed that the pumping station will be owned and operated by Windmill, the developer of the Zibi Development. Should the ownership / operating authority be different, Hatch will require clarification prior to detailed design.

2 Methodology

2.1 Background Information

The pumping station will utilize the existing wet well in an existing building. It is understood that the sewage will be conveyed by gravity to the wet well. Phasing of the development will be in accordance with the Functional Servicing Report, however, due to the small size of the temporary pumping station, no phasing is proposed.

2.2 Capacity of the Pumping Station

The capacity of the pumping station is based on the total estimated peak wet weather flow rate of 11.9 L/s, provided by David Schaeffer Engineering Ltd. via e-mail (Appendix 4). However, DSEL also requested an estimate of the maximum flow that can be achieved with the forcemain / existing wet well combination. It was assumed that this was to mean that the aim of the pump selection should be to optimise the utilization of the existing facilities, and to achieve a maximum reasonable flow utilizing the existing wet well, while keeping the operating costs at a reasonable level.

3 Design of the Pumping Station

3.1 Design Parameters

The City of Ottawa Design Guidelines call for a minimum forcemain diameter of 100 mm. The MOE Design Guidelines (2008) call for a flow velocity of at least 0.6 m/s in forcemains, however Hatch's preference is for a velocity of above 1.0m/s (ideally 1.25 to 1.5 m/s) to maintain adequate self-cleaning of the forcemain. However this preference has to be balanced with friction losses to ensure economic operation of the system. It may be noted here that at any given velocity smaller forcemains will transport grit better than larger forcemains (all other things being equal) as result of the shear stress.

The existing pumping station has limited to no storage capacity to cater for emergency overflow conditions. During detailed design, the time to emergency overflow will be finalized with the operating authority and the Cities of Ottawa and Gatineau. It is expected that a Time-to-Overflow of up to 30 minutes will be required at minimum. It is understood that there are options to have emergency storage in the existing building by re-purposing existing holding facilities.

Access for maintenance personnel to the wet well will be reviewed during detailed design to ensure that it meets legal requirements.

3.2 Sizing of the Wet Well

The existing wet well is proposed to be used for the temporary pumping. The flow of the pumping station (11.9 L/s) will be accommodated by 1 duty and 1 standby pump, each of which will be able to handle the nominal inflow individually. For conceptual design purposes a flow rate of 12 L/s was taken. The wet well capacity required to achieve a given pump cycle time can be calculated as follows:

$$V = \frac{T_c \cdot Q}{4}$$

Where:

V = wet well volume in L;

T_c = Pump Cycle Time in seconds;

Q = Pump discharge rate, in L/s

For a pump cycle time of 5 minutes (i.e. a combined 12 starts per hour) the wet well volume can be calculated as:

$$V = \frac{T_c \cdot Q}{4} = \frac{180s \cdot 12\ L/s}{4} = 900L$$

It is noted that Hatch has used a reduced cycle time from what is usually used since this is a temporary pumping station and pump rotation for longevity is not as much of an issue as in permanent pumping stations.

In addition there is an option to use the lower flow rates, based on using Variable Speed Drives. In this case the live storage could be reduced to ~ 500 L, having a live storage depth of 0.2 m. As such the existing wet well is sufficient to have adequate pump cycle times to avoid overloading the pump motors.

The existing wet well is roughly 1.8 m x 1.3 m, which does not meet the minimum size requirement from the MOECC. Hatch is of the opinion that the wet well may be used for the temporary pumping station; the proposed pumps will fit into the wet well. Since the pumps will not normally operate at the same time, we have no major concerns that we believe cannot be dealt with in detailed design. However, there is a remaining risk that the MOECC may not approve of this option.

3.3 Float Control Levels

The selected pumps (refer to Section 3.5) require a minimum water depth of 260 mm, as per the specification sheet. Hatch will review the suction conditions in detailed design to ensure that the required submergence is maintained and to maximise storage utilization. For the purpose of this report it is assumed that satisfactory suction conditions can be maintained with a minimum water depth of 500 mm. As shown in Section 3.2 above, the live depth required will be less than 0.5 m. With a wet well depth of ~ 3.7 m, there will be adequate live volume available for pump operation and alarm levels. Operating levels will be set during detailed design.

For the purpose of system head calculations, a suction depth of 0.5m and live well depth of 0.5 m were assumed.

3.4 Sizing and Pressure Class of the Forcemain, and System Curve

The velocity of sewage in the forcemain during normal operation should be in the range of 0.9m/s to 1.5m/s, as recommended in section 7.2.5.2 of the "Ottawa Sewer Design Guidelines". The forcemain should have a minimum nominal diameter of 100mm, as specified in section 7.2.5.1 of the "Ottawa Sewer Design Guidelines".

The static head of this pumping station will range between 3.9 and 4.4 m during normal operation (up to the "Alarm" level), based on the operating levels as defined in Section 3.3 above and the forcemain discharge elevation of 49.9 m (pipe obvert).

The forcemain material has not been finalised, therefor the calculations were based on a nominal diameter of 100 mm, using part stainless steel and HDPE. A flow rate of 12 L/s achieves a velocity of 1.5 m/s, which satisfies the MOE requirements and the City of Ottawa requirements. The following friction losses have been calculated for the forcemain, in accordance with City of Ottawa and MOE requirements, for a nominal flow of 12.0L/s:

- Hazen Williams C (HW-C) = 100: 20.1 m;
- HW-C = 110: 16.9 m
- HW-C = 120: 14.4 m.

Since the forcemain has not been finalised, it will be possible to select the pipe material for the remaining sections of the forcemain to ensure that the selected pumps will work within a good operating range. Hatch has assumed that a Hazen Williams C value of 110 (representing an average between the MOE design guidelines and HDPE design values) is likely to be more representative of the actual hydraulic conditions.

A system curve has been calculated from 2 L/s to 22.0 L/s using the HW-C factors above for the 100mm forcemain. Minor losses were estimated by allowing for a 'k' value of 15 for fittings and pipework inside the pumping station. This 'k' value results in an additional dynamic head of 1.8 m at a flow rate of 12.0L/s. A graph of the system curve is attached. (Appendix 1: Figure 3). The following lines have been plotted:

- Maximum static head, and friction losses based on a HW-C of 100, along with minor losses;
- Intermediate static head, and friction losses based on a HW-C of 110, along with minor losses;
- Minimum static head, and friction losses based on a HW-C of 120, along with minor losses.

The intermediate head represents the most likely system curve, and this was used as the basis for the pump selection. The full calculations are shown in Appendix 2.

3.5 Pump Selection and Maximum Achievable Capacity

From the hydraulic system curve, two identical pumps have been selected for the proposed pumping station; these are Flygt NP 3127 SH 3 ~ Adaptive 248.

Each pump is a submersible wastewater pump with a 155 mm diameter impeller. It operates with a 60 Hz, 3 phase motor with an output rating of 8.2 kW at 3495 rpm. These pumps require a minimum water level of 260 mm, therefore the floor level proposed in Section 3.3, 0.5 m below the lead pump stop level, is suitable. Hatch proposes that one pump is to be equipped with a mix-flush valve.

The flow velocity in the forcemain for the nominal flow of 12.0 L/s is at the upper limit of the desired forcemain velocity based on the City of Ottawa design requirements. Based on the current pump selection, the pump will require to be equipped with Variable Speed Drives (VSD) to ensure that the existing wet well can be utilized. Using VSDs increases the number of allowable starts per hour per pump, and at the same time reduces the critical flow rate. In this case VSDs will also save some energy, which over the life of the pumping station will likely more than offset the additional capital costs.

Running at full speed, the selected pump will result in a pumpage of approximately 14.5 L/individually This flow rate would result in a flow velocity of 1.8 m/s, which is higher than the preferred range of the City of Ottawa, but below the MOECC maximum flow velocity criterion.

The data sheet for the Flygt NP 3127 SH 3 ~ Adaptive 248 pumps is attached in Appendix 3.

The system curve / pump curve attached in Appendix 1 shows the flow range that the pump can handle, given the hydraulic design parameters.

3.6 Emergency Backup Times and Emergency Overflow

The existing pumping station wet well only has an emergency storage capacity of ~ 6000 L; with an inflow rate of 12.0 L/s this will only provide emergency storage for 500 s, or just over 8 minutes. This will likely not be approved without additional storage for emergencies. The existing storage will be sufficient for an initial period, until such time that the incoming peak flows exceeds 3.33 L/s, based on the general requirement form the MOECC to have at least 30 minutes of emergency storage.

Once this low flow rate is exceeded, additional emergency overflow storage will very likely be required for continued approval.

4 Electrical Works

4.1 Power Supply

The existing pumping station is equipped with a 600 V power supply panel, however this was based on lower power pumps. It should be assumed that the panels will require at least a full upgrade, but it would be prudent to assume that the panels are to be replaced.

Depending on the power supply options available, the pumps may be either equipped with 600 V or 208 V three phase motors. The latter motors may be supplied from a 240/120 V single phase supply if desirable. In this case, the VSDs will have to be de-rated to suit the conditions.

Standby power will be required for the pumping station; this may be in the form of a mobile generator. This may factor into the overall power supply arrangement. The generator shall be breaker protected to suit the system layout. For reliability a diesel generator is recommended.

4.2 Control Panel

The control panel will contain the control schematic (3-position mode selector switch, push-buttons and any other ancillary equipment required to provide a safe pump control). These components will be supplied as loose equipment, in the same package as the submersible pumps. The general contractor will install, commission and start-up the control system as per the pump control supplier documentation.

4.2.1 Operation

The pump control shall be based on the “Lead-Lag” principle. The operator can select three modes of operation from 2 selector switches:

- MANUAL mode: Each pump can be started and stopped individually, from push-buttons;
- AUTO mode: Pumps start and stop as per the “LEAD-LAG” principle.
  At the first start pump P-1 will be the lead pump and will start at the LWL level. Should the level reach the HWL level, then the lag pump P-2 starts. The lag pump will stop once the LWL is reached. The lead pump stop once the LLWL level is reached. Once both pumps are stopped, pump P-2 becomes the “lead” pump and P-1 the “lag” pump. After each operation, the “lead” position alternates.
- OFF position: Both pumps are stopped.

The control panel will include the LIT-1 ultrasonic level transducer. This transducer will provide the level inputs, (LLWL, LWL, HWL, HHWL) to be used to control the pumps.

The controls for the submersible pumps will be provided by the pump manufacturer (Flygt).

Each pump circuit is fitted with a thermomagnetic circuit breaker with instantaneous magnetic trip and adjustable overload relay.

Control power for pump schematic is to be provided from a Un-interruptible Power Supply (UPS). The UPS will power the level transmitter and auto-dialer.

A heating element with a thermostat will control the temperature of the control panel.

The following items shall also be included in the motor control panel:

- duplex receptacle with ground fault protection;
- lightning arrester;
- motor temperature surveillance;
- intrinsically safe relays for level switches installed in classified area;
- MINICAS relays for submersible motor protection;
- smoke detector for smoke alarm;
- manual transfer switch for generator operation of the station;

- dry contacts for the alarm function of high-high water level, pump faults, power failure, smoke alarm, diesel generator fault, illegal entry is to be wired to the alarm control panel.

The time totalizer and event counter will enable staff to monitor the performance of pumps. A flow meter can be provided if required, or a system curve can be provided to allow for the calculation of volume of sewage being pumped based on the running times of the pumping units.

Each pump will be monitored for failing to respond to a "start" command. The pump failing to respond will be locked out and the lag pump will assume the lead duty position.

A separate “Alarm Control Panel” (ACP) will be provided on the outside of the pumping station main control panel. The ACP will house the alarming control logic required and a programmable auto-dialer to relay alarms. The dialer will store at least 4 pre-set emergency numbers and will dial in case of an alarm until the dialed call is acknowledged. As a backup, an industrial outdoor strobe/audible alarm unit will also be mounted on the outside of the ACP that will be activated only in case of an auto-dialer failure, or if the auto-dialer alarm is not acknowledged within an adjustable short period of time. Alarm notifications instructions will also be added near the strobe light/audible alarm for manual alarming.

5 Confined Space Entry Requirements

The proposed wet well pumping station is classified as a "confined space" similar to any underground maintenance hole or chamber.

Entry to the wet well is subject to the following requirements:

- Ontario Regulation 632/05 (Confined Spaces)

  http://www.elaws.gov.on.ca/html/regs/english/elaws_regs_050632_e.htm

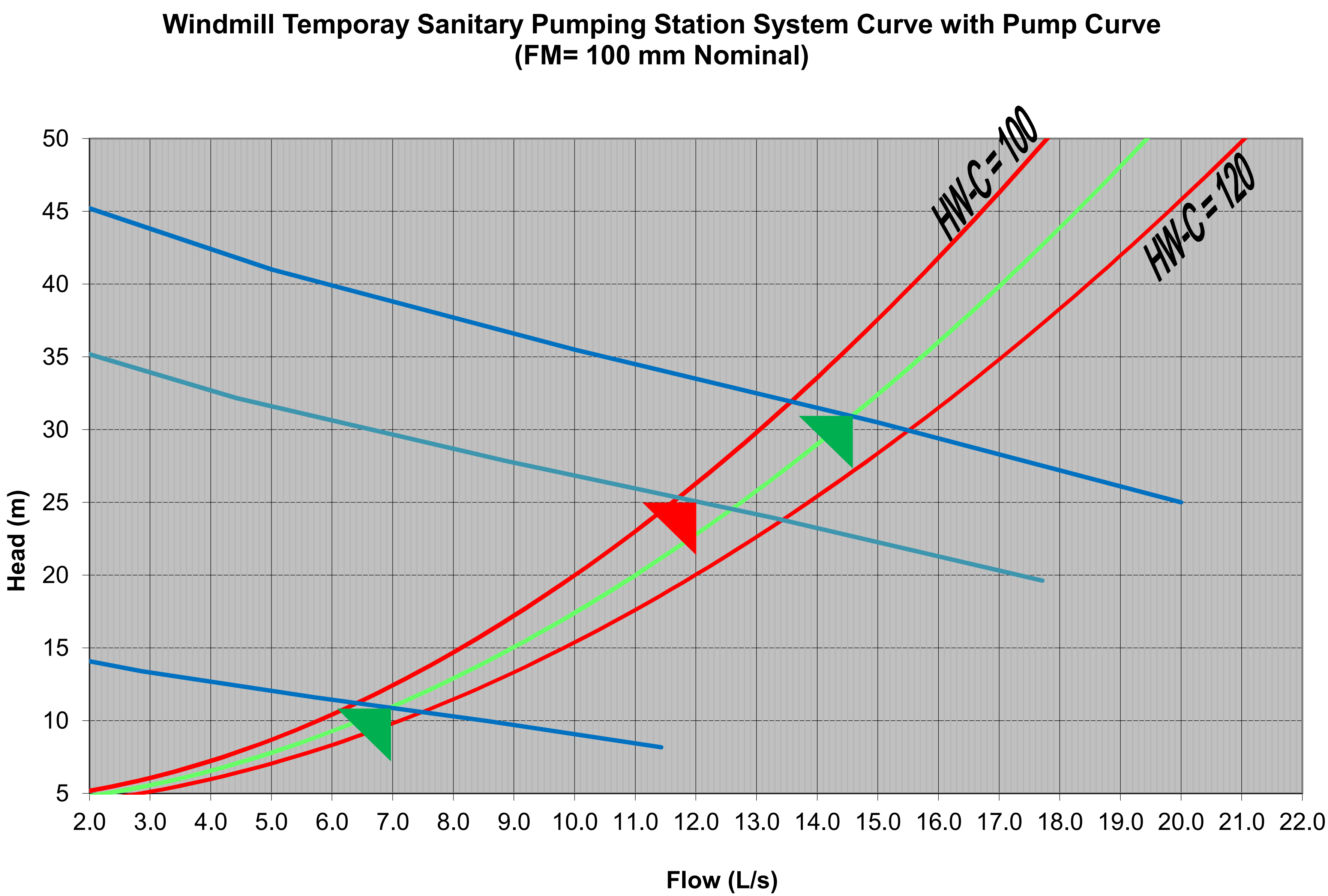
- Confined Spaces Guidelines prepared by the Ontario Ministry of Labour

  http://www.labour.gov.on.ca/english/hs/pdf/gl_confined.pdf

Entry procedures shall be developed by the owner of the Pumping Station in accordance with the above noted regulations and laws, and safety equipment shall meet legal requirements and be maintained in strict accordance with manufacturer’s requirements.

Appendix 1: Figures

System Graph


Windmill Temporay Sanitary Pumping Station System Curve with Pump Curve
(FM= 100 mm Nominal)
HW-C = 100
HW-C = 120
Head (m)
Flow (L/s)
50
45
40
35
30
25
20
15
10
5
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
12.0
13.0
14.0
15.0
16.0
17.0
18.0
19.0
20.0
21.0
22.0

Appendix 2: System Curve and Calculations

Spreadsheet to calculate the Sytem Curve for a temporary Zibi / Windmill PS on Chaudiere Island in Ottawa, pumping to Gatineau

prepared by Peter Rüsch, April 19, 2016

Elevation at discharge Location:	49.90 m (obvert)	(At the discharge location)	
Forcemain Length:	465 m		
Forcemain Inner Diameter:	100.0 mm	(Nominal Diameter=100 mm: to be confirm in detail design)	
Sump Max level:	46.00 m		3.90
Sump Min level:	45.50 m		4.40
Sump Intermediate level:	45.75 m		

		Friction Losses:			**Local Losses:**	**System Curve**		
		HW-C			**k=**			
Flow (l/s):	**Velocity (m/s):**	**100**	**110**	**120**	**15**	**Max**	**Ave**	**Min**
2.0	0.25	0.73	0.61	0.52	0.05	5.18	4.81	4.47
2.2	0.28	0.87	0.73	0.62	0.06	5.33	4.94	4.58
2.4	0.31	1.02	0.86	0.73	0.07	5.49	5.08	4.70
2.6	0.33	1.18	0.99	0.84	0.08	5.67	5.23	4.83
2.8	0.36	1.36	1.14	0.97	0.10	5.85	5.38	4.97
3.0	0.38	1.54	1.29	1.10	0.11	6.05	5.55	5.11
3.2	0.41	1.74	1.46	1.24	0.13	6.26	5.73	5.27
3.4	0.43	1.94	1.63	1.39	0.14	6.49	5.92	5.43
3.6	0.46	2.16	1.81	1.54	0.16	6.72	6.12	5.60
3.8	0.48	2.39	2.00	1.70	0.18	6.97	6.33	5.78
4.0	0.51	2.63	2.20	1.87	0.20	7.23	6.55	5.97
4.2	0.53	2.88	2.41	2.05	0.22	7.49	6.78	6.17
4.4	0.56	3.13	2.63	2.24	0.24	7.77	7.02	6.38
4.6	0.59	3.40	2.85	2.43	0.26	8.07	7.27	6.59
4.8	0.61	3.68	3.09	2.63	0.29	8.37	7.52	6.81
5.0	0.64	3.97	3.33	2.83	0.31	8.68	7.79	7.04
5.2	0.66	4.27	3.58	3.05	0.34	9.01	8.07	7.28
5.4	0.69	4.58	3.84	3.27	0.36	9.34	8.35	7.53
5.6	0.71	4.90	4.11	3.50	0.39	9.69	8.65	7.78
5.8	0.74	5.23	4.38	3.73	0.42	10.05	8.95	8.05
6.0	0.76	5.57	4.67	3.97	0.45	10.41	9.26	8.32
6.2	0.79	5.92	4.96	4.22	0.48	10.79	9.59	8.60
6.4	0.81	6.27	5.26	4.48	0.51	11.18	9.92	8.88
6.6	0.84	6.64	5.57	4.74	0.54	11.58	10.26	9.18
6.8	0.87	7.02	5.88	5.01	0.57	11.99	10.61	9.48
7.0	0.89	7.41	6.21	5.28	0.61	12.41	10.97	9.79
7.2	0.92	7.80	6.54	5.57	0.64	12.85	11.33	10.11
7.4	0.94	8.21	6.88	5.86	0.68	13.29	11.71	10.44
7.6	0.97	8.63	7.23	6.15	0.72	13.74	12.10	10.77
7.8	0.99	9.05	7.59	6.46	0.75	14.20	12.49	11.11
8.0	1.02	9.49	7.95	6.77	0.79	14.68	12.89	11.46
8.2	1.04	9.93	8.32	7.08	0.83	15.16	13.31	11.82
8.4	1.07	10.38	8.70	7.41	0.87	15.66	13.73	12.18
8.6	1.09	10.84	9.09	7.74	0.92	16.16	14.16	12.55
8.8	1.12	11.32	9.49	8.07	0.96	16.68	14.59	12.93
9.0	1.15	11.80	9.89	8.42	1.00	17.20	15.04	13.32
9.2	1.17	12.29	10.30	8.77	1.05	17.74	15.50	13.72
9.4	1.20	12.79	10.72	9.12	1.10	18.28	15.96	14.12
9.6	1.22	13.29	11.14	9.49	1.14	18.84	16.44	14.53
9.8	1.25	13.81	11.58	9.85	1.19	19.40	16.92	14.94
10.0	1.27	14.34	12.02	10.23	1.24	19.98	17.41	15.37
10.2	1.30	14.87	12.47	10.61	1.29	20.56	17.91	15.80
10.4	1.32	15.42	12.92	11.00	1.34	21.16	18.41	16.24
10.6	1.35	15.97	13.39	11.40	1.39	21.77	18.93	16.69
10.8	1.38	16.54	13.86	11.80	1.45	22.38	19.46	17.14
11.0	1.40	17.11	14.34	12.20	1.50	23.01	19.99	17.60
11.2	1.43	17.69	14.83	12.62	1.55	23.64	20.53	18.07
11.4	1.45	18.28	15.32	13.04	1.61	24.29	21.08	18.55
11.6	1.48	18.88	15.82	13.47	1.67	24.94	21.64	19.03
11.8	1.50	19.48	16.33	13.90	1.73	25.61	22.21	19.53
12.0	**1.53**	**20.10**	**16.85**	**14.34**	**1.78**	**26.28**	**22.78**	**20.02**
12.2	1.55	20.72	17.37	14.78	1.84	26.97	23.36	20.53
12.4	1.58	21.36	17.90	15.24	1.91	27.66	23.96	21.04
12.6	1.60	22.00	18.44	15.69	1.97	28.37	24.56	21.56
12.8	1.63	22.65	18.99	16.16	2.03	29.08	25.17	22.09
13.0	1.66	23.31	19.54	16.63	2.09	29.80	25.78	22.62
13.2	1.68	23.98	20.10	17.11	2.16	30.54	26.41	23.17
13.4	1.71	24.66	20.67	17.59	2.23	31.28	27.04	23.72
13.6	1.73	25.34	21.24	18.08	2.29	32.03	27.68	24.27
13.8	1.76	26.04	21.82	18.58	2.36	32.80	28.33	24.84
14.0	1.78	26.74	22.41	19.08	2.43	33.57	28.99	25.41
14.2	1.81	27.45	23.01	19.58	2.50	34.35	29.66	25.98
14.4	1.83	28.17	23.61	20.10	2.57	35.14	30.33	26.57
14.6	1.86	28.90	24.22	20.62	2.64	35.94	31.02	27.16
14.8	1.88	29.64	24.84	21.14	2.71	36.75	31.71	27.76
15.0	1.91	30.38	25.47	21.68	2.79	37.57	32.41	28.37
15.2	1.94	31.14	26.10	22.22	2.86	38.40	33.11	28.98
15.4	1.96	31.90	26.74	22.76	2.94	39.24	33.83	29.60
15.6	1.99	32.67	27.39	23.31	3.02	40.09	34.55	30.23
15.8	2.01	33.45	28.04	23.87	3.09	40.95	35.28	30.86
16.0	2.04	34.24	28.70	24.43	3.17	41.81	36.02	31.50
16.2	2.06	35.04	29.37	25.00	3.25	42.69	36.77	32.15
16.4	2.09	35.84	30.04	25.57	3.33	43.58	37.53	32.81
16.6	2.11	36.66	30.73	26.15	3.42	44.47	38.29	33.47
16.8	2.14	37.48	31.41	26.74	3.50	45.38	39.06	34.14
17.0	2.16	38.31	32.11	27.33	3.58	46.29	39.84	34.81
17.2	2.19	39.15	32.81	27.93	3.67	47.22	40.63	35.50
17.4	2.22	40.00	33.52	28.53	3.75	48.15	41.43	36.19
17.6	2.24	40.85	34.24	29.14	3.84	49.09	42.23	36.88
17.8	2.27	41.72	34.97	29.76	3.93	50.04	43.04	37.59
18.0	2.29	42.59	35.70	30.38	4.02	51.00	43.86	38.30
18.2	2.32	43.47	36.43	31.01	4.11	51.97	44.69	39.02
18.4	2.34	44.36	37.18	31.65	4.20	52.95	45.53	39.74
18.6	2.37	45.25	37.93	32.29	4.29	53.94	46.37	40.47
18.8	2.39	46.16	38.69	32.93	4.38	54.94	47.22	41.21
19.0	2.42	47.07	39.46	33.58	4.47	55.95	48.08	41.96
19.2	2.44	47.99	40.23	34.24	4.57	56.96	48.95	42.71
19.4	2.47	48.92	41.01	34.90	4.66	57.99	49.82	43.47
19.6	2.50	49.86	41.79	35.57	4.76	59.02	50.71	44.24
19.8	2.52	50.81	42.59	36.25	4.86	60.07	51.60	45.01
20.0	2.55	51.76	43.39	36.93	4.96	61.12	52.50	45.79
20.2	2.57	52.73	44.19	37.62	5.06	62.18	53.40	46.57
20.4	2.60	53.70	45.01	38.31	5.16	63.26	54.32	47.37
20.6	2.62	54.68	45.83	39.01	5.26	64.34	55.24	48.17
20.8	2.65	55.66	46.66	39.71	5.36	65.43	56.17	48.97
21.0	2.67	56.66	47.49	40.42	5.47	66.52	57.11	49.79
21.2	2.70	57.66	48.33	41.14	5.57	67.63	58.05	50.61
21.4	2.72	58.67	49.18	41.86	5.68	68.75	59.01	51.44
21.6	2.75	59.69	50.03	42.59	5.78	69.88	59.97	52.27
21.8	2.78	60.72	50.90	43.32	5.89	71.01	60.94	53.11
22.0	2.80	61.76	51.76	44.06	6.00	72.16	61.91	53.96

Wet Well Analysis and Storage requirements for the existing Windmill PS:

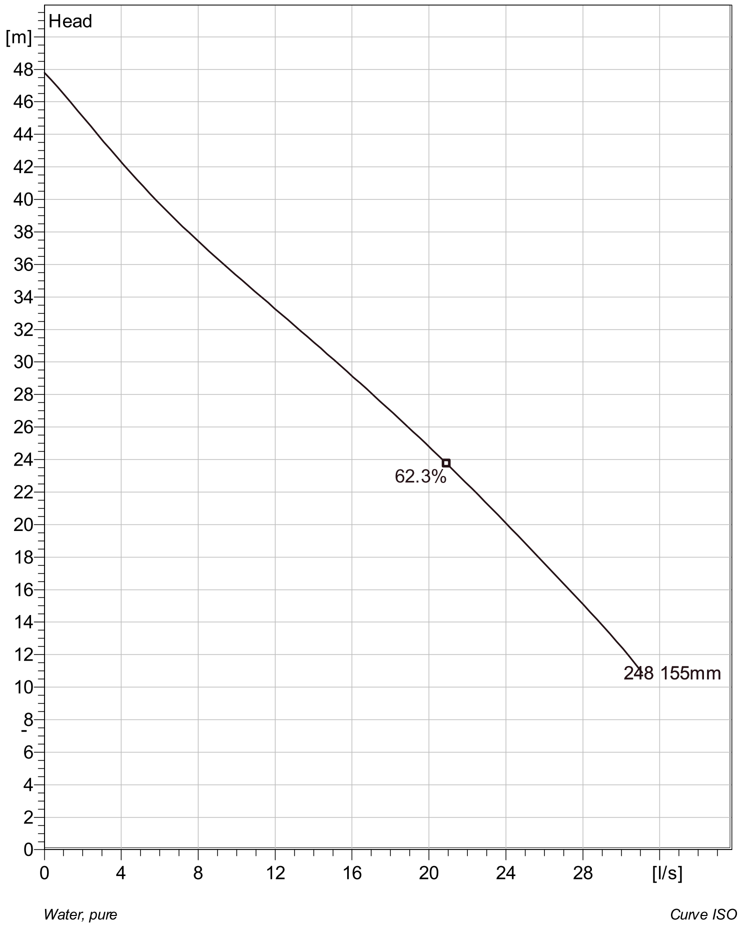
prepared by Peter Rüsch, April 19, 2016

Input Flow Rate:	12.00	L/s		
Output Flow Rate:	12.00	L/s		
Storage Time:	300	s	(at a combined 12 start per hour)	
Storage Volume:	900	L		
Storage Volume of 2400 MH:				
	L		W	
Rectangular:	1.83	m	1.30 m	
Storage / m:	2.38	m^3 /m		
Storage / m (less equipment):	2.14	m^3 /m	(at 90% effectiveness)	
Depth of Storage (Live Storage):	0.42	m		
Incoming Pipe Invert:	N/A	m		
HHWL (Alarm on):	N/A	m	Level Unknown, if any.	
HWL (Lag Pump on):	N/A	m		
LWL (Lead Pump on):	46.00	m	Approximately, based on lid level and measurement	~ 2.6 m below lid
LLWL (Lead Pump off):	45.50	m	Approximately, based on lid level and measurement	~ 3.0 m below lid
Sump Invert:	45.00	m	Not measured, however pumps were visible.	
Storage in PS:				
Overflow Invert:	48.70	m		
HHWL:	46.20		Assumed Alarm Level to determine time-to-overflow	
	2.50	m		
Emergency Storage Required:	1800	s		
Inflow Rate:	12			
Volume:	21600	L		
Less Volume in PS (Overflow-HHWL):	5948	L		
Time to overflow:	496	s		
	8	min		
Additional Storage required for Time-to-Overflow of 30 minutes:	~ 15653	L		

Appendix 3: Flygt Pump Curve

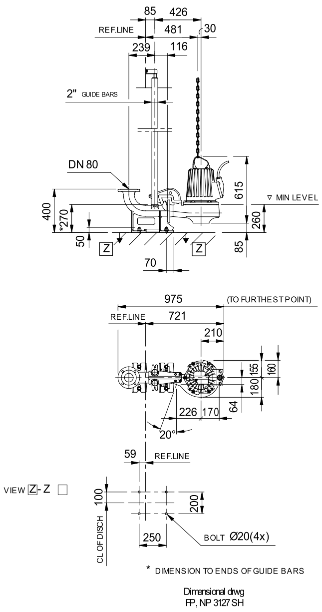
NP 3127 SH 3~ Adaptive 248

Technical specification



Note: Picture might not correspond to the current configuration.

Installation: P - Semi permanent, Wet



General

Patented self cleaning semi-open channel impeller, ideal for pumping in most waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	80 mm
Inlet diameter	80 mm
Impeller diameter	155 mm
Number of blades	2

Motor

Motor #	N3127.160 21-11-2AL-W 11hp
Stator variant	40
Frequency	60 Hz
Rated voltage	400 V
Number of poles	2
Phases	3~
Rated power	8.2 kW
Rated current	15 A
Starting current	128 A
Rated speed	3495 1/min
Power factor	
1/1 Load	0.92
3/4 Load	0.90
1/2 Load	0.85
Efficiency	
1/1 Load	87.7 %
3/4 Load	88.4 %
1/2 Load	87.7 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2016-04-25	

xylem

NP 3127 SH 3~ Adaptive 248

Performance curve

FLYGT

Pump

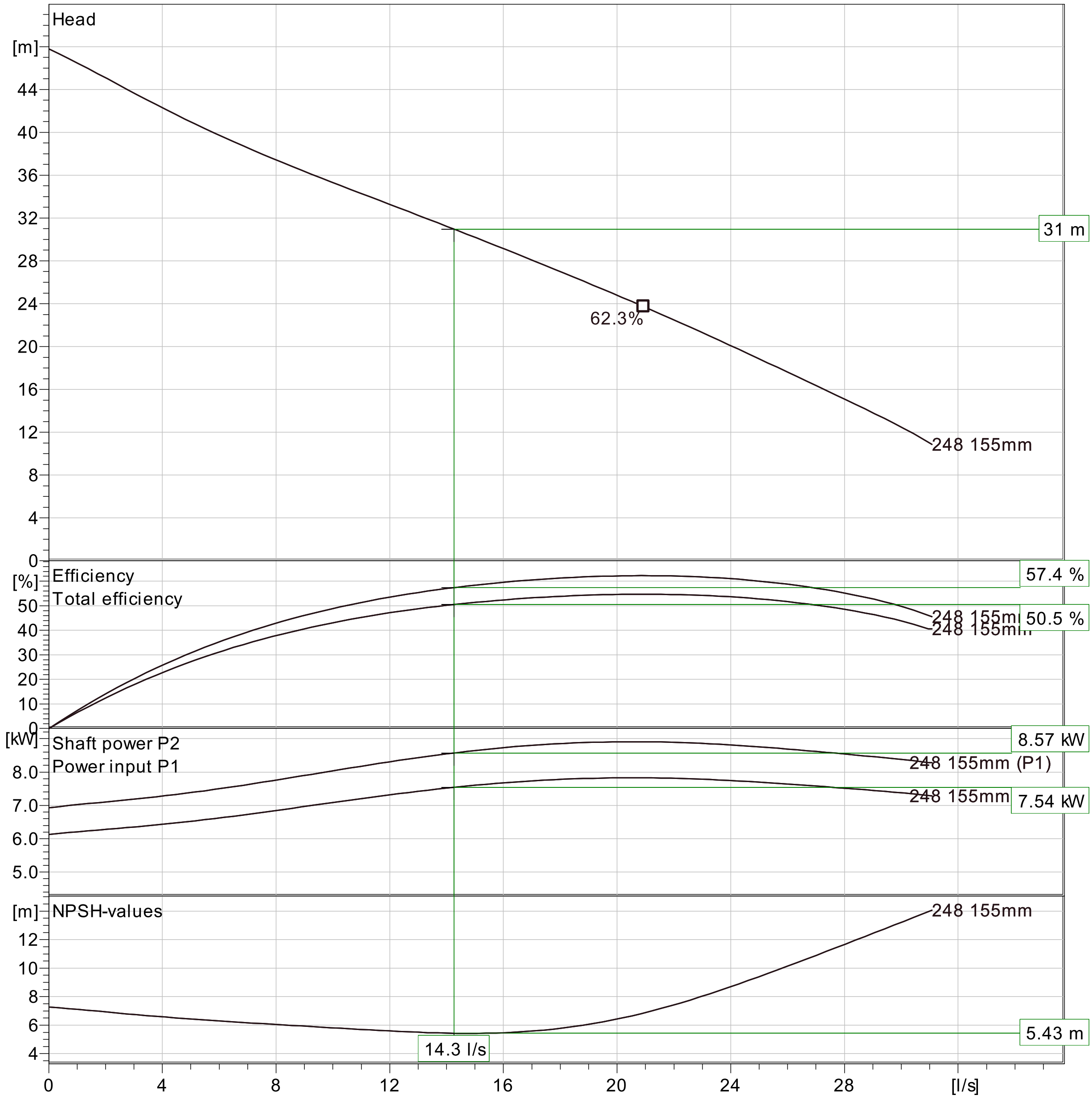
Discharge Flange Diameter	80 mm
Inlet diameter	80 mm
Impeller diameter	155 mm
Number of blades	2

Motor

Motor #	N3127.160 21-11-2AL-W 11hp
Stator variant	40
Frequency	60 Hz
Rated voltage	400 V
Number of poles	2
Phases	3~
Rated power	8.2 kW
Rated current	15 A
Starting current	128 A
Rated speed	3495 1/min

Power factor	
1/1 Load	0.92
3/4 Load	0.90
1/2 Load	0.85

Efficiency	
1/1 Load	87.7 %
3/4 Load	88.4 %
1/2 Load	87.7 %



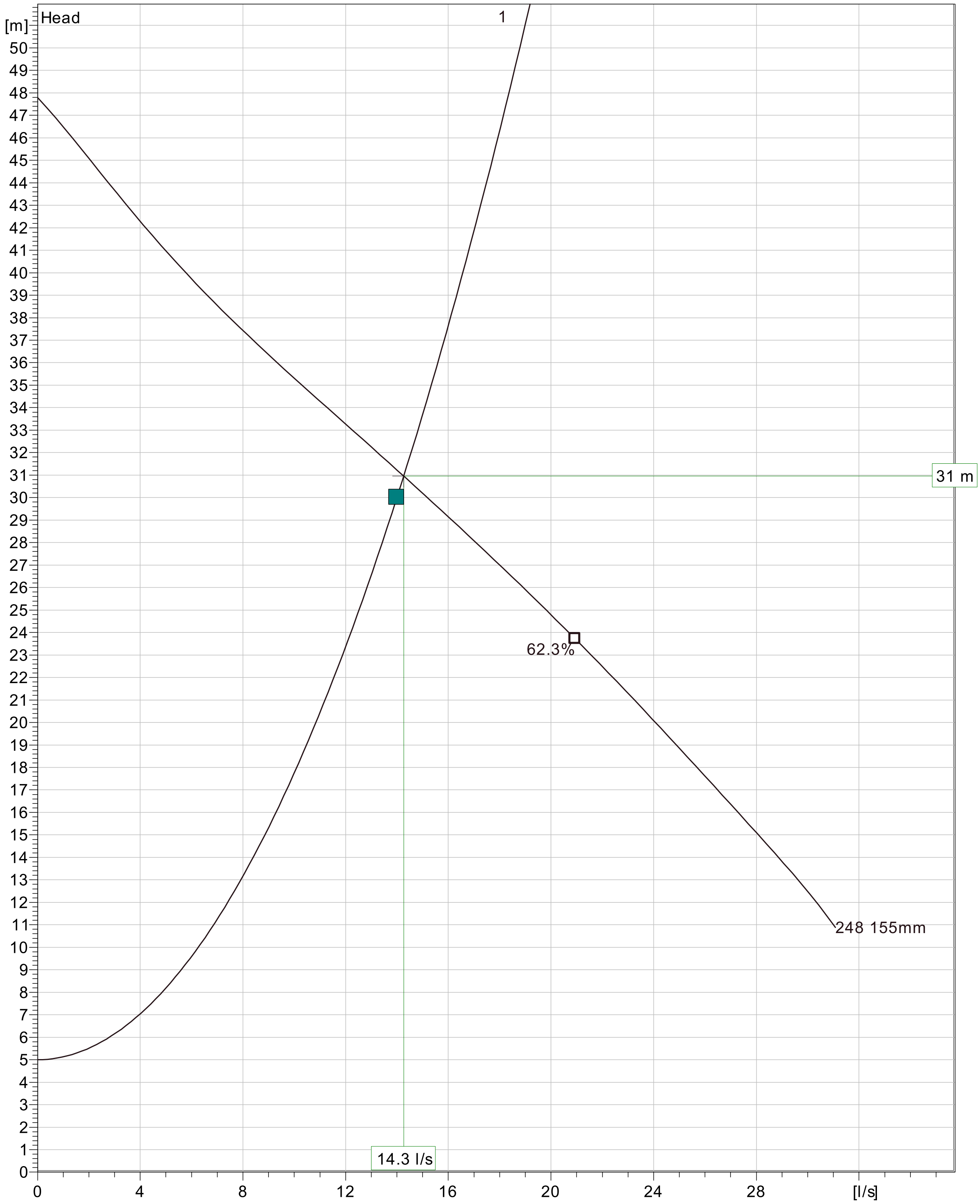
Water, pure

Curve ISO

Project	Project ID	Created by	Created on	Last update
			2016-04-25	

NP 3127 SH 3~ Adaptive 248

Duty Analysis

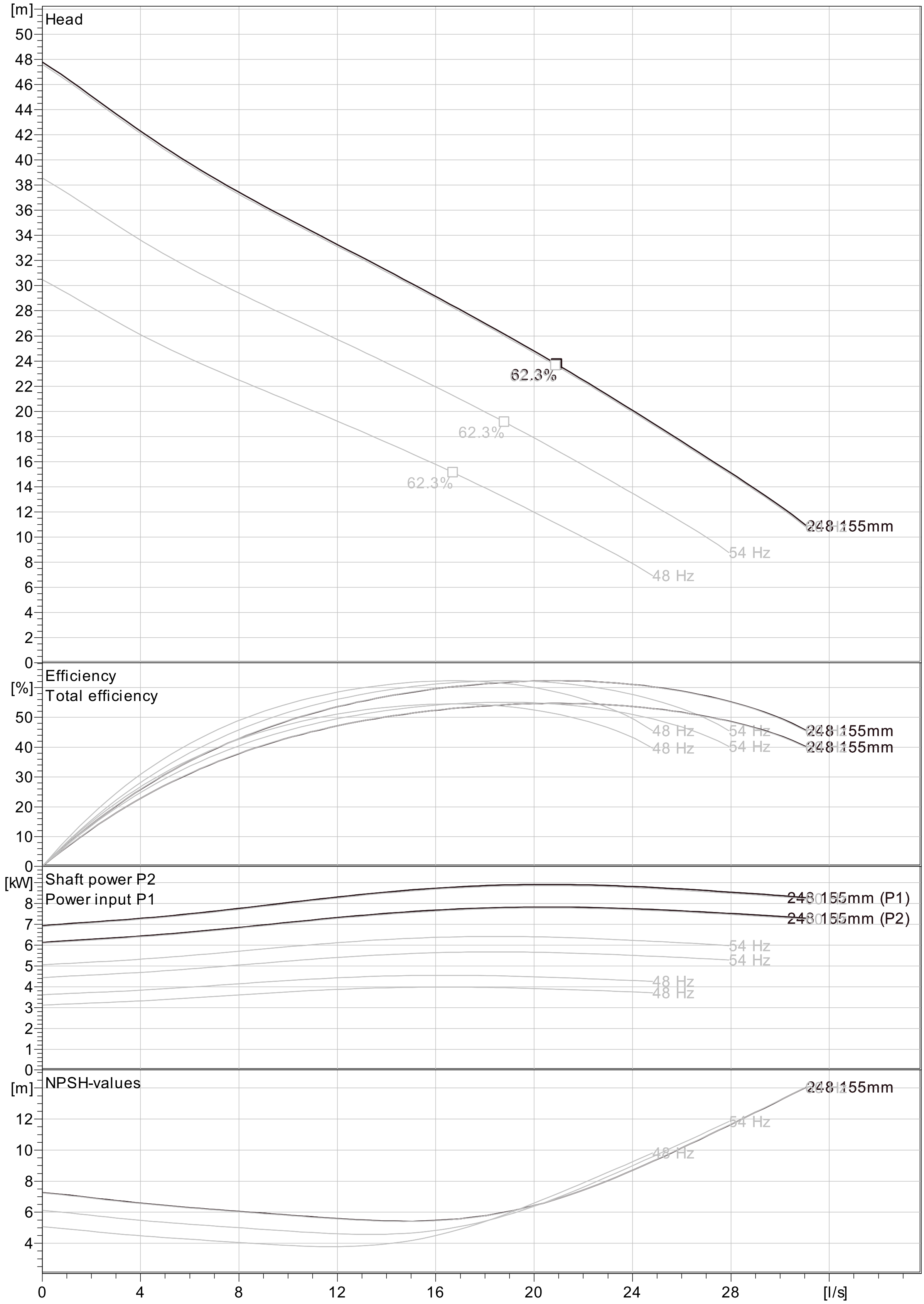


	Individual pump			Total					
Pumps running /System	Flow	Head	Shaft power	Flow	Head	Shaft power	Pump eff.	Specific energy	NPSHre
1	14.3 l/s	31 m	7.54 kW	14.3 l/s	31 m	7.54 kW	57.4 %	0.000167 kWh/l	5.43 m

Project	Project ID	Created by	Created on	Last update
			2016-04-25	

NP 3127 SH 3~ Adaptive 248

VFD Curve



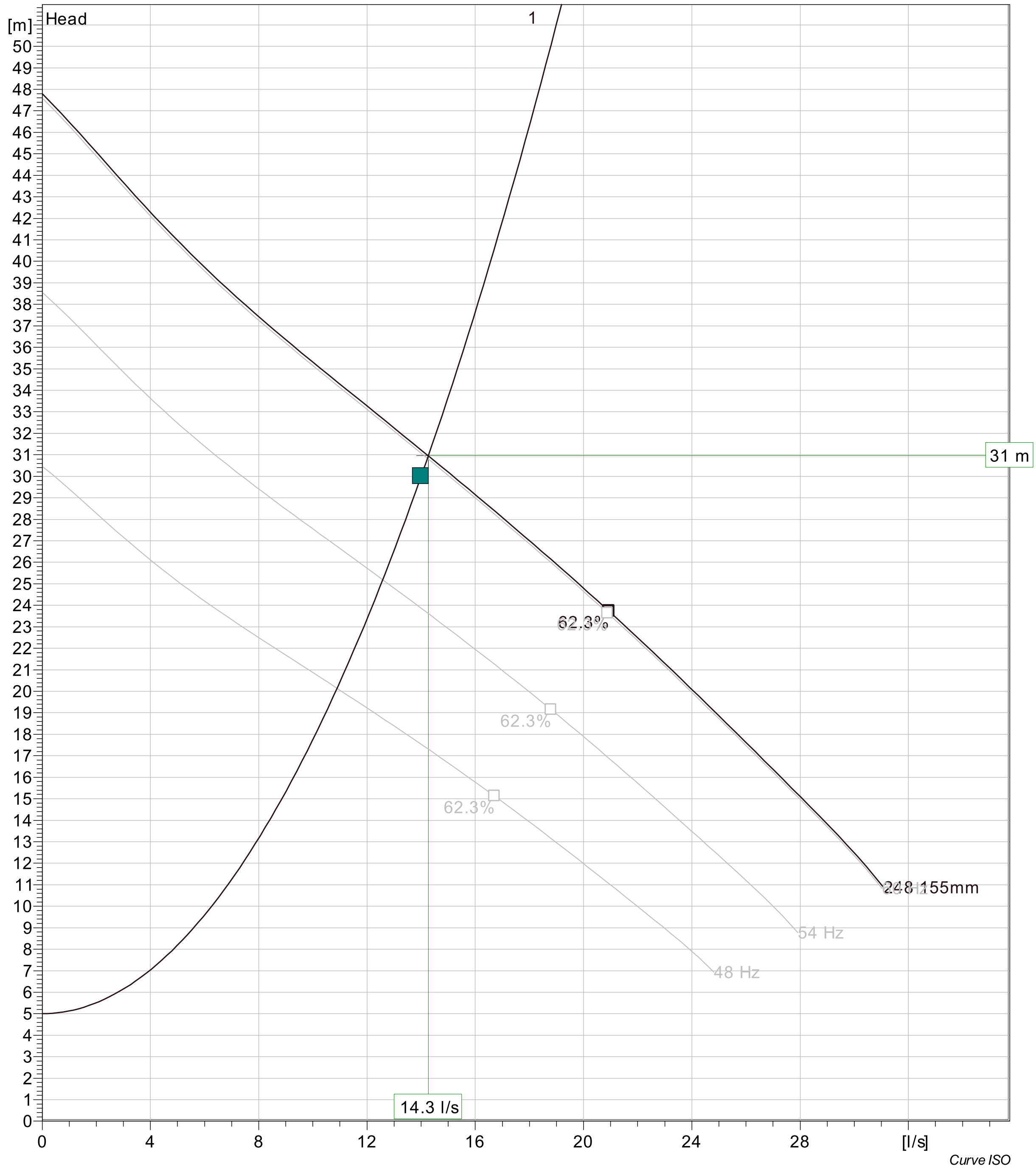
Curve ISO

Project	Project ID	Created by	Created on	Last update
			2016-04-25	

xylem

NP 3127 SH 3~ Adaptive 248

VFD Analysis

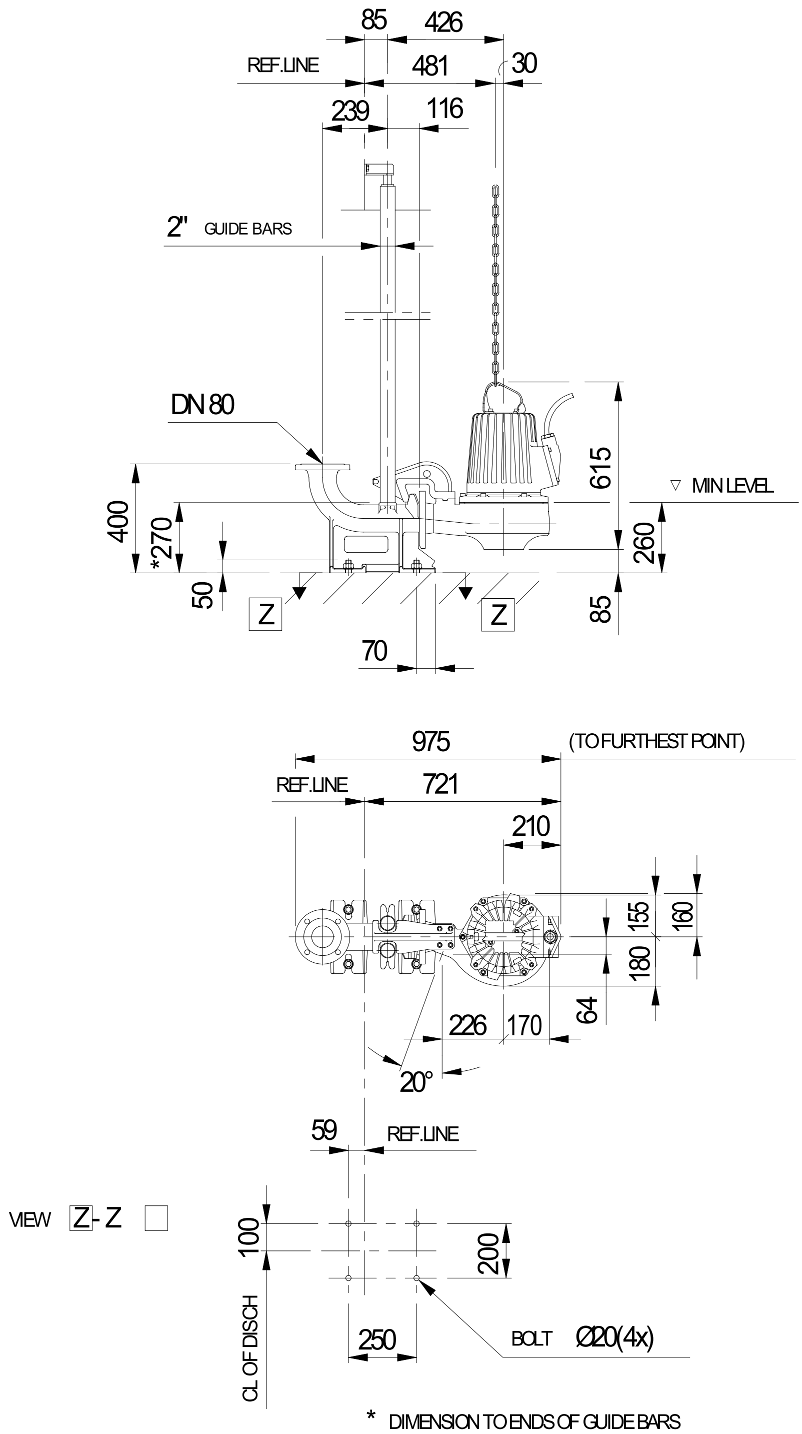


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	14.3 l/s	31 m	7.54 kW	14.3 l/s	31 m	7.54 kW	57.4 %	0.000167 kWh/l	5.43 m
1	60 Hz	14.2 l/s	30.8 m	7.5 kW	14.2 l/s	30.8 m	7.5 kW	57.4 %	0.000166 kWh/l	5.42 m
1	54 Hz	12.6 l/s	25.2 m	5.45 kW	12.6 l/s	25.2 m	5.45 kW	57 %	0.000136 kWh/l	4.58 m
1	48 Hz	10.9 l/s	20.1 m	3.81 kW	10.9 l/s	20.1 m	3.81 kW	56.5 %	0.000111 kWh/l	3.81 m

Project	Project ID	Created by	Created on	Last update
			2016-04-25	

NP 3127 SH 3~ Adaptive 248

Dimensional drawing



Weight

Dimensional drwg
FP, NP 3127 SH

Project	Project ID	Created by	Created on	Last update
			2016-04-25	

Appendix 4: E-mail re System Flow

Rusch, Peter

From:	Adam Fobert <afobert@dsel.ca>
Sent:	Tuesday, March 22, 2016 4:00 PM
To:	Peter Rüsch
Cc:	Steven Merrick
Subject:	717: Windmill Zibi - Interim and Ultimate PS
Attachments:	san-2016-03-03_717-zibi_master-plan_adf.xlsx; 2016-03-22_windmill-zibi-hatch_coord.dwg

Hello Peter,

As discussed yesterday, please find the following and attached:

Interim Pump Station:
1) Estimated inflow: 11.9L/s (see attached calc sheet – tab for Phase 1A)
2) Estimated Length of new forcemain to be extended from temp PS to existing 100mm dia stainless steel = 206m
3) Estimated Length of new forcemain to be extended from existing 100mm dia stainless to outlet = 22m
4) Estimated Length of existing 100mm dia stainless steel = 237m
5) Total Forcemain length = 465m
6) Forcemain elevations: The forcemain should exit the existing building at 1.8m below the existing grade, which would put it at 51.29m. We could go lower, but I'd rather avoid as much rock as possible for the interim line. If the forcemain continues along these lines, we'll encounter a high point of 52.49m. Then it will be downhill to the bridge where is will maintain a relatively constant elevation of ~50.50m. The receiving invert of our outlet in Gatineau is at ~49.9m. This means it could almost be a gravity line if it weren't for the 240m of flat run on the bridge.

**** Please note that the client is looking to see how they can maximize the use of the interim facility. Can you provide a sense of the maximum flow that the 100mm diameter forcemain could handle? We would have to discuss what the resulting wet well storage is.

Ultimate Pump Station:
1) Estimated Inflow = 49.2L/s (see attached calc sheet – tab for Master Servicing)
2) Incoming invert = 46.51m
3) Total Forcemain Length ~560m

I have also attached a CAD of our plans to date that show the forcemain routing.

Let me know if you need anything else.

I suspect we'll need to have a discussion about the interim forcemain elevations.

Adam Fobert, P.Eng.
Manager of Site Plan Design

DSEL
david schaeffer engineering ltd.

APPENDIX D

Stormwater Management

										Sewer Data								
Area ID	**Up**	**Down**	**Area**	**C**	**Indiv AxC**	**Acc AxC**	**T_C**	**I**	**Q**	**DIA**	**Slope**	**Length**	**$A_{hydraulic}$**	**R**	**Velocity**	**Qcap**	**Time Flow**	**Q / Q full**
			(ha)	**(-)**			**(min)**	**(mm/hr)**	**(L/s)**	**(mm)**	**(%)**	**(m)**	**(m^2)**	**(m)**	**(m/s)**	**(L/s)**	**(min)**	**(-)**
104B			0.846	0.85	0.72	0.72												
207			0.033	0.90	0.03	0.03												
104A	BLDG	STM104	0.257	0.80	0.21	0.95	10.0	104.2	276.2	525	1.00	48.9	0.216	0.131	1.99	430.1	0.4	0.64
FUT.			0.099	0.90	0.09	0.09												
104C	STM104	STM103	0.032	0.85	0.03	1.07	10.4	102.1	303.6	525	1.50	26.8	0.216	0.131	2.43	526.7	0.2	0.58
	STM103	STM102	0.000	0.00	0.00	1.07	10.6	101.2	300.9	525	1.00	26.7	0.216	0.131	1.99	430.1	0.2	0.70
	STM102	STM101	0.000	0.00	0.00	1.07	10.8	100.1	297.6	600	0.50	7.0	0.283	0.150	1.54	434.2	0.1	0.69
	STM101	HW100	0.000	0.00	0.00	1.07	10.9	99.7	296.5	600	0.50	33.6	0.283	0.150	1.54	434.2	0.4	0.68

Stormceptor Sizing Detailed Report

PCSWMM for Stormceptor

Project Information

Date	27/04/2016
Project Name	Zibi Ontario
Project Number	717
Location	N/A

Stormwater Quality Objective

This report outlines how Stormceptor System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the Stormceptor Sizing Summary.

Stormceptor System Recommendation

The Stormceptor System model STC 4000 achieves the water quality objective removing 80% TSS for a City of Toronto (clay, silt and sand) particle size distribution.

The Stormceptor System

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for all rainfall events, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Stormceptor is the only oil and sediment separator on the market sized to remove TSS for a wide range of particle sizes, including fine sediments (clays and silts), that are often overlooked in the design of other stormwater treatment devices.

Small storms dominate hydrologic activity, US EPA reports

"*Early efforts in stormwater management focused on flood events ranging from the 2-yr to the 100-yr storm. Increasingly stormwater professionals have come to realize that small storms (i.e. < 1 in. rainfall) dominate watershed hydrologic parameters typically associated with water quality management issues and BMP design. These small storms are responsible for most annual urban runoff and groundwater recharge. Likewise, with the exception of eroded sediment, they are responsible for most pollutant washoff from urban surfaces. Therefore, the small storms are of most concern for the stormwater management objectives of ground water recharge, water quality resource protection and thermal impacts control.*"

"*Most rainfall events are much smaller than design storms used for urban drainage models. In any given area, most frequently recurrent rainfall events are small (less than 1 in. of daily rainfall).*"

"Continuous simulation offers possibilities for designing and managing BMPs on an individual site-by-site basis that are not provided by other widely used simpler analysis methods. Therefore its application and use should be encouraged."

– US EPA Stormwater Best Management Practice Design Guide, Volume 1 – General Considerations, 2004

Design Methodology

Each Stormceptor system is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology from up-to-date local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective.

The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing (summary of analysis presented in Appendix 2):

- Site parameters
- Continuous historical rainfall, including duration, distribution, peaks (Figure 1)
- Interevent periods
- Particle size distribution
- Particle settling velocities (Stokes Law, corrected for drag)
- TSS load (Figure 2)
- Detention time of the system

The Stormceptor System maintains continuous positive TSS removal for all influent flow rates. Figure 3 illustrates the continuous treatment by Stormceptor throughout the full range of storm events analyzed. It is clear that large events do not significantly impact the average annual TSS removal. There is no decline in cumulative TSS removal, indicating scour does not occur as the flow rate increases.

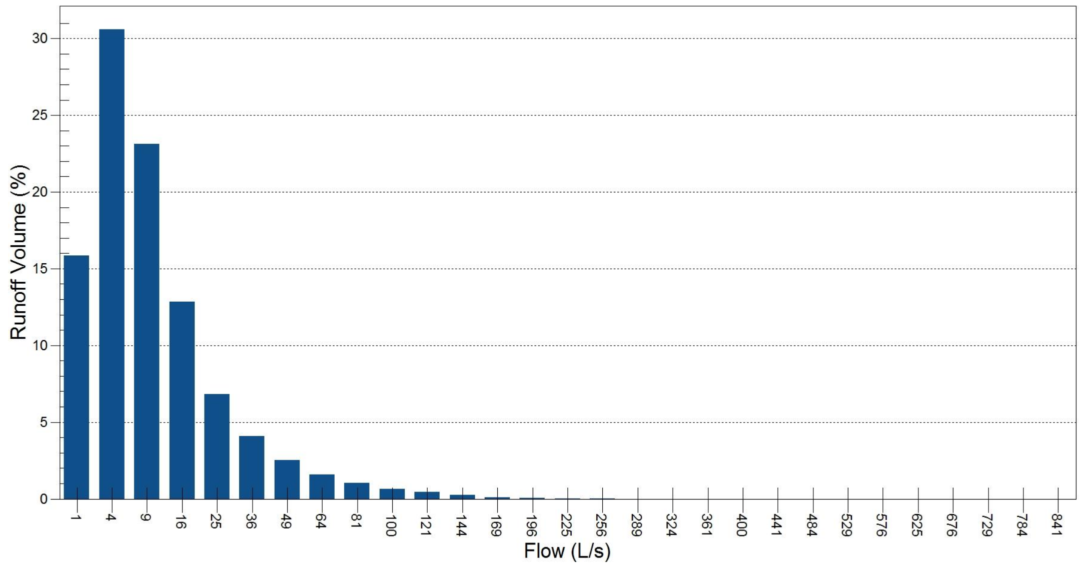


Figure 1. Runoff Volume by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – ON 6000, 1967 to 2003 for 1.34 ha, 90% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

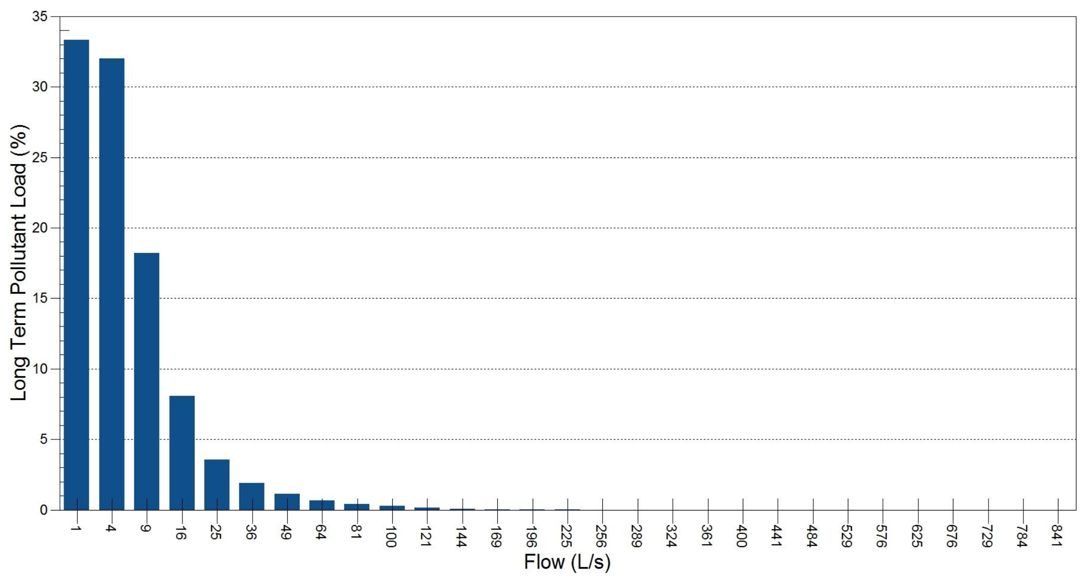
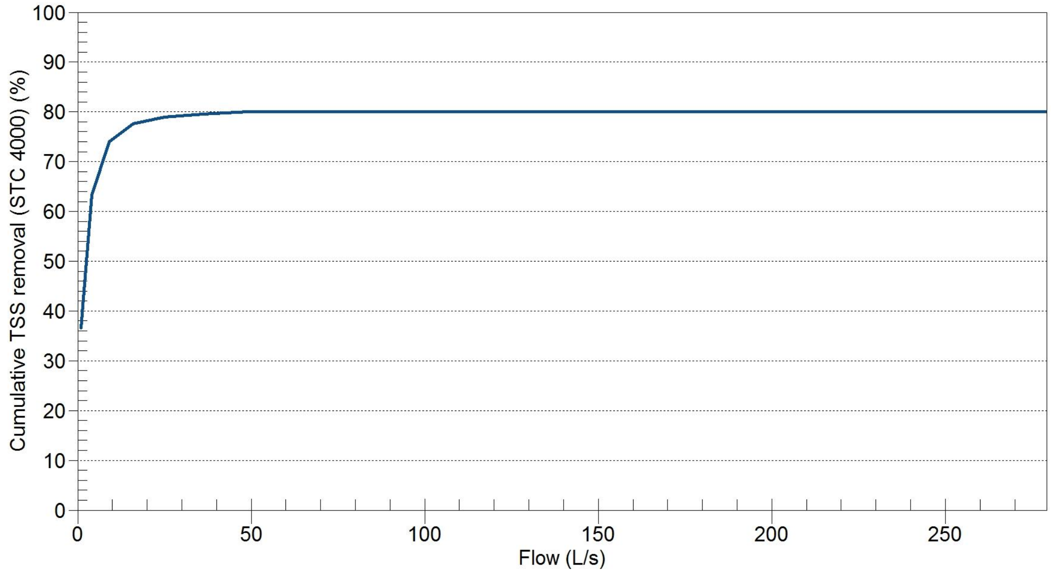


Figure 2. Long Term Pollutant Load by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – 6000, 1967 to 2003 for 1.34 ha, 90% impervious. The majority of the annual pollutant load is transported by small frequent storm events. Conversely, large infrequent events carry an insignificant percentage of the total annual pollutant load.



Stormceptor Model	STC 4000	Drainage Area (ha)	1.34
TSS Removal (%)	80	Impervious (%)	90

Figure 3. Cumulative TSS Removal by Flow Rate for OTTAWA MACDONALD-CARTIER INT'L A – 6000, 1967 to 2003. Stormceptor continuously removes TSS throughout the full range of storm events analyzed. Note that large events do not significantly impact the average annual TSS removal. Therefore no decline in cumulative TSS removal indicates scour does not occur as the flow rate increases.

Stormceptor®

Appendix 1
Stormceptor Design Summary

Project Information

Date	27/04/2016
Project Name	Zibi Ontario
Project Number	717
Location	N/A

Designer Information

Company	N/A
Contact	N/A

Notes

N/A

Drainage Area

Total Area (ha)	1.34
Imperviousness (%)	90

The Stormceptor System model STC 4000 achieves the water quality objective removing 80% TSS for a City of Toronto (clay, silt and sand) particle size distribution.

Rainfall

Name	OTTAWA MACDONALD-CARTIER INT'L A
State	ON
ID	6000
Years of Records	1967 to 2003
Latitude	45°19'N
Longitude	75°40'W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ha-m)	Discharge (L/s)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 300	58
STC 750	69
STC 1000	69
STC 1500	70
STC 2000	75
STC 3000	76
STC 4000	**80**
STC 5000	81
STC 6000	83
STC 9000	87
STC 10000	87
STC 14000	89

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

City of Toronto (clay, silt and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity m/s
10	20	2.65	0.0004					
30	10	2.65	0.0008					
50	10	2.65	0.0022					
95	20	2.65	0.0063					
265	20	2.65	0.0366					
1000	20	2.65	0.1691					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor version 1.0
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 300 is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 750 to STC 6000 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 300	STC 750 to STC 6000	STC 9000 to STC 14000
Single inlet pipe	75 mm	25 mm	75 mm
Multiple inlet pipes	75 mm	75 mm	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Imbrium Systems Inc., 1-800-565-4801.

Stormceptor®

Appendix 2
Summary of Design Assumptions

SITE DETAILS

Site Drainage Area

Total Area (ha)	1.34	Imperviousness (%)	90

Surface Characteristics

Width (m)	232
Slope (%)	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/h)	61.98
Min. Infiltration Rate (mm/h)	10.16
Decay Rate (s^{-1})	0.00055
Regeneration Rate (s^{-1})	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal calculations.

Maintenance Frequency (months)	12

Dry Weather Flow

Dry Weather Flow (L/s)	No

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the Stormceptor System is identified in the table below.

Storage ha-m	Discharge L/s
0	0

PARTICLE SIZE DISTRIBUTION

Particle Size Distribution

Removing fine particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the Stormceptor System.

City of Toronto (clay, silt and sand)

Particle Size μm	Distribution %	Specific Gravity	Settling Velocity m/s		Particle Size μm	Distribution %	Specific Gravity	Settling Velocity m/s
10	20	2.65	0.0004					
30	10	2.65	0.0008					
50	10	2.65	0.0022					
95	20	2.65	0.0063					
265	20	2.65	0.0366					
1000	20	2.65	0.1691					

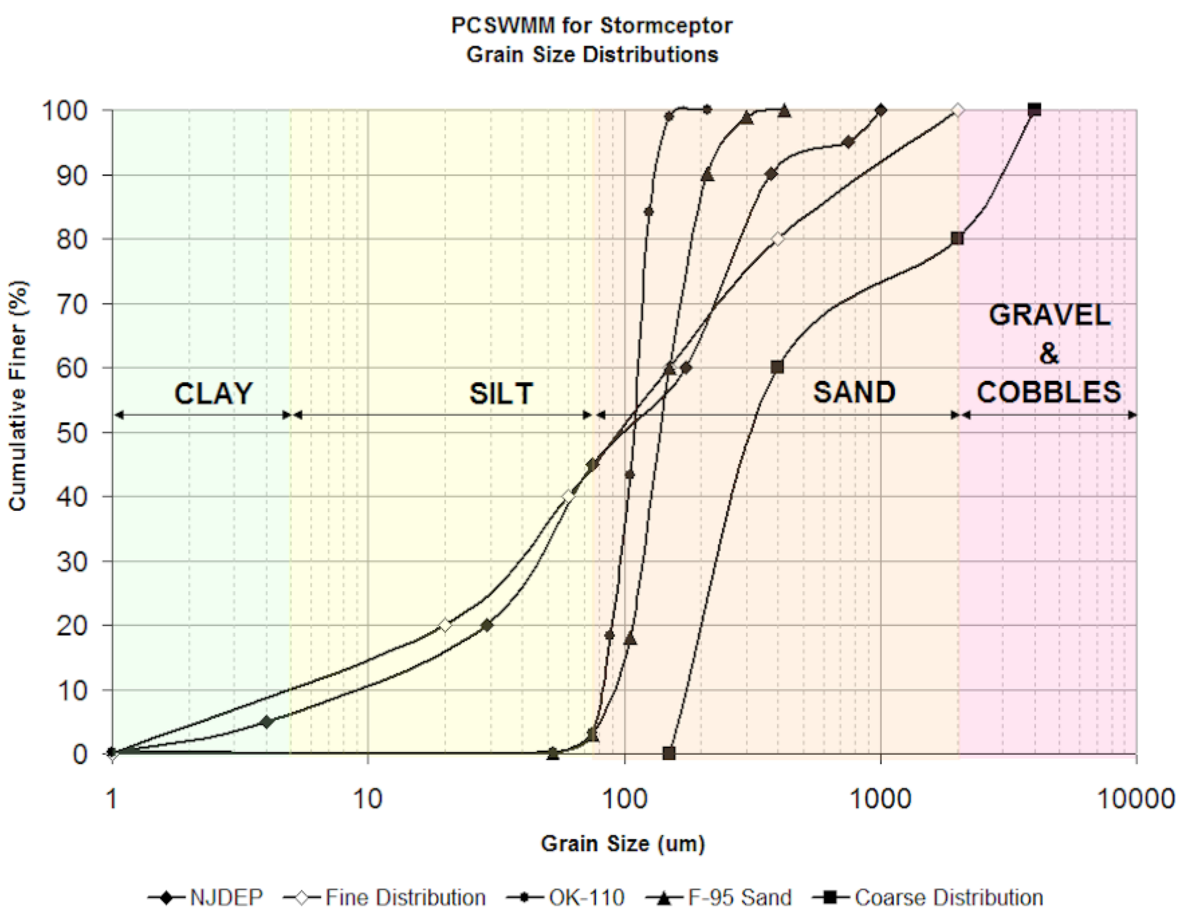


Figure 1. PCSWMM for Stormceptor standard design grain size distributions.

Stormceptor®

TSS LOADING

TSS Loading Parameters

TSS Loading Function	Buildup / Washoff

Parameters

Target Event Mean Concentration (EMC) (mg/L)	125
Exponential Buildup Power	0.4
Exponential Washoff Exponential	0.2

HYDROLOGY ANALYSIS

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the Stormceptor System are based on the average annual removal of TSS for the selected site parameters. The Stormceptor System is engineered to capture fine particles (silts and sands) by focusing on average annual runoff volume ensuring positive removal efficiency is maintained during all rainfall events, while preventing the opportunity for negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

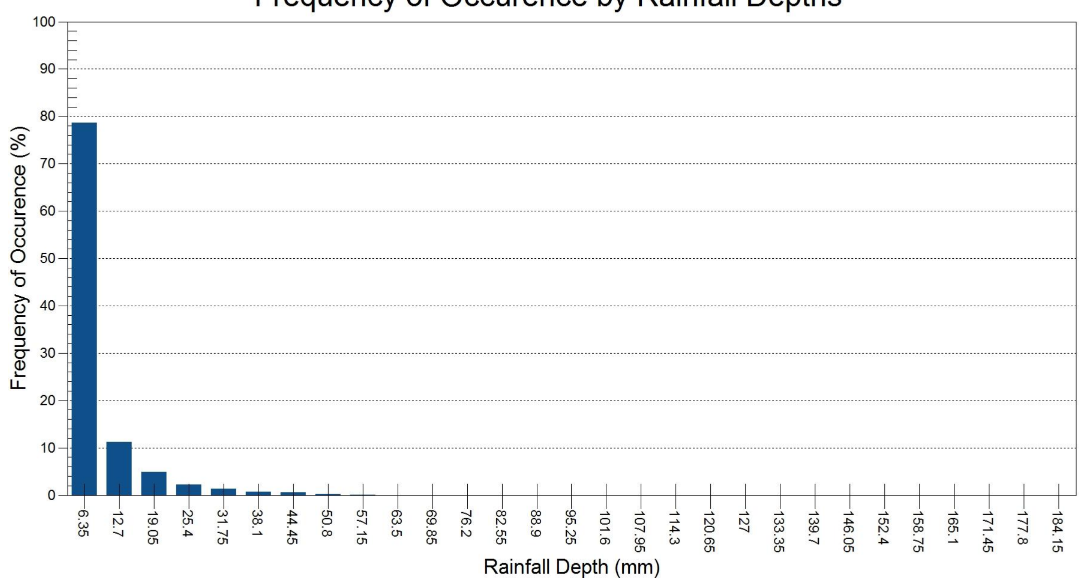
Rainfall Station

Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A		
Rainfall File Name	ON6000.NDC	Total Number of Events	4537
Latitude	45°19'N	Total Rainfall (mm)	20978.1
Longitude	75°40'W	Average Annual Rainfall (mm)	567.0
Elevation (m)	371	Total Evaporation (mm)	1821.2
Rainfall Period of Record (y)	37	Total Infiltration (mm)	2089.3
Total Rainfall Period (y)	37	Percentage of Rainfall that is Runoff (%)	81.8

Rainfall Event Analysis

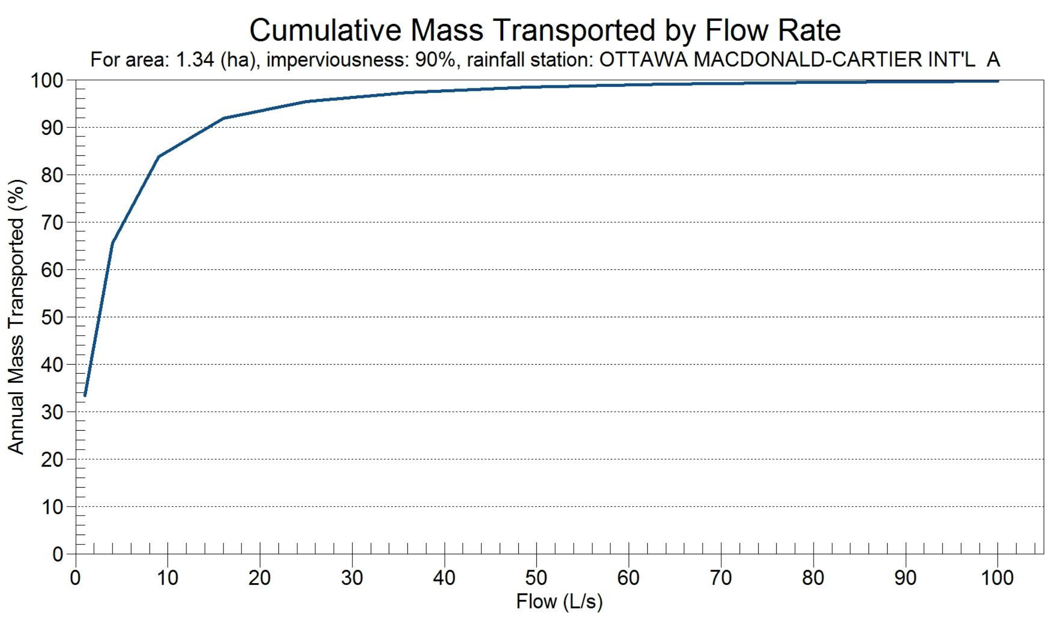
Rainfall Depth mm	No. of Events	Percentage of Total Events %	Total Volume mm	Percentage of Annual Volume %
6.35	3564	78.6	5671	27.0
12.70	508	11.2	4533	21.6
19.05	223	4.9	3434	16.4
25.40	102	2.2	2244	10.7
31.75	60	1.3	1704	8.1
38.10	33	0.7	1145	5.5
44.45	28	0.6	1165	5.6
50.80	9	0.2	416	2.0
57.15	5	0.1	272	1.3
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0
114.30	1	0.0	109	0.5
120.65	0	0.0	0	0.0
127.00	0	0.0	0	0.0
133.35	0	0.0	0	0.0
139.70	0	0.0	0	0.0
146.05	0	0.0	0	0.0
152.40	0	0.0	0	0.0
158.75	0	0.0	0	0.0
165.10	0	0.0	0	0.0
171.45	0	0.0	0	0.0
177.80	0	0.0	0	0.0
184.15	0	0.0	0	0.0
190.50	0	0.0	0	0.0
196.85	0	0.0	0	0.0
203.20	0	0.0	0	0.0
209.55	0	0.0	0	0.0
>209.55	0	0.0	0	0.0

Frequency of Occurence by Rainfall Depths

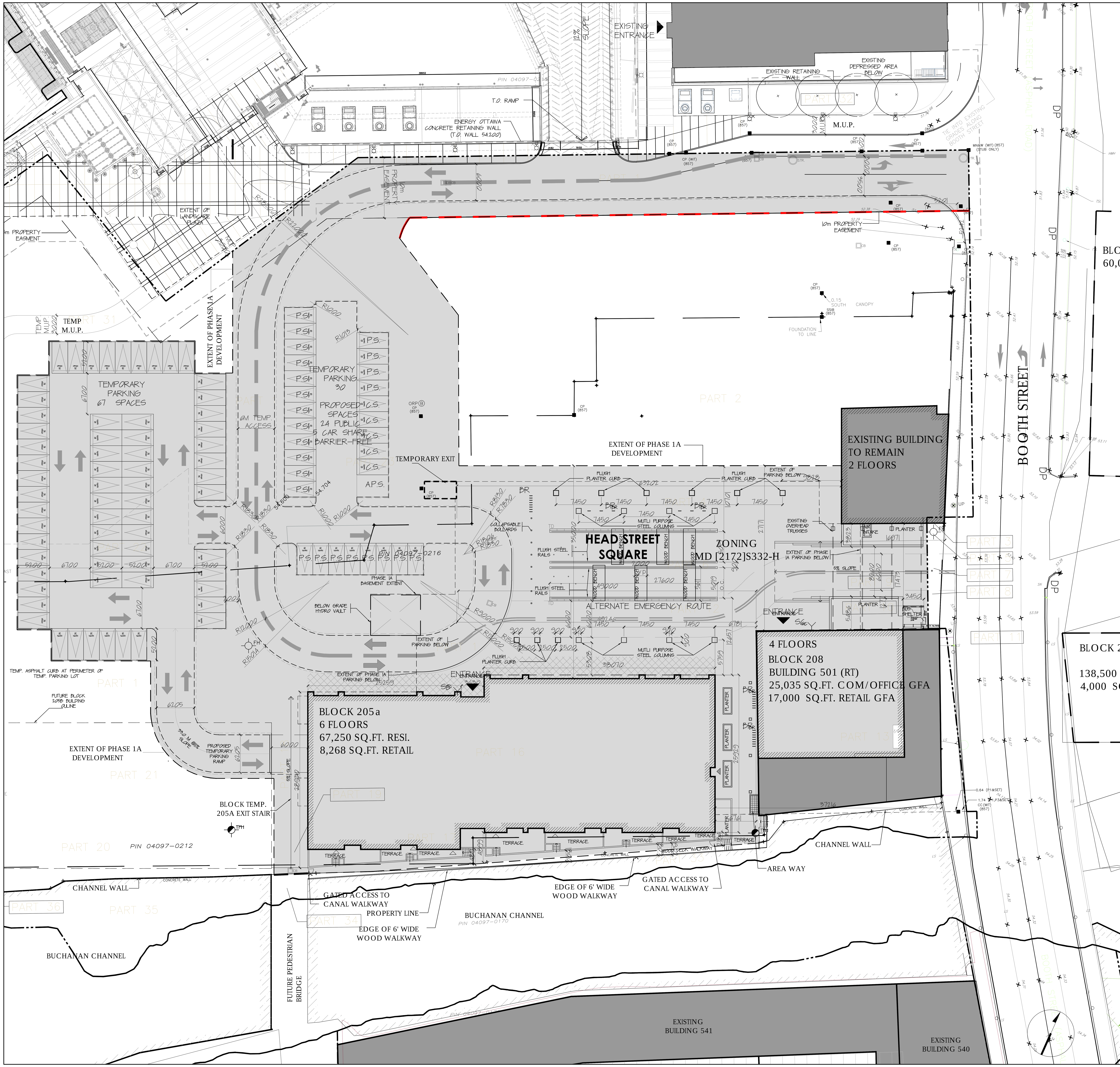


Pollutograph

Flow Rate L/s	Cumulative Mass %
1	33.4
4	65.5
9	83.7
16	91.8
25	95.4
36	97.3
49	98.4
64	99.0
81	99.4
100	99.7
121	99.9
144	99.9
169	100.0
196	100.0
225	100.0
256	100.0
289	100.0
324	100.0
361	100.0
400	100.0
441	100.0
484	100.0
529	100.0
576	100.0
625	100.0
676	100.0
729	100.0
784	100.0
841	100.0
900	100.0

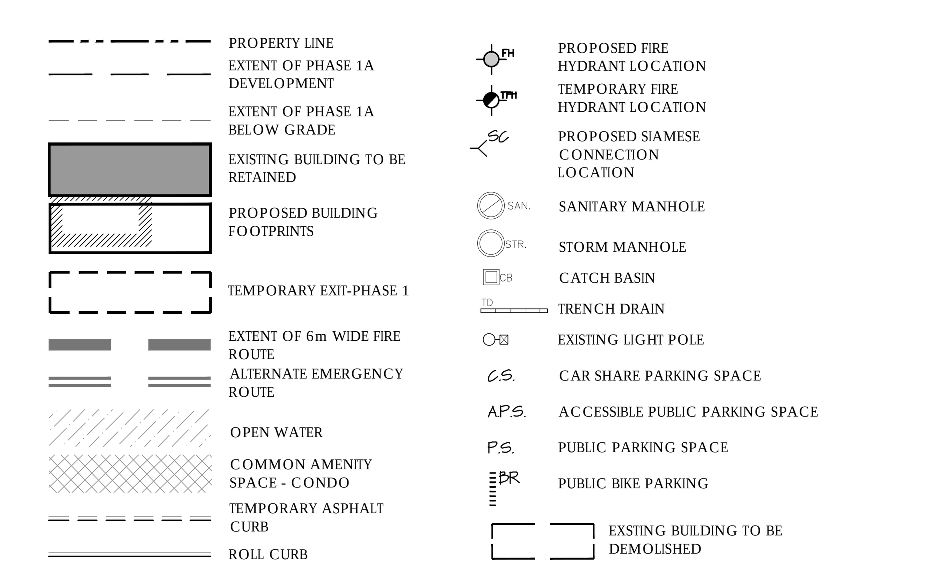


DRAWINGS / FIGURES



LOCATION PLAN

LEGEND



PHASE 1A ZONING TABLE

CURRENT ZONING	MD5 [2172] S332	
TOTAL PHASE 1A SITE AREA	10,938 m²	
TEMPORARY OVERFLOW PARKING AREA - PHASE 1A	1,747 m²	
PHASE 1A No. OF DWELLING UNITS	71 DWELLING UNITS	
PHASE 1A RESIDENTIAL - 205A	6,250 m²	
PHASE 1A RETAIL AREA - 205A	768 m²	
PHASE 1A RETAIL AREA - 208	1,457 m²	
PHASE 1A OFFICE AREA - 208	1,298 m²	
PHASE 1A Restaurant - 208	100 m²	
PHASE 1 GROSS FLOOR AREA	9,873 m²	
SETBACKS	ALL SIDES : NO MINIMUMS	REFER TO SITE PLAN
BUILDING HEIGHTS	73m, maximum 4 buildings over nine(9) storeys within Area A on Schedule 332	Block 205A: 6 Storeys - 18.5m Block 208: 3 Storeys -15m Block 301: underground parking garage
	REQUIRED	PROVIDED
AMENITY AREA 6m² PER UNIT 50% TO BE COMMUNAL (201m²) 402m² Required	TOTAL: 402m² COMMON: 201m²	TOTAL: 1056m² private balconies/terraces: 834m² Total communal: 222.7m² Indoor (fitness room) 20.7m² Outdoor (part of head street square) 202 m²
PARKING RESIDENTIAL + VISITOR: MINIMUM: NONE MAXIMUM: 1.5/DWELLING UNIT RETAIL: MINIMUM: NONE MAXIMUM: 1.0/100M2 OF GFA OFFICE: MINIMUM: 0.75/100M2 OF GFA MAXIMUM: 1.0/100M2 OF GFA RESTAURANT: MINIMUM: NONE MAXIMUM: NONE	MIN. REQUIRED: 11 SPACES OFFICE: 11 SPACES MAX. PERMITTED: RETAIL: 22 SPACES OFFICE: 14 SPACES RESIDENTIAL + VISITOR: 107 SPACES TOTAL MAX PERMITTED: 143 SPACES	PARKING FOR PHASE 1A BLOCK 301 P1: 64 SPACES BLOCK 205A - P1: 36 SPACES SURFACE: 97 SPACES TOTAL PROPOSED: 197 SPACES PARKING FOR PHASE 1A - BY USE RETAIL: 22 SPACES OFFICE: 11 SPACES RESIDENTIAL + VISITOR: 67 SPACES RESTAURANT: 97 SPACES TOTAL PROPOSED: 197 SPACES **NOTE : PARKING LEVEL P2 (86 ADDITIONAL PARKING SPACES) OF BLOCK 301 WILL ONLY BE AVAILABLE IN PHASE 1B VIA FUTURE BLOCK 206.
BICYCLE PARKING RESIDENTIAL: 0.5/DWELLING UNIT RETAIL/OFFICE: 1/250M2 OF GFA RESTAURANT: 1/1,500M2 OF GFA 50% CAN BE VERTICAL	TOTAL REQUIREMENT: 44 SPACES RESIDENTIAL: 34 SPACES RETAIL: 4 SPACES OFFICE: 6 SPACES	TOTAL REQUIREMENT: 84 SPACES RESIDENTIAL INTERIOR: 34 SPACES PUBLIC EXTERIOR: 50 SPACES

PROJECT TEAM

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NOTE: ALL ENERGY OTTAWA RELATED LANDSCAPE INFORMATION OUTSIDE OUR PROPERTY LIMITS ARE BASED ON CSW LANDSCAPE ARCHITECTS LIMITED ISSUED FOR CONSTRUCTION SET DATED 17.05.17

NOTE: ALL EXISTING SITE INFORMATION AS PER SITE SURVEY PLAN DATED XX.XX.XX AND PREPARED BY "STANTEC GEOMATICS LTD."

APPROVED ☐ REFUSED ☐

THIS DAY OF ,20

DOUGLAS JAMES, MCIP, RPP, ACTING MANAGER, DEVELOPMENT REVIEW
CENTRAL PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT
DEPARTMENT, CITY OF OTTAWA

no.	date	revision
10	17.08.XX	S.P.C PHASE 1A RESUB. 1
9	17.08.18	ISSUED FOR COORDINATION
2	16.04.05	ISSUED FOR S.P.C. PHASE 1A
1	15.08.14	ISSUED FOR S.P.C. PHASE 1A

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and/or omissions to the architect.

All contractors must comply with all pertinent codes and by-laws.

Do not scale drawings.

This drawing may not be used for construction until signed.

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E: mail@hobinarc.com
hobinarc.com

project
ZIBI

drawing title
ZIBI ONTARIO - MASTER PLAN
CHADIERE WEST
PHASE 1A

drawn	date	scale
PB	17-02-02	1:300

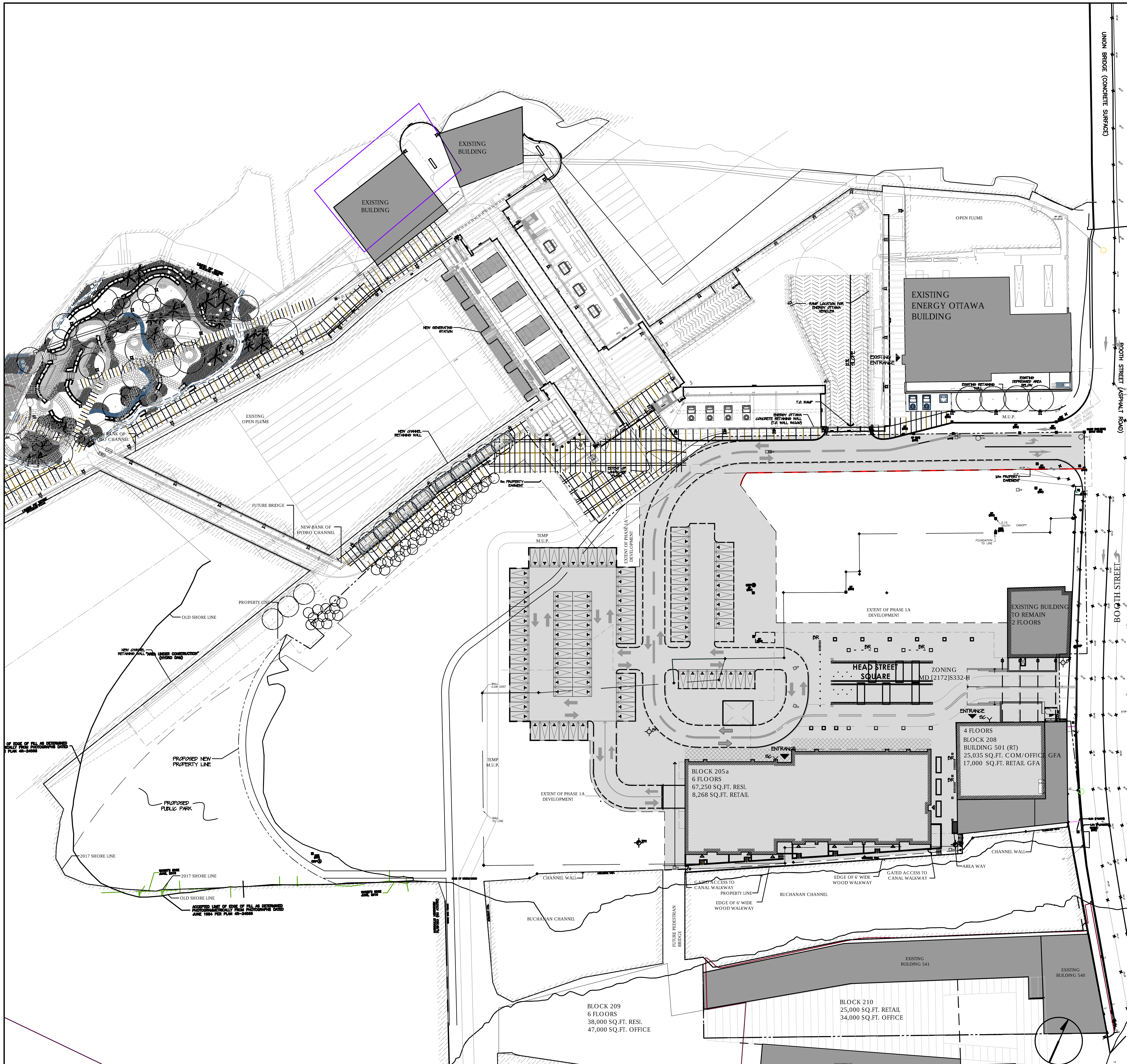
project
1508

.\07-Logos\Barry J Hobin OAA Stamp.jpg

drawing no.
A003

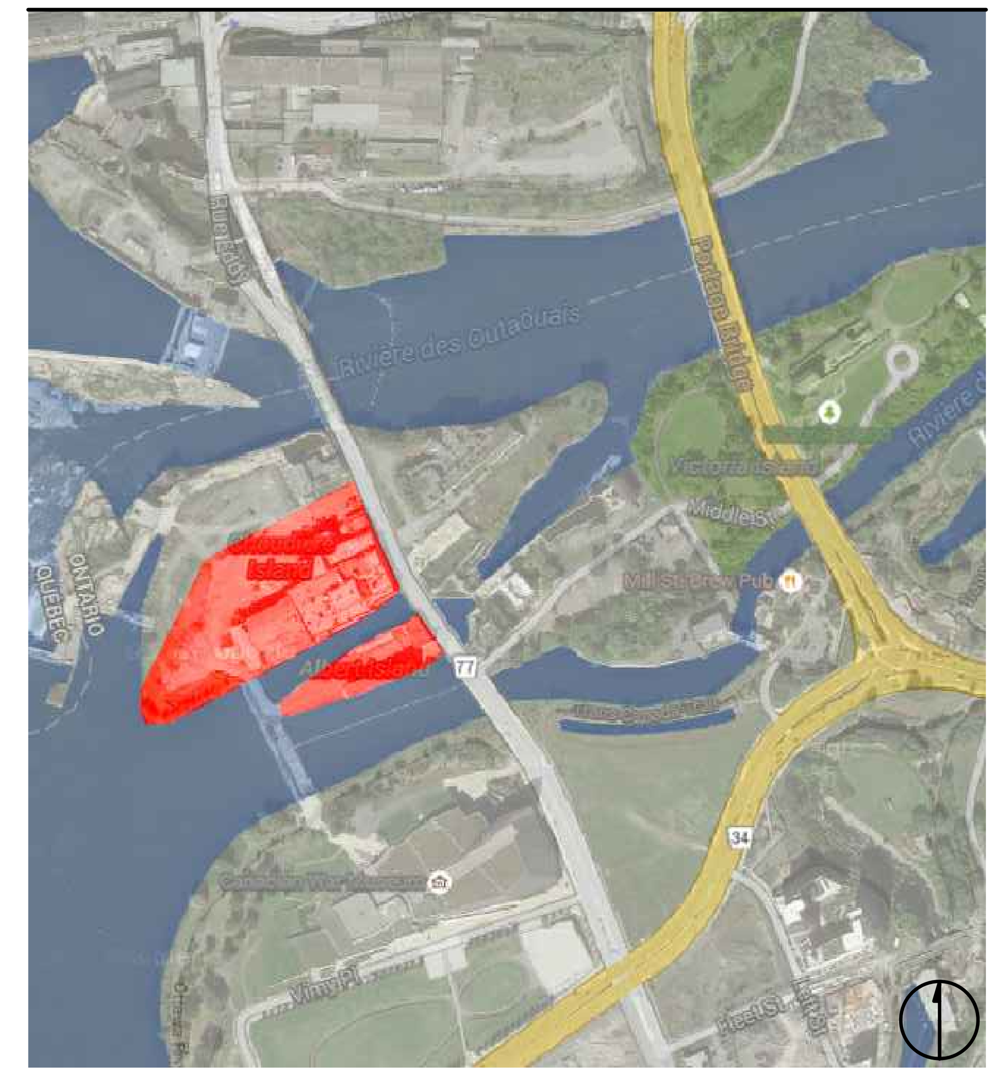
revision no.

FILE NO: D07-12-15-0158



17-02-02

LOCATION PLAN



LEGEND

PROPERTY LINE	PROPOSED FIRE HYDRANT LOCATION
EXTENT OF PHASE 1A DEVELOPMENT	TEMPORARY FIRE HYDRANT LOCATION
EXTENT OF PHASE 1A BELOW GRADE	PROPOSED SIAMESE CONNECTION LOCATION
EXISTING BUILDING TO BE RETAINED	SAN. SANITARY MANHOLE
PROPOSED BUILDING FOOTPRINTS	STR. STORM MANHOLE
TEMPORARY EXIT-PHASE 1	CB CATCH BASIN
EXTENT OF 6m WIDE FIRE ROUTE	TD TRENCH DRAIN
ALTERNATE EMERGENCY ROUTE	EXISTING LIGHT POLE
OPEN WATER	C.S. CAR SHARE PARKING SPACE
COMMON AMENITY SPACE - CONDO	A.P.S. ACCESSIBLE PUBLIC PARKING SPACE
TEMPORARY ASPHALT CURB	P.S. PUBLIC PARKING SPACE
ROLL CURB	BR PUBLIC BIKE PARKING
	EXSTING BUILDING TO BE DEMOLISHED

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CENTRAL PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

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zibi
Windmill | dream

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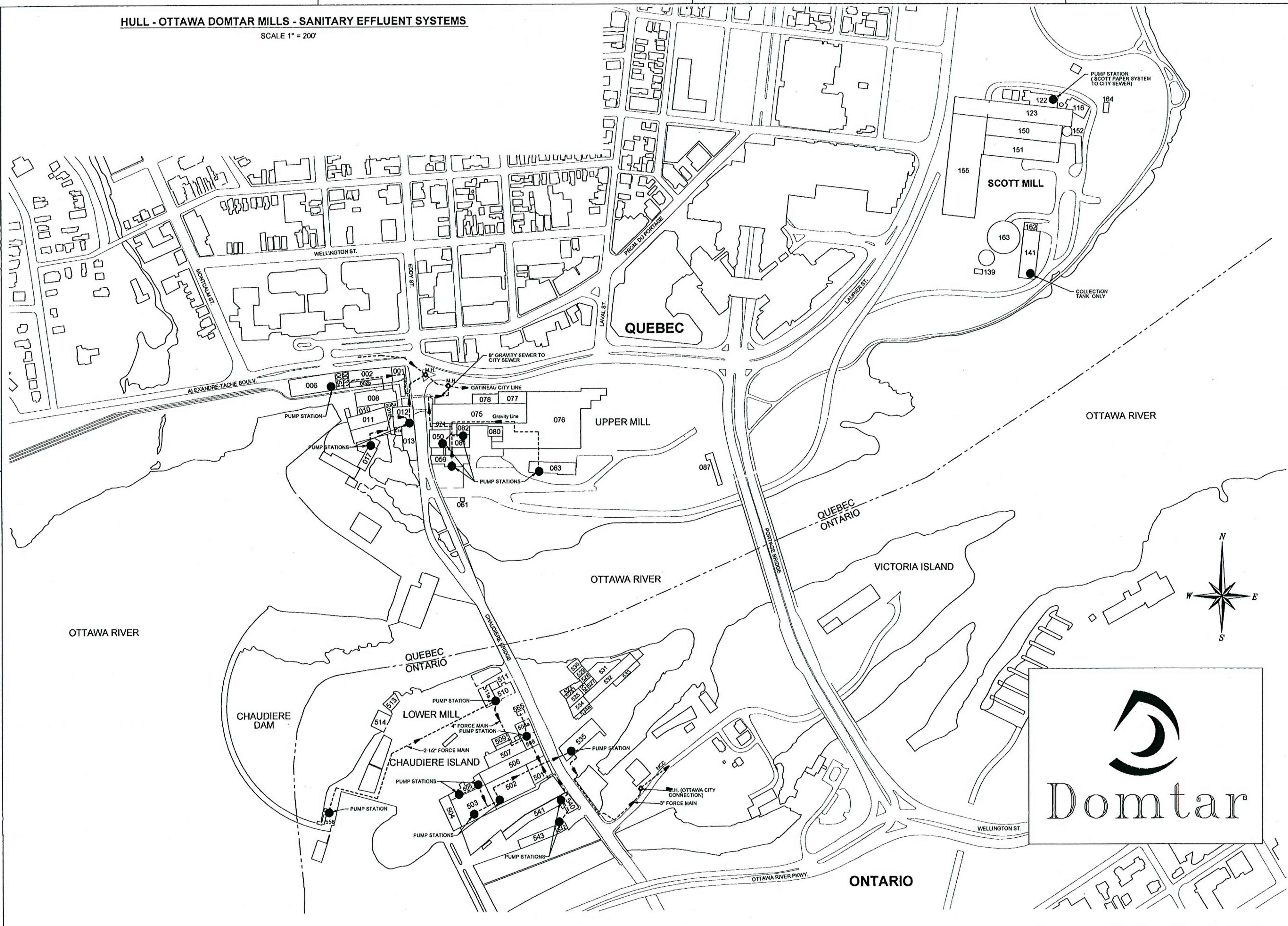
project: ZIBI		
drawing title: ZIBI ONTARIO - MASTER PLAN CHAUDIERE WEST PHASE 1A		
drawn: PB	date: 17-02-02	scale: 1:500
.\07-Logos\Barry J Hobin BAA Stamp.jpg		project: 1508
		drawing no.: A004
		revision no.

FILE NO: D07-12-15-0158

47856-B

HULL - OTTAWA DOMTAR MILLS - SANITARY EFFLUENT SYSTEMS

SCALE 1" = 200'



gec
greenough environmental consulting inc.
1827 Woodward Drive, Suite 110
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DWG.NO.	REFERENCE

No.	DATE	REVISION
1	Jan 12/05 JFL	Sanitary Lines Revised

DEPT. EQ.CLASS EQ.NO.

DESIGN CODE

DRAWN	RDB	NOV 20/2004
PROJECT		
DES. ENG.		
APPROVAL		

Domtar

MILL	ALL
DEPT.	
BLDG	ALL

TITLE

SANITARY EFFLUENT SYSTEMS

DWG TYPE: SITE

PROJECT

SCALE 1" = 200'

47856-B REV. 1

47852.dwg Plot: 03/02/05 12:15 /Logan ver 1018/04