SITE SERVICING BRIEF
135470-6.04.03

75 Michael Cowpland Drive

CITY OF OTTAWA

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1 INTRODUCTION

1.1 Scope

IBI Group has been retained by Huntington Properties & Access Storage to prepare the necessary engineering plans, specifications and documents to support the proposed Site Plan Application for the subject lands in accordance with the policies set out by the Planning and Development Branch of the City of Ottawa. This Brief will present a detailed servicing scheme to support development of the property, and will include sections on water supply, wastewater management, minor and major stormwater management along with erosion and sediment control.

1.2 Subject Site

The Self Storage Facility is located northeast of the Denzil Doyle Court and Terence Matthews Crescent intersection. The proposed Self Storage Facility development is approximately 1.66 hectares in size and is bounded by Denzil Doyle Court to the west, Terence Matthews Crescent to the south, Michael Cowpland Drive to the east, and multiple developed lots to the north. Please refer to **Figure 1** for more information regarding the site location.

Figure 1 Site Location

The Self Storage Facility project will consist of the construction of 6 prefabricated metal storage buildings, including 1 that will house a rental office, along with vehicular access routes, dedicated parking space and landscaping areas. A site plan of the envisioned development is included in **Appendix A**.

1.3 Previous Studies

Design of this project has been undertaken in accordance with the following reports:

- Kanata South Business Park – Stormwater Management Report prepared by A. J. Robinson & Associates Inc, February 1986

An engineering pre-consultation with the City of Ottawa was held in May 2021 regarding the proposed development. Notes from this meeting is included in **Appendix A**.

1.4 Geotechnical Considerations

Paterson Group Inc. was retained to prepare a geotechnical investigation for the site. The objectives of the investigation were to prepare a report to:

- Determine the subsoil and groundwater conditions at the site by means of test pits and boreholes and,
- To provide geotechnical recommendations pertaining to the design of the proposed development including construction considerations.

The geotechnical investigation report PG3798-2 Dated November 23, 2022 confirmed that the site consists mostly of silty clay. Based on the undrained shear strength testing results, a permissible grade raise of 0.8 m is recommended for the subject site and within 6 m of building footprints. A permissible grade raise restriction of up to 1.1 m is recommended for areas located a minimum of 6 m beyond building footprints. Grade raise exceeding the limits will require geotechnical investigation.

The report contains recommendations which include but are not limited to the following:

- Fill used for grading beneath the proposed development to meet OPSS Granular 'A' or Granular 'B' Type II placed in lifts no greater than 300 mm compacted to 98% SPMDD.
- Pavement Structure – Car Only Parking Areas:

LOCAL ROAD	THICKNESS
Asphaltic Concrete	50mm
OPSS Granular A Base	150mm
OPSS Granular B Type II Subbase	300mm

- Pavement Structure – Access Lanes and Heavy Truck Parking Areas:

LOCAL ROAD	THICKNESS
Asphaltic Concrete	90mm
OPSS Granular A Base	150mm
OPSS Granular B Type II Subbase	450mm

- Pipe bedding and cover: The pipe bedding for water and pipes placed on a relatively dry, undisturbed subgrade surface should consist of at least 150 mm of OPSS Granular A material. Where the bedding is located upon silty clay the thickness of the bedding material should be increased to a minimum of 300 mm of OPSS Granular A. The bedding layer should extend to the spring line of the pipe. Cover material, from the spring line to at least 300 mm above the obvert of the pipe should consist of OPSS Granular A or Granular B Type II. The bedding and cover materials should be placed in maximum 300 mm thick lifts compacted to a minimum of 99% of the material's SPMDD.
- The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level.

2 WATER SUPPLY

2.1 Existing Conditions

As previously noted, the 1.66ha Self Storage Facility site is located east of Denzil Doyle Court, north of Terence Matthews Crescent, and east of Michael Cowpland Drive. The subject site is flanked on all three streets by existing watermains. An existing ductile iron 305mm diameter watermain is located within the Denzil Doyle Court right of way, the Terence Matthews Crescent right of way, and the Michael Cowpland right of way. All three watermains fall within the City of Ottawa's pressure district Pressure Zone 3 which will provide the water supply to the site.

2.2 Design Criteria

2.2.1 Water Demands

Water demands have been calculated for the full development. This site only consists of an office with an area of 94 m^2. Siamese connections will be provided for all 6 storage buildings. Per unit population density and consumption rates are taken from Tables 4.1 and 4.2 at the Ottawa Design Guidelines – Water Distribution and are summarized as follows:

- Commercial Shopping Center 2500 l/1000m^2/day
- Other Commercial 28,000 l/gross ha/day
- ICI Average Day Demand 28,000 l/gross ha/day
- ICI peak Daily Demand 42,000 l/gross ha/day
- ICI Peak Hour Demand 75,600 l/gross ha/day

A watermain demand calculation sheet is included in **Appendix B** and the total water demands are summarized as follows:

- Average Day 0.0030 l/s
- Maximum Day 0.0046 l/s
- Peak Hour 0.0082 l/s

2.2.2 System Pressure

The Ottawa Design Guidelines – Water Distribution (WDG001), July 2010, City of Ottawa, Clause 4.2.2 states that the preferred practice for design of a new distribution system is to have normal operating pressures range between 345 kPa (50 psi) and 480 kPa (80 psi) under maximum daily flow conditions. Other pressure criteria identified in Clause 4.2.2 of the guidelines are as follows:

Minimum Pressure — Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi)

Fire Flow	During the period of maximum day demand, the system pressure shall not be less than 140 kPa (20 psi) during a fire flow event.
Maximum Pressure	In accordance with the Ontario Building/Plumbing Code, the maximum pressure should not exceed 552 kPa (80 psi). Pressure reduction controls will be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.2.3 Fire Flow Rates

The Self Storage Facility site plan contains 6 prefabricated buildings with automatic sprinkler system. All buildings will fall under OBC Section 3.10 "Self Service Storage Buildings", F-2 Occupancy and non-combustible. The sprinkler system will be designed and installed in accordance with NFPA-13 requirements. The sprinkler system will be supplied from the city water connection and the demand will be calculated using the hazard classification plus the appropriate inside/outside hose allowances.

Calculations using the Fire Underwriting Survey (FUS version 2020) were conducted to determine the fire flow requirement for the site. Results of the analysis provides a maximum fire flow rate of 9,000 l/min or 150.0 l/s is required which is used in the hydraulic analysis. A copy of the FUS calculations is included in **Appendix B**.

2.2.4 Boundary Conditions

The City of Ottawa has provided the hydraulic boundary conditions at Denzil Doyle Court. A copy of the boundary conditions is included in **Appendix B** and summarized as follows:

Table 2. 1 Hydraulic Boundary Conditions

CRITERIA	HYDRAULIC HEAD
	Denzil Doyle Court
Max HGL (Basic Day)	161.1 m
Peak Hour	156.5 m
Max Day + Fire (9,000 l/m)	152.3 m

2.2.5 Hydraulic Model

A computer model for the subject site has been developed using the InfoWater program by Innovyze. The model includes the existing watermain and boundary condition at Denzil Doyle Court.

2.3 Proposed Water Plan

2.3.1 Hydraulic Analysis

A 150 mm watermain is proposed with the connection to the existing 300mm watermain at Denzil Doyle Court. 100mm water service is proposed to each building. Building A is the only building receiving potable water for daily use. There will be a 19mm diameter water feed from Building A to Building B for an automatic trap primer. Only Building A will have a domestic water metering. Building A water service line will be branched off to Building B after the water meter. Detailed water entry detail for each building is included in **Appendix B**. The 100mm watermain services for Building B – F are marked in the plan as fire service. Refer to the general plan of services **Drawing C-001** for detailed watermain layout for the subject site. A private hydrant is proposed to the north of Building D, with a design fire flow of 9000 L/min (150 L/s).

The hydraulic model was run under basic day conditions to determine the maximum pressure for the site. The minimum pressure for the site is determined in the peak hour analysis using the provided boundary condition. Results of the analysis for the site are summarized in Section 2.3.2 and the water model schematic and model results are included in **Appendix B**.

2.3.2 Modeling Results

The hydraulic model was run under basic day, maximum day with fire flows and under peak hour conditions. Results of the hydraulic model are included in **Appendix B** and summarized as follows:

Scenario	
Basic Day (Max HGL) Pressure Range	576.19 to 580.60 kPa
Peak Hour (Min HGL) Pressure Range	531.12 to 535.53 kPa
Available Fire Flow under Max Day Scenario	212.47 L/s

A comparison of the results and design criteria is summarized as follows:

Maximum Pressure	All nodes in basic day scenario exceed 552 kPa (80 psi), therefore pressure reducing control is required for all buildings in this development, including the fire department connections to Building B to F. Pressure reducing valves (PRVs) are shown in both General Plan of Services Drawing C-001 and Grading Plan C-200.
Minimum Pressure	All nodes in the model exceed the minimum value of 276 kPa (40 psi).
Fire Flow	The required fire flow will be provided through the public hydrants and a private hydrant on site. The private hydrant provides 212.47 L/s of available fire flow, which is larger than the required fire flow 150 L/s (9000 L/min). There are 4 public hydrants around the site, 2 located on Michael Cowpland Drive, 1 on Terence Matthews Crescent and 1 on Denzil Doyle Court. All 4

hydrants are rated Class AA, which can provide 1500 GPM (5678 L/min) and above flow rate. All buildings are covered with at least 1 hydrant with 76m and 1 hydrant within 152m. According to Table 18.5.4.3 Maximum Fire Flow Hydrant Capacity - Ottawa Design Guidelines, a total of 5678 L/min + 3785 L/min = 9463 L/min fire flow can be provided, which is larger than required fire flow 9000 L/min. Therefore, the existing public can provide sufficient fire flow for the site.

3 WASTEWATER DISPOSAL

3.1 Existing Conditions

There is an existing 250mm diameter sanitary sewer along Denzil Doyle Court, and a 250mm diameter sanitary sewer along Michael Cowpland Drive. To the south of the site, an existing 250mm diameter sanitary sewer on Terence Matthews Crescent provides deeper sewer connection to service the site.

3.2 Design Criteria

The sanitary sewers for the subject site will be based on the City of Ottawa design criteria. It should be noted that the sanitary sewer design for this study incorporates the latest City of Ottawa design parameters identified in Technical Bulletin ISTB-2018-01. Some of the key criteria will include the following:

- Average commercial flow = 28,000 l/s/ha
- Peak ICI flow factor = 1.5 if ICI area is ≤ 20% total area
  1.0 if ICI area is > 20% total area
- Inflow and Infiltration Rate = 0.33 l/s/ha
- Minimum Full Flow Velocity = 0.60 m/s
- Maximum Full Flow Velocity = 3.0 m/s
- Minimum Pipe Size = 200 mm diameter

3.3 Recommended Wastewater Plan

The on-site sanitary system will consist of 200mm PVC sewer installed at normal depth and slope and will provide a single 100mm service connection to the commercial building pad (Building A with office). Another 100mm sanitary service connection is proposed to Building B. The sewers have been designed using the criteria noted above in section 3.2 and outlet via a connection to the sanitary sewer within the Terence Matthews Crescent right of way to the south of the site. A copy of the sanitary sewer design sheet can be found in **Appendix C.** Please refer to the General Plan of Services **Drawing C-001** for further details.

4 SITE STORMWATER MANAGEMENT

4.1 Existing Conditions

The existing undeveloped subject lands currently drains south towards Terence Matthews Crescent and Michael Cowpland Drive. There is an existing 375mm diameter storm sewer along Michael Cowpland Drive, and a 450mm diameter storm sewer along Denzil Doyle Court. To the south of the site, the existing 375mm diameter storm sewer on Terence Matthews Crescent provides deep sewer connection to service the site.

4.2 Design Criteria

The stormwater system was designed following the principles of dual drainage, making accommodations for both major and minor flow.

Some of the key criteria include the following:

- Design Storm — 1:2year return (Ottawa)
- Rational Method Sewer Sizing
- Initial Time of Concentration — 10 minutes
- Runoff Coefficients
  - Landscaped Areas — C = 0.30
  - Asphalt/Concrete — C = 0.90
  - Roof — C = 0.90
- Pipe Velocities — 0.80 m/s to 6.0 m/s
- Minimum Pipe Size — 250 mm diameter (200 mm CB Leads)

4.3 Proposed Minor System

The minor storm sewers for the subject site will be sized based on the rational method and the City of Ottawa 2-year event. Minor storm flow to the downstream storm sewer network will be controlled by Inlet Control Devices (ICDs) to limit flow and prevent sewer surcharging downstream. A detailed storm sewer design sheet and the associated storm sewer drainage area plan is included in **Appendix D**. The sites outletting sewers, downstream of ICD's, have been sized such that they do not exceed the size of the connection sewers in the public ROW, however that they are able to convey the fixed flow generated by each respective ICD. The General Plan of Services, depicting all on-site storm sewers can be found in **Appendix A**.

4.4 Stormwater Management

The subject site will be limited to a release rate established using the criteria described in section 4.2 and the Stormwater Management Report for the Kanata South Business Park. This will be achieved through a combination of inlet control devices (ICD's) at inlet locations and a combination of surface and underground storage.

Flows generated that are in excess of the site's allowable release rate will be stored on site in strategic surface storage areas or underground storage and gradually released into the minor system so as not to exceed the site's allocation.

The maximum surface retention depth located within the developed areas will be limited to 300mm during a 100-year event. Overland flow routes will be provided in the grading to permit emergency overland flow, in excess of the 100-year event, from the site.

At certain locations within the site, the opportunity to store runoff is limited due to grading constraints and building geometry. These locations are generally located at the perimeter of the site where it is necessary to tie into public boulevards and adjacent properties or in areas where ponding stormwater is undesirable. These "uncontrolled" areas – 0.0456 hectares in total, have a C value of 0.30 (X1.25 as per City Comment). Based on 100-year storm uncontrolled flows, the uncontrolled areas generate 8.49 l/s runoff (refer to Section 4.5 for calculation).

The site grading and ponding has been designed to control water generated during the 1:100-year event, with no overflow leaving the site. Please refer to the SWM calculations in **Appendix D**.

4.5 Inlet Controls

The allowable release rate for the 1.66 Ha site can be calculated as follows:

$\mathbf{Q_{allowable}}$ = 74.2 L/s/Ha as per Kanata South Business Park SWM Report

Area = 1.66 Ha

= **123.17 L/s**

As noted in Section 4.4, the landscaped area along south which will into the storm sewer uncontrolled.

Based on a 100-year event, the flow from the 0.04 Ha uncontrolled area can be determined as:

$\mathbf{Q_{uncontrolled}} = \mathbf{2.78} \times \mathbf{C} \times \mathbf{i_{100yr}} \times \mathbf{A}$ where:

C = Average runoff coefficient of uncontrolled area = 0.2

$\mathbf{i_{100yr}}$ = Intensity of 100-year storm event (mm/hr)

= $1735.688 \times (T_c + 6.014)^{0.820}$ = 178.56 mm/hr; where T_c = 10 minutes

A = Uncontrolled Area = 0.0456 Ha

Therefore, the uncontrolled release rate can be determined as:

$$\mathbf{Q_{uncontrolled}} = \mathbf{2.78} \times \mathbf{C} \times \mathbf{i_{100yr}} \times \mathbf{A}$$

$$= 2.78 \times 0.3 \times 1.25 \times 178.56 \times 0.0456$$

$$= \mathbf{8.49\ L/s}$$

The maximum allowable release rate from the remainder of the site can then be determined as:

$$\mathbf{Q_{max\ allowable}} = \mathbf{Q_{restricted}} - \mathbf{Q_{uncontrolled}}$$

$$= 123.17\ L/s - 8.49\ L/s$$

$$= \mathbf{114.68\ L/s}$$

Based on the flow allowance at the various inlet locations, a combination of various sizes of inlet control devices (ICDs) were chosen in the design. The design of the inlet control devices is unique to each drainage area and is determined based on various factors, including hydraulic head and allowable release rate. The inlet control devices were sized according to the manufacturer's design charts. The restrictions will cause the on-site catchbasins and manholes to surcharge, generating surface ponding in the parking and landscaped areas. Ponding locations and elevations are summarized on the Ponding Plan **Drawing C-600**, and included in **Appendix D**.

4.6 On-Site Detention

The site was designed to limit runoff to the allowable release rate up to the 100-year storm event. Flows exceeding the 2-year storm, up to the 100-year storm will be contained on-site via surface and underground in-line storage. Orifices in manholes will be employed to control runoff from parking, access and landscape areas. To determine the resulting storage volumes a 2-year and 100-year storm was applied, starting at 2 minutes with time steps of 5 minutes interval until a peak storage volume requirement was attained for the sub-area being controlled. Available ponding volumes at each inlet were calculated using in-line structure volumes during the 100-year events.

The modified rational method was used to calculate maximum storage required for a given release rate. As per accepted convention, when underground storage is considered available storage the ICD release rate is to be reduced by 50% to account for the loss of head during the initial part of the rainfall event while the underground portion of the storage fills with runoff.

Major flow up to the 100-year storm is contained on-site and is gradually released to the minor system, aside from the small uncontrolled areas, major flow does not leave the site via overland flow.

The stormwater management for the site has ensured that there will be no surface ponding during the 2-year storm event except in the landscaped area.

A stormwater management summary sheet and the results of the on-site storage volume requirements are included in **Appendix D**.

A summary of the ICD type for each drainage area and corresponding storage details is provided in Table 4.1 below.

Table 4.1 – Post-Development Storage Summary Table

Post-Development Flows						
Drainage Area	ICD TYPE	Restricted /Uncontrolled Flow (L/s)	Storage Required (m^3)	Storage Provided (m^3)		
		100-year	100-year	Surface	Underground	Total
UNCONTROLLED FLOW						
UN	N/A	8.49	N/A	N/A	N/A	
CONTROLLED STORM SEWER SYSTEM						
Area Tributary to CBMH106	TEMPEST HF	108.00	491.76	146.16	348.49	494.65
Area Tributary to CBMH140	TEMPEST LMF	6.00	40.35	67.70	-	67.70
TOTAL RESTRICTED RELEASED RATE						
		122.49				

4.7 100 year + 20% Stress Test

A cursory review of the 100yr event + 20% has been performed using the modified rational method. The Peak flow from each area during a 100year event has been increased by 20%. The calculations have been included in **Appendix D.**

A summary of the require storage volumes, and overflow balances is provided below.

DRAINAGE AREA	ICD RESTRICTED FLOW (L/s)	100yr20 STORAGE REQUIRED (m^3)	TOTAL STORAGE PROVIDED (m^3)	100yr20 OVERFLOW (m^3)
Area Tributary to CBMH106	108.00	623.81	494.65	129.16
Area Tributary to CBMH140	6.00	52.45	67.70	0

The overland flow from the area tributary to CBMH106 is directed to Denzil Doyle Court. The volume of overflow is 129.16 m3. Based on a Tc of 50minutes, this volume can be reverse calculated to 41.40 L/s. Based on the spill point cross section, at the limit of the access, a simple rectangular channel with a bottom of 8.50m, at a grade of 2.0% can convey 41.40 L/s @ a depth of 0.01m. Therefore, the 100year +20% overflow of 41.40 L/s will have a maximum overflow depth of 0.01m (Ponding 102.06m). Refer to **Appendix D** for detailed overflow calculation.

4.8 Quality Control

According to Kanata South Business Park – Stormwater Management Report, the water quality aspects of the development were addressed with the following conclusions being presented:

- The light industrial/business park type industries are considered to produce a relatively low level of pollutants.
- The development is in the upper reaches of a large watershed draining to the Rideau River. The outlet from the site is to a municipal drain which is running at a very flat grade, thereby, presenting ample opportunity for pollutants to settle out.
- On-site control of stormwater by parking lot and possibly roof top storage will result in a reduction of pollutant loadings.
- Laboratory and field observations, indicate that installation of an orifice in the outlet of a catchbasin with a sump, has brought about a greater retention of grit and other solids after a storm event than observed with a conventional storm sewer outlet. The constricted release of flow from the orifice causes stormwater to backup in the catchbasin thereby keeping the turbulent zone of the water away from the sump and reducing velocities in the catchbasin. These actions facilitate settling of suspended solids into the sump.

Based on the above, it is felt that the proposed quantity control measures will also serve to ensure that the proposed development will not unduly affect the quality of water flowing from the site into Monahan Creek and thus to the Rideau River. Correspondence with RVCA regarding the water quality control is attached in **Appendix D.**

To provide sufficient water quality control, an OGS is proposed before the storm outlet to the street. An 80% of TSS removal is provided by the OGS. Detailed calculation and specifications for the OGS are included in **Appendix D**.

5 GRADING AND ROADS

5.1 Site Grading

The existing grades within portions of the proposed development lands vary due to the existing topography of the site. The grading plan will require the balancing of various requirements including but not limited to geotechnical constraints, minimum/maximum slopes, overland routing of stormwater, all to ensure the site is graded in accordance with municipal standards.

Refer to the grading plan provided in **Appendix E**.

A retaining wall exceed 1.0m in height is anticipated along the north eastern property lines. A retaining wall less than 600mm height is anticipated along Terrance Mathews Drive. Terracing has been utilized around the balance of the perimeter to tie the proposed grading into existing.

5.2 Road Network

No public roads are proposed through the site. Minimum 6.0m wide drive aisle have been provided, as shown on the Site Plan in **Appendix A.** An internal Fire route has been shown where fire truck access is required, as determined by the site architect.

There are 52 parking stalls provided on the site, of which 3 are barrier free.

Noise attenuation features and indoor noise clause provisions will not be required commercial use lands for road noise generated by the adjacent roads.

6 SOURCE CONTROLS

6.1 General

Since an end of pipe treatment facility is already provided for the development lands, stormwater site management for the subject lands will focus on site level or source control management of runoff. Such controls or mitigative measures are proposed for this development not only for final development but also during construction and build out. Some of these measures are:

- flat site grading where possible
- vegetation planting
- groundwater recharge in landscaped areas

6.2 Lot Grading

Where possible, all of the proposed blocks within the development will make use of gentle surface slopes on hard surfaces such as asphalt and concrete. In accordance with local municipal standards, all grading will be between 0.5 and 5.0 percent for hard surfaces and 2.0 and 7.0 percent for all landscaped areas. Significant grade changes will be accomplished through the use of terracing (3:1 max slope), ramps and/or retaining walls. All street and parking lot catchbasins shall be equipped with 3.0m subdrains on opposite sides of a curbside catchbasin running parallel to the curb, and with 3.0m subdrains extending out from all 4 sides of parking lot catchbasins.

6.3 Vegetation

As with most site plans, the developer will be required to complete a vegetation and planting program. Vegetation throughout the development including planting along roadsides and within the individual blocks provides opportunities to re-create lost vegetation.

6.4 Groundwater Recharge

Groundwater recharge targets have not been identified for this site. Perforated sub-drain systems will be implemented at capture locations in all vegetated areas. This will promote increased infiltration during low flow events before water is collected by the storm sewer system.

7 CONVEYANCE CONTROLS

7.1 General

Besides source controls, the development also proposes to use several conveyance control measures to improve runoff quality. These will include:

- vegetated swales; and
- catchbasin sumps and manhole sumps.

7.2 Catchbasins and Maintenance Hole Sumps

All catchbasins within the development, either rear yard or street, will be constructed with minimum 600 mm deep sumps. These sumps trap pollutants, sand, grit and debris which can be mechanically removed prior to being flushed into the minor pipe system. Both rear yard and street catchbasins will be to OPSD 705.02. All storm sewer maintenance holes serving local sewers less than 900 mm diameter shall be constructed with a 300 mm sump as per City standards.

8 SEDIMENT AND EROSION CONTROL PLAN

8.1 General

During construction, existing stream and conveyance systems can be exposed to significant sediment loadings. Although construction is only a temporary situation, it is proposed to possibly introduce a number of mitigative construction techniques to reduce unnecessary construction sediment loadings. These may include:

- Until the local storm sewer is constructed, groundwater in trenches will be pumped into a filter mechanism prior to release to the environment;
- sediment capture filter socks will remain on open surface structures such as maintenance holes and catchbasins until these structures are commissioned and put into use; and
- silt fence on the site perimeter will be installed.

8.2 Trench Dewatering

Any trench dewatering using pumps will be discharged into a filter trap made up of geotextile filters and straw bales similar in design to the OPSD 219.240 Dewatering Trap. These will be constructed in a bowl shape with the fabric forming the bottom and the straw bales forming the sides. Any pumped groundwater will be filtered prior to release to the existing surface runoff. The contractor will inspect and maintain the filters as needed, including sediment removal and disposal and material replacement as needed. It should be noted that that the contractor will be responsible for the design and management of the trap(s).

8.3 Seepage Barriers

In order to further reduce sediment loading to the stormwater management facility, seepage barriers will be installed on any surface water courses at appropriate locations that may become evident during construction. These barriers will be Light Duty Straw Bale Barriers per OPSD 219.100 and Heavy-Duty Silt Fence Barriers per OPSD 219.130; locations are shown on the Sediment and Erosion Control Plan included in **Appendix E**. They are typically made of layers of straw bales or geotextile fabric staked in place. All seepage barriers will be inspected and maintained as needed.

8.4 Surface Structure Filters

All catchbasins, and to a lesser degree, manholes, convey surface water to sewers. Until streets are asphalted and curbed, all catchbasins and manholes will be constructed with sediment capture inserts or equivalent located between the structure frame and cover. These will stay in place and be maintained during construction and build until it is appropriate to remove same.

9 CONCLUSION

This report has illustrated that the proposed Kanata West Center development can be serviced via existing municipal services. The water network will be extended to provide necessary service. All sanitary and storm sewer designs for this development will be completed in conformance with City of Ottawa standards while acknowledging downstream constraints. By limiting flow into the minor storm sewer system as per the applicable local stormwater management criteria and allowing for excess surface storage on-site, all stormwater management requirements will be met. Adherence to the Sediment and Erosion Control Plan during construction will minimize harmful impacts on surface water.

Based on the information provided within this report, the plans prepared for the subject development can be serviced to meet City of Ottawa requirements.

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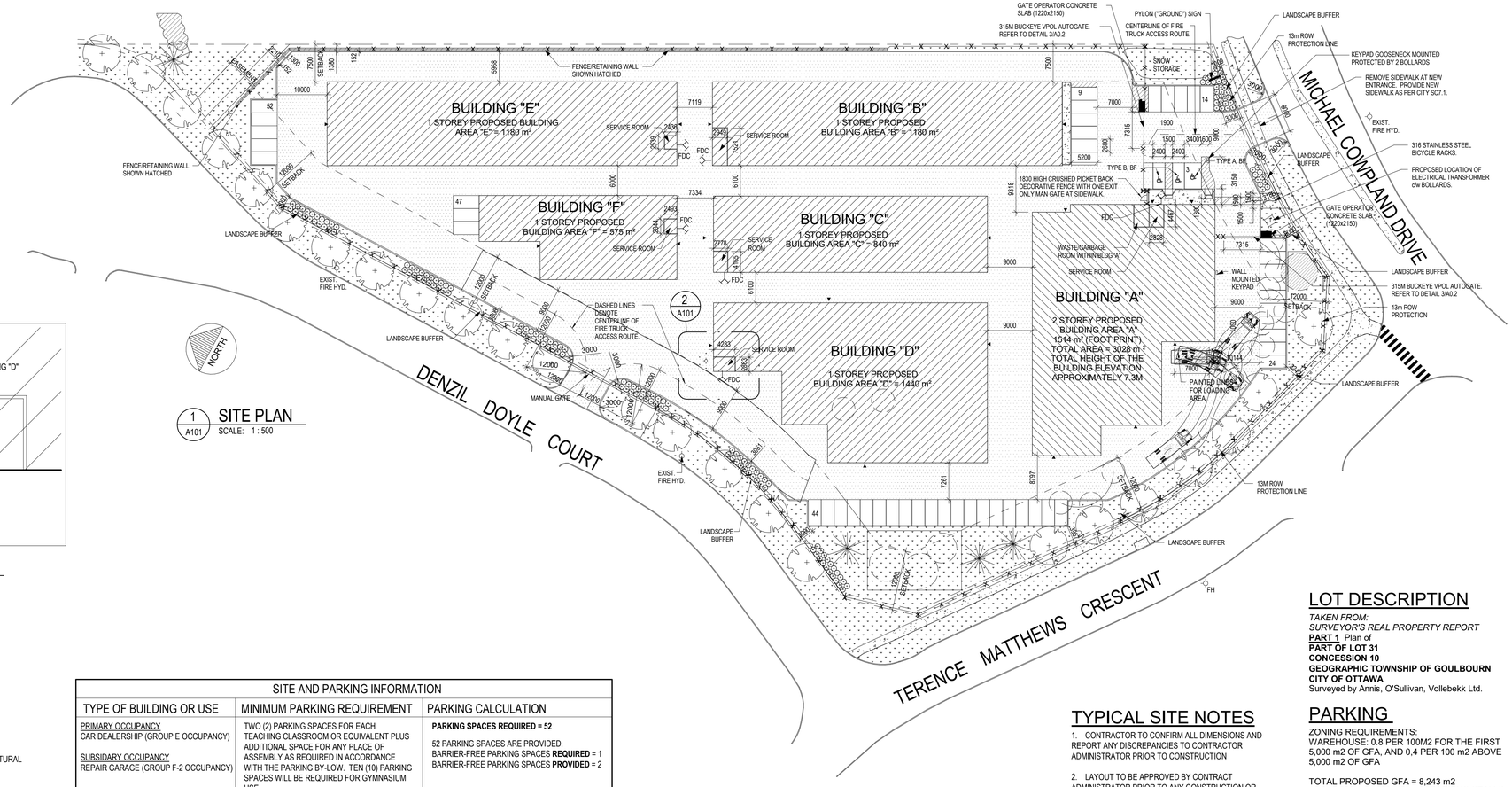
Amy Zhuang, P.ENG.
Project Engineer

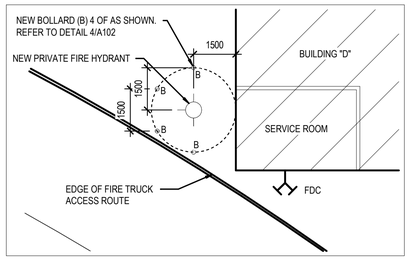
https://ibigroup.sharepoint.com/sites/Projects1/135470/Internal Documents/6.0_Technical/6.04_Civil/01_Brief/CTR-Design Brief-2021-09-20.docx

APPENDIX A

- Site Plan
- Legal Plan
- General Plan of Services Drawing C-001
- Notes of Pre-consultation



1 / A101 SITE PLAN
SCALE: 1 : 500



2 / A101 NEW PRIVATE FIRE HYDRANT
SCALE: 1 : 100

SITE PLAN SYMBOLS LEGEND

- ▼ = ENTRANCE
- ▽ = EXIT
- = MANHOLE, CATCH BASIN, ETC, REFER TO CIVIL
- = LS, LIGHT STANDARD, REFER TO ELECTRICAL AND STRUCTURAL
- = DENOTES SLOPED GRADE, REFER TO CIVIL
- = DENOTES FIRE TRUCK ACCESS ROUTE, REFER TO CIVIL DRAWINGS
- = PROPERTY LINE
- = SURVEY BAR
- UP = UTILITY POLE
- FH = FIRE HYDRANT
- BN = BASKETBALL NET
- = SIDEWALK/ CONCRETE SURFACE
- = PEDESTRIAN WALKWAY
- –S– = SWALE. REFER TO CIVIL DRAWINGS
- = SETBACK LINE
- BH = BOREHOLE LOCATION
- = GRASS
- X–X–X = FENCE LINE
- = LANDSCAPING
- = ASPHALT
- = PAINTED LINES
- T = PADMOUNT TRANSFORMER BY HYDRO OTTAWA. PROVIDE TRANSFORMER BASE TO HYDRO OTTAWA STANDARDS. PRECAST TRANSFORMER BASE AND BOLLARDS BY GENERAL CONTRACTOR. REFER TO HYDRO OTTAWA STANDARD DETAILS UFS0001, UGS0002 AND UTS0038.
- ● = BOLLARD

SITE AND PARKING INFORMATION		
TYPE OF BUILDING OR USE	MINIMUM PARKING REQUIREMENT	PARKING CALCULATION
PRIMARY OCCUPANCY CAR DEALERSHIP (GROUP E OCCUPANCY) SUBSIDIARY OCCUPANCY REPAIR GARAGE (GROUP F-2 OCCUPANCY)	TWO (2) PARKING SPACES FOR EACH TEACHING CLASSROOM OR EQUIVALENT PLUS ADDITIONAL SPACE FOR ANY PLACE OF ASSEMBLY AS REQUIRED IN ACCORDANCE WITH THE PARKING BY-LOW. TEN (10) PARKING SPACES WILL BE REQUIRED FOR GYMNASIUM USE.	**PARKING SPACES REQUIRED = 52** 52 PARKING SPACES ARE PROVIDED. BARRIER-FREE PARKING SPACES **REQUIRED** = 1 BARRIER-FREE PARKING SPACES **PROVIDED** = 2
EXISTING PARKING		BUILDING AREA
ZONING = CH - COMMERCAIL HIGHWAY MIN. LOT AREA = REFER TO BY-LAW MIN. LOT FRONTAGE = REFER TO BY-LAW MIN. FRONT YARD SETBACK = 9 M MIN. SIDE YARD SETBACK = 6 M MIN. REAR YARD SETBACK = 10.5 M	FIRE TRUCK ACCESS ROUTE IS FROM NICK KANEB DRIVE AND SHALL CONFORM TO OBC 2012 - 3.2.5.4, 3.2.5.5 AND 3.2.5.6	BUILDING AREA = 1180 SQ.M.
		SITE AREA
		SITE AREA = 16575 SQ. M.

GENERAL SITE PLAN NOTES

1. OBC 3.2.5.5.(1) LOCATION OF ACCESS ROUTES

   ACCESS ROUTES REQUIRED BY ARTICLE 3.2.5.4 SHALL BE LOCATED SO THAT THE PRINCIPLE ENTRANCE AND EVERY ACCESS OPENING REQUIRED BY ARTICLE 3.2.5.1 AND 3.2.5.2. ARE LOCATED NOT LESS THAN 3M AND NOT MORE THAN 15M FROM THE CLOSEST PORTION OF THE ACCESS ROUTE REQUIRED FOR FIRE DEPARTMENT USE, MEASURED HORIZONTALLY FROM THE FACE OF THE BUILDING.

2. OBC 3.2.5.6.(1) ACCESS ROUTE DESIGN

   A PORTION OF A ROADWAY OR YARD PROVIDED AS A REQUIRED ACCESS ROUTE FOR FIRE DEPARTMENT USE SHALL, (a) HAVE A CLEAR WIDTH OF NOT LESS THAN 6M, UNLESS IT CAN BE SHOWN THAT LESSER WIDTHS ARE SATISFACTORY, (b) HAVE A CENTERLINE RADIUS NOT LESS THEN 12M, (c) HAVE AN OVERHEAD CLEARANCE OF NOT LESS THAN 5M, (d) HAVE A CHANGE OF GRADIENT NOT MORE THAN 1 IN 12.5 OVER A MINIMUM DISTANCE OF 15M, (e) BE DESIGNED TO SUPPORT THE EXPECTED LOADS IMPOSED BY FIRE FIGHTING EQUIPMENT AND BE SURFACED WITH CONCRETE ASPHALT OR OTHER MATERIAL DESIGNED TO PERMIT ACCESSIBILITY UNDER ALL CLIMATIC CONDITIONS.

3. PROVIDE 75mm THK HI-40 UNDER ALL EXTERIOR CONCRETE SIDEWALK AT ALL ENTRANCES/EXITS. EXTEND RIGID INSULATION MIN 1220 PAST THE EDGE OF CONCRETE SIDEWALKS.

4. FOR CONCRETE SIDEWALK EXPANSION AND CONTRACTION JOINTS, REFER TO CIVIL DETAIL AND SPECIFICATIONS.

5. REFER TO LANDSCAPING PLAN AND CIVIL PLANS FOR LOCATION OF SOD. ALL REMAINING AREAS NOT SLATED FOR SOD TO RECEIVE TOPSOIL AND SEED.

6. REFER TO CIVIL DRAWINGS FOR LOCATIONS OF FIRE ROUTE SIGNAGE.

7. REFER TO CIVL DRAWINGS FOR TACTILE INDICATORS.

8. ALL CURBS ADJACENT TO PARKING AREAS AND CURBS FORMING PART OF SIDWALKS ADJACENT TO PARKING AREAS TO BE PAINTED YELLOW.

9. ENSURE FINAL PLACEMENT OF FIRE DEPARTMENT CONNECTION IS NOT MORE THAN 45 m FROM THE NEAREST FIRE HYDRANT AS PER OBC 3.2.5.16. (2).

LOT DESCRIPTION

TAKEN FROM:
SURVEYOR'S REAL PROPERTY REPORT
PART 1 Plan of
PART OF LOT 31
CONCESSION 10
GEOGRAPHIC TOWNSHIP OF GOULBOURN
CITY OF OTTAWA
Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

ZONING

75 Michael Cowpland Drive
SITE INFORMATION
Legal Description:
Part of Lot 31, Concession 10, Geographic Township of Goulbourn, City of Ottawa

Municipal Address:
75 Michael Cowpland Drive, Kanata, ON

Site Area:
16,575 m2 (178,411.8 ft2)

Building Area:
Existing: N/A
Proposed: 8,243 m2 (88,726.91 ft2)

ZONING INFORMATION:
Zoning:
Business Park Industrial, Subzone 4 – Kanata South Business Park (IP4)

Lot Coverage (Sec 205., Table 205):
Required: 55% (maximum)
Proposed: 41%

Building Height (Sec. 205, Table 205(h)):
Required: 22 m (maximum)
Proposed: 6.6 m

Floor Space Index (Sec. 205, Table 205(g)):
Required: 2 (maximum)
Proposed: 0.5

Required Yards (Sec. 206, Table 206B):
Min. Front Yard: Building A - 12 m (12 m required)
Min. Interior Side Yard: Buildings B and E - 7.5 m (7.5 m required)
Min. Rear Side Yard: 12 m (7.5 m required)

TYPICAL SITE NOTES

1. CONTRACTOR TO CONFIRM ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO CONTRACTOR ADMINISTRATOR PRIOR TO CONSTRUCTION

2. LAYOUT TO BE APPROVED BY CONTRACT ADMINISTRATOR PRIOR TO ANY CONSTRUCTION OR REMOVALS

3. ALL DIMENSIONS ARE IN METRIC UNLESS OTHERWISE NOTED

4. CONTRACTOR IS RESPONSIBLE FOR ALL EXCAVATIONS, REMOVALS, DISPOSALS AND ROUGH GRADING AS REQUIRED TO CONSTRUCTION ALL WORKS AS SHOWN ON ALL PLANS, DETAILS AND SPECIFICATIONS

5. LOCATION OF ALL UTILITIES SHOWN FOR ILLUSTRATION ONLY. CONTRACTOR MUST CONTACT ALL UTILITIES REGARDING RULES FOR WORKING IN THE AREA OF THE UTILITIES PRIOR TO COMMENCEMENT OF ANY WORK. CONTRACTOR MUST CONFIRM LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION

6. ALL EXISTING ROADS, SIDEWALKS, CURBS, FENCING, PAVING, SODDED AREAS, AND APPROACHES, ETC. TO REMAIN TO BE PROTECTED DURING CONSTRUCTION TO CONTRACT ADMINISTRATOR'S APPROVAL AT THE CONTRACTORS OWN COSTS.

7. ALL EXISTING TREES, SHRUB BEDS, MULCH BEDS, AND SOD TO REMAIN TO BE PROTECTED DURING CONSTRUCTION. AREAS DAMAGED DURING CONSTRUCTION TO BE REPAIRED TO CONTRACT ADMINISTRATOR'S APPROVAL AT THE CONTRACTORS OWN COST.

8. USE SPECIFIED BACKFILL IN ALL TRENCHES RUNNING BELOW ALL STRUCTURES, PAVING, WALKWAYS, ETC.

9. FILL ALL HOLES AND LOW AREAS TO DESIGN SUBGRADE WITH COMPACTED FILL (SUITABLE TO SURFACE FINISH), FOR SODDED/PLANTED AREAS USE COMPACTED CLEAN EARTH FILL SUITABLE FOR PLANT GROWTH. FOR PAVED AREAS USE COMPACTED GRANULAR BASE.

10. ALL TREES WITHIN OR IMMEDIATELY ADJACENT TO AREA OF WORK TO BE PROTECTED TO CITY OF OTTAWA TREE PROTECTION STANDARDS.

11. REFER TO LANDSCAPE DRAWINGS FOR LOCATIONS OF ALL EXISTING, REMOVED, AND PROPOSED TREE AND SHRUB PLANTING

PARKING

ZONING REQUIREMENTS:
WAREHOUSE: 0,8 PER 100M2 FOR THE FIRST 5,000 m2 OF GFA, AND 0,4 PER 100 m2 ABOVE 5,000 m2 OF GFA

TOTAL PROPOSED GFA = 8,243 m2
=0.8*(5,000 m2 / 100 m2) = 40 PARKING STALLS
+0.4*(3243 m2 / 100 m2) = 12 PARKING STALLS
TOTAL PARKING STALLS REQUIRED = 52
TOTAL PARKING STALLS PROVIDED = 52

FDC - APPROXIMATE LOCATION OF FIRE DEPARTMENT CONNECTION ON BUILDING

SITE SUMMARY

EXISTING LOT AREA	16575 SQ.M
PROPOSED BUILDING "A"	3028 SQ.M
PROPOSED BUILDING "B"	1180 SQ.M
PROPOSED BUILDING "C"	840 SQ.M
PROPOSED BUILDING "D"	1440 SQ.M
PROPOSED BUILDING "E"	1180 SQ.M
PROPOSED BUILDING "F"	575 SQ.M
TOTAL PROPOSED G.F.A.	8,243 SQ.M

LOT COVERAGE(8,243-1514 BLDG"A")6729 40% PROPOSED

THE MAXIMUM PERMITTED LOT COVERAGE IS 55% AS PER TABLE 205(C)

ONTARIO BUILDING CODE

1. SITE PLAN AND BUILDING DESIGN IS BASED ON "SECTION 3.10. SELF-SERVICE STORAGE BUILDINGS".

2. OCCUPANCY CLASSIFICATION IS F-2, BUILDING IS SPRINKLERED. CONSTRUCTION IS NON-COMBUSTIBLE. OCCUPANT LOAD DOES NOT APPLY.

3. SPATIAL SEPARATIONS DOES NOT APPLY BETWEEN BUILDINGS AS PER OBC 3.10.4.3 (4). THE DISTANCE BETWEEN INDIVIDUAL BUILDINGS SHALL NOT BE LESS THAN 6M.

4. PER OBC 3.10, PROVISIONS FOR FIRE FIGHTING MEETS 9M WIDE ACCESS ROUTE AND UNOBSTRUCTED PATH OF TRAVEL FOR THE FIREFIGHTER FROM THE VEHICLE TO THE FIRE DEPARTMENT CONNECTION (FDC) OF MAX. 45M.

5. BUILDING IS EXEMPT PER OBC, MMA SUPPLEMENTARY STANDARD SB-10, DIVISION 3, ENERGY EFFICIENCY DESIGN AFTER DECEMBER 31, 2016, PER SECTION 1.2.1.1 (1)(d) AND 1.2.1.1 (2)(b).

ARCHITECTURE 49

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

CONSULTANT

CONSULTANT

CONSULTANT

CLIENT
ACCESS STORAGE

SEAL:
ONTARIO ASSOCIATION OF ARCHITECTS
JIE CHEN
LICENCE
8009

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

NORTH ARROW: TRUE NORTH

DIGITAL REFERNECE:

PROJECT NO.: 229-00058-11 CONTRACT NO.
DRAWN BY: NM/AS CHECKED BY: JC/AB APPROVED BY: Approver
KEYPLAN:

NO.	DATE	ISSUED
2	2023.11.13	ISSUED FOR SITE PLAN RESUBMISSION
1	2023.09.20	ISSUED FOR SITE PLAN RESUBMISSION

PROJECT

ACCESS STORAGE
75 MICHAEL COWPLAND DRIVE

DRAWING TITLE

SITE PLAN - GENERAL

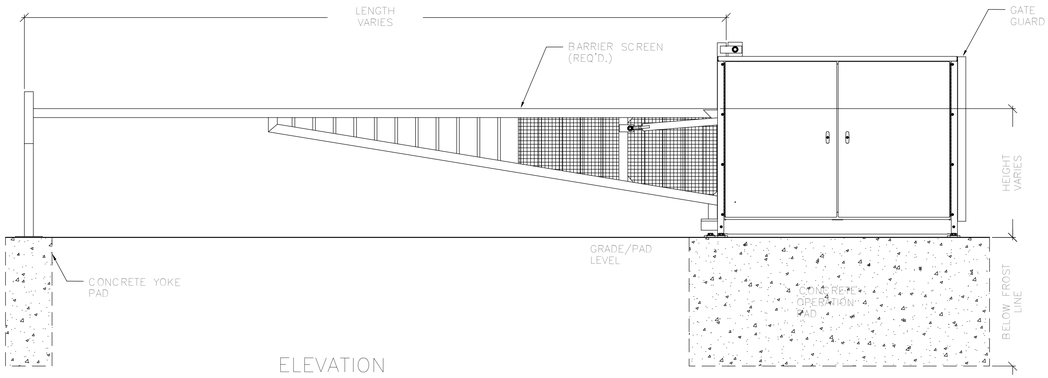
DRAWING NO. **A101**

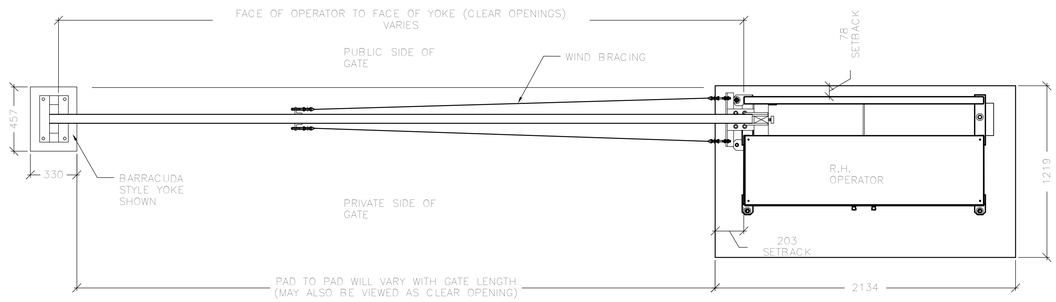
#18885

PRINT DATE: 11/13/2023 10:40:37 AM

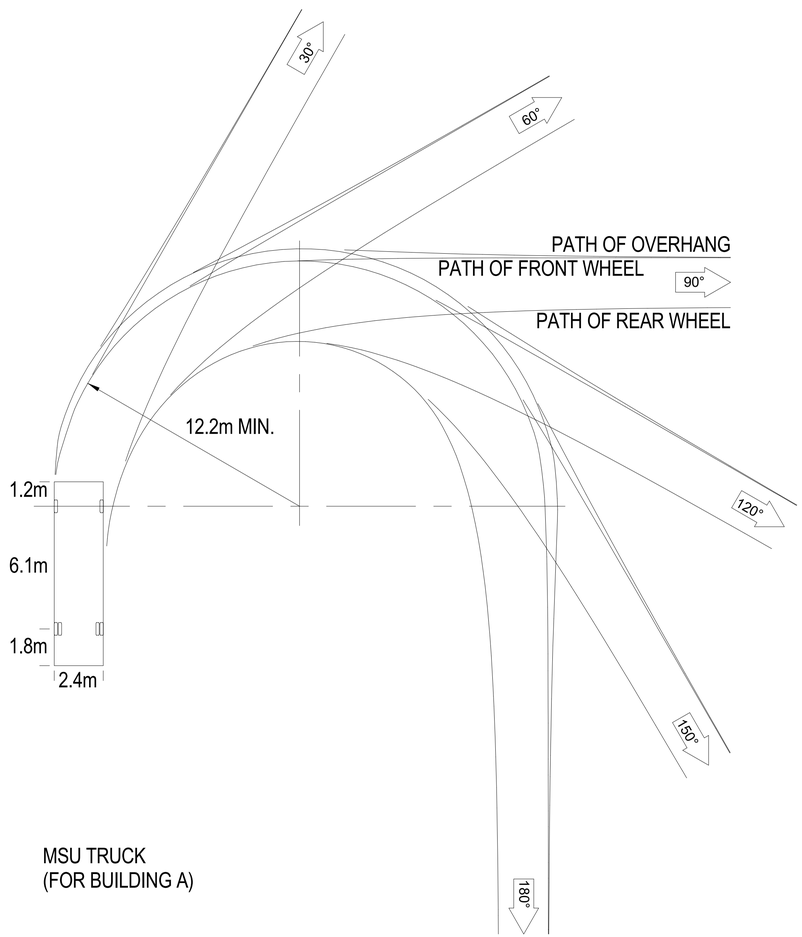
D07-12-22-0174

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

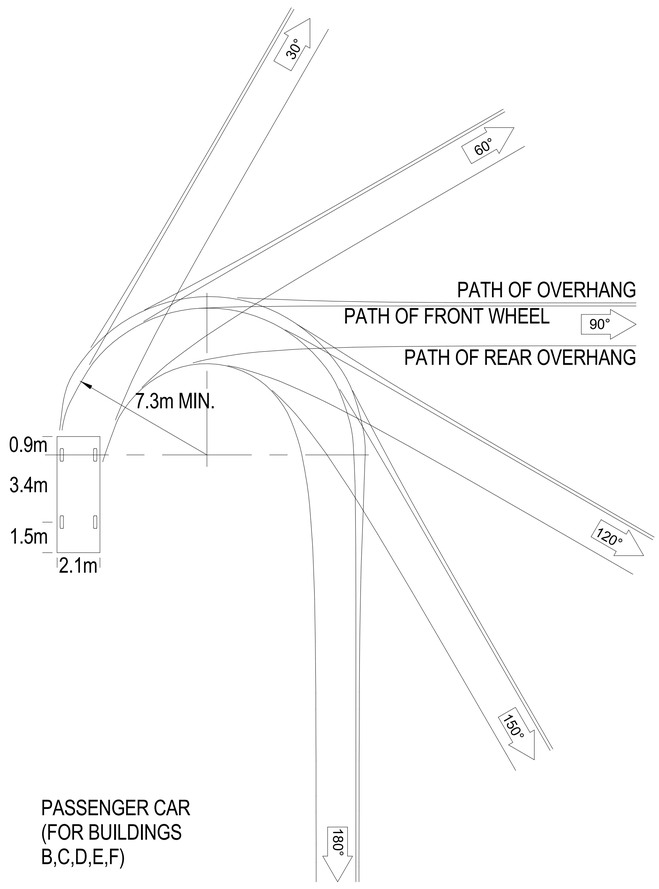




2 A102 **PIVOT GATE**
SCALE: 1 : 20

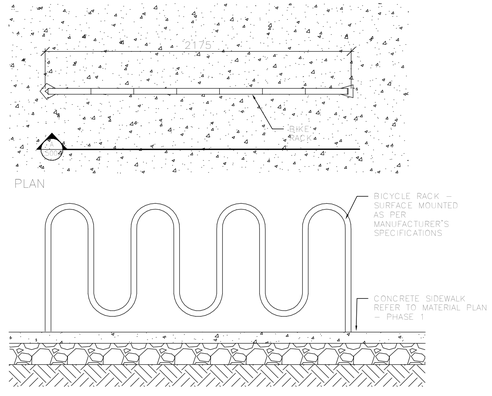


MSU TRUCK
(FOR BUILDING A)

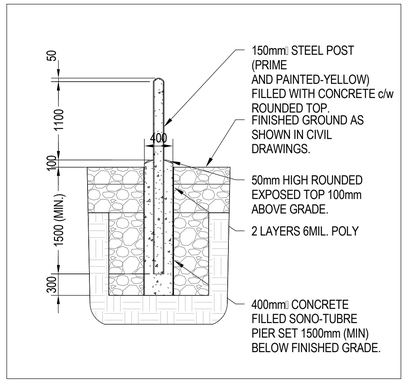


PASSENGER CAR
(FOR BUILDINGS
B,C,D,E,F)

1 A102 **TURNING TEMPLATES**
SCALE: 1 : 140



3 A102 **BIKE RACK**
SCALE: 1 : 20



4 A102 **TYPICAL BOLLARD DETAIL**
SCALE: N.T.S.

ARCHITECTURE 49

ARCHITECTURE49
1345 ROSEMOUNT AVENUE | CORNWALL, ON, CANADA K6J 3E5
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CONSULTANT

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CLIENT
ACCESS STORAGE

SEAL:
ONTARIO ASSOCIATION OF ARCHITECTS
JIE CHEN
LICENCE
8009

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

NORTH ARROW: DIGITAL REFERNECE:

PROJECT NO.: 229-00058-11 CONTRACT NO.:
DRAWN BY: Author CHECKED BY: Checker APPROVED BY: Approver
KEYPLAN:

NO.	DATE	ISSUED
2	2023.11.13	ISSUED FOR SITE PLAN RESUBMISSION
1	2023.09.20	ISSUED FOR SITE PLAN RESUBMISSION

PROJECT

ACCESS STORAGE
75 MICHAEL COWPLAND DRIVE

DRAWING TITLE

SITE PLAN - DETAILS

DRAWING NO.
A102

#18885

PRINT DATE: 11/13/2023 10:40:37 AM
D07-12-22-0174

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

TOPOGRAPHIC PLAN OF SURVEY OF

PART OF LOT 31
CONCESSION 10
GEOGRAPHIC TOWNSHIP OF GOULBOURN
CITY OF OTTAWA

Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

Scale 1 : 300

12 9 6 3 0 6 12 Metres

Metric

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

Surveyor's Certificate

I CERTIFY THAT :

1. This survey and plan are correct and in accordance with the Surveys Act and the Surveyors Act and the regulations made under them.
2. The survey was completed on the 1st day of November, 2022.

Nov. 9, 2022
Date

J. E. Anderson
Ontario Land Surveyor

Notes & Legend

	Denotes	
—□—	"	Survey Monument Planted
—■—	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
IB	"	Iron Bar
IBø	"	Round Iron Bar
(WIT)	"	Witness
Meas.	"	Measured
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(P1)	"	Plan 5R-10105
(P2)	"	(1692) Plan March 3, 2016
(P3)	"	Plan 5R-12716
(P4)	"	Plan 5R-12849
(P5)	"	Plan 5R-12172
	"	Deciduous Tree
	"	Coniferous Tree
FH	"	Fire Hydrant
WV	"	Water Valve
SP	"	Water Stand Post
MH-ST	"	Maintenance Hole (Storm Sewer)
MH-S	"	Maintenance Hole (Sanitary)
MH-T	"	Maintenance Hole (Traffic)
MH-H	"	Maintenance Hole (Hydro)
MH	"	Maintenance Hole (Unidentified)
VC	"	Valve Chamber (Watermain)
— ST —	"	Underground Storm Sewer
— S —	"	Underground Sanitary Sewer
— W —	"	Underground Water
— G —	"	Underground Gas
— OHW —	"	Overhead Wires
CB	"	Catch Basin
DI	"	Ditch Inlet
TB-B	"	Bell Terminal Box
TB-C	"	Cable Terminal Box
TB	"	Unidentified Terminal Box
LS	"	Light Standard
Ø	"	Diameter
+ 65.00	"	Location of Elevations
+ 65.00	"	Top of Concrete Curb Elevation

Bearings are grid, derived from Can-Net 2016 Real Time Network GPS observations, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).
For bearing comparisons, a rotation of 0°00'50" counter-clockwise was applied to bearings on P1 & P2, a rotation of 0°04'20" counter-clockwise was applied to bearings on P3 & P4.

ELEVATION NOTES

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

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. Underground utility data derived from City of Ottawa utility sheets reference P-K-15, P-K-21, R-K-02 & R-K-03 (Plans Revised October 7, 2022).
4. Sanitary and storm sewer grades and inverts were derived from City of Ottawa Engineering Plans reference 8555B-01 (Dated July, 1989) & 8555-12 (Dated February, 1986).
5. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

ASSOCIATION OF ONTARIO LAND SURVEYORS
PLAN SUBMISSION FORM
V-36367

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

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
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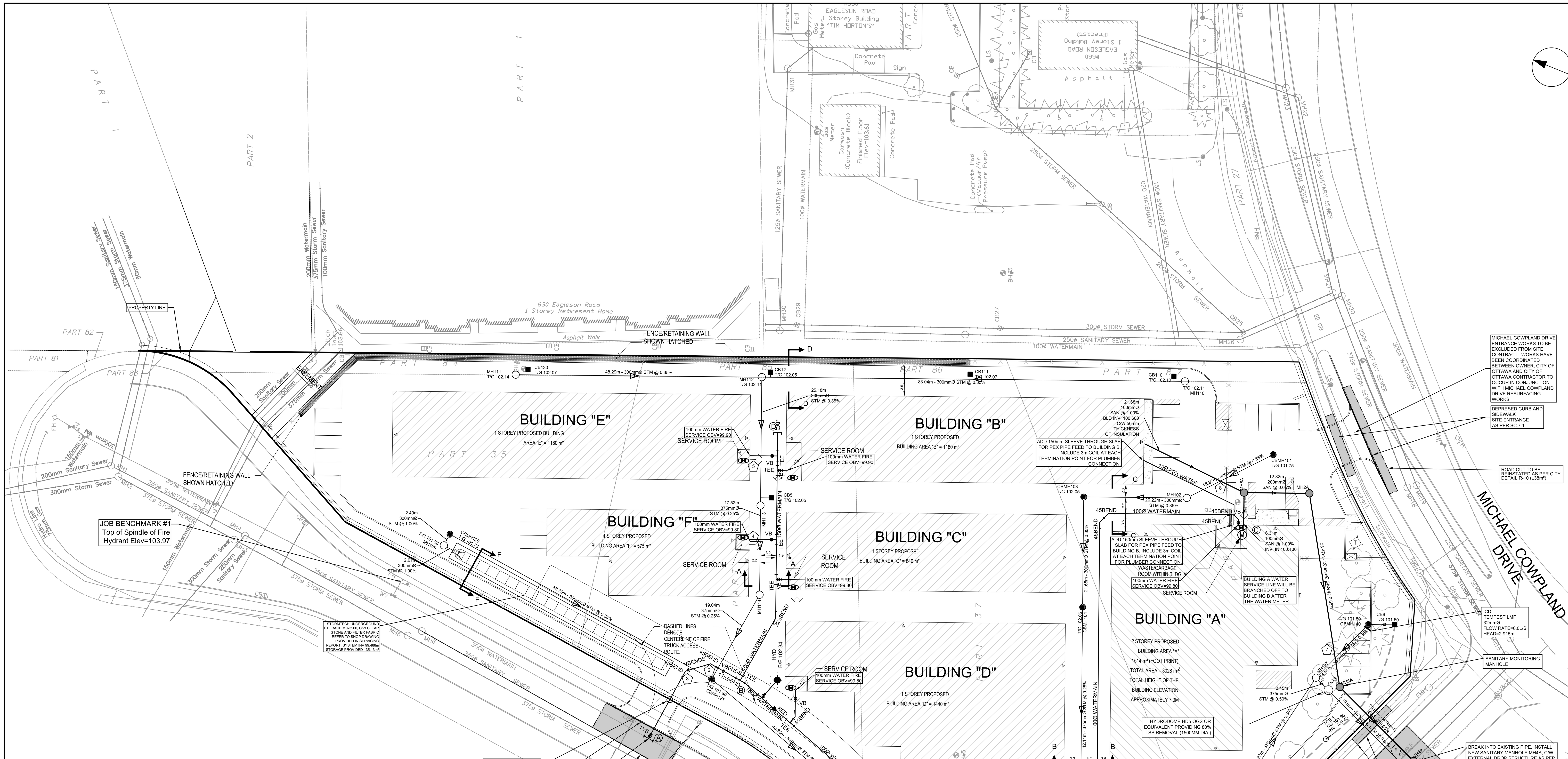
Ontario Land Surveyors

Job No. 23507-22 Huntington PtLt 31 C 10 GO T F | FS



STM STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT IN AS-BUILT	INVERT OUT	INVERT OUT AS-BUILT	DESCRIPTION
CBMH101	101.75			NW99.463		1200mmØ OPSD-701.010
CBMH103	102.05	S99.296		W99.236		1200mmØ OPSD-701.010
CBMH104	102.05	E99.161		W99.141		1200mmØ OPSD-701.010
CBMH105	101.90	E99.035 N98.995 W99.035		SE98.975		1500mmØ OPSD-701.011
CBMH106	101.92	NW98.929		E98.899		1200mmØ OPSD-701.010
CBMH115	101.87	N99.088		S99.058		1200mmØ OPSD-701.010
CBMH120	101.75	W99.413		S99.383		1200mmØ OPSD-701.010
CBMH121	101.80	N99.177 E99.217		S99.157		1200mmØ OPSD-701.010
CBMH140	101.81	S99.152		W98.884		1200mmØ OPSD-701.010
MH102	102.07	SE99.397		N99.367		1200mmØ OPSD-701.010
MH107	102.16	W98.758 E98.833		SW98.698		1200mmØ OPSD-701.010
MH108	102.02	N99.131		E99.071		1200mmØ OPSD-701.010
MH109	101.88	S99.468		E99.438		1200mmØ OPSD-701.010
MH110	102.11			N99.788		1200mmØ OPSD-701.010
MH111	102.14			S99.666		1200mmØ OPSD-701.010
MH112	102.11	N99.497 S99.497		W99.437		1200mmØ OPSD-701.010
MH113	102.17	E99.349		W99.329		1200mmØ OPSD-701.010
MH114	102.17	E99.285		W99.265		1200mmØ OPSD-701.010
OGS	102.05	NE98.680		SW98.660		1500mmØ OPSD-701.011

MANHOLE FRAME AND COVERS PER CITY STD S25 AND S24.1

SAN STRUCTURE TABLE

NAME	RIM ELEV.	INVERT IN	INVERT IN AS-BUILT	INVERT OUT	INVERT OUT AS-BUILT	DESCRIPTION
MH2A	102.11	N99.773		SW99.713		1200mmØ OPSD-701.010
MH3A	101.98	NE99.463		SW99.433		1200mmØ OPSD-701.010
MH4A	100.92	NE99.300 SE98.298		NW98.021		1200mmØ OPSD-701.010
MH8A	102.10	W100.067 N100.384		S99.857		1200mmØ OPSD-701.010

MANHOLE FRAME AND COVERS PER CITY STD S25 AND S24

CLIENT

HUNTINGTON PROPERTIES

COPYRIGHT

ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR CITY REVIEW	2022-12-09
2	REVISED PER CITY COMMENTS	2023-03-09
3	REVISED PER CITY COMMENTS	2023-07-07
4	REVISED PER CITY COMMENTS	2023-07-19
5	REVISED PER CITY COMMENTS	2023-09-22
6	REVISED PER CITY COMMENTS	2023-11-13

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

KEY PLAN

SITE

CONSULTANTS

Project Coordinator:
Huntington Properties
Architect:
A49 Architecture
Landscape:
Fotenn
Mechanical & Electrical:
Goodkey, Weedmark & Associates Limited
Surveyor:
Annis O'Sullivan Vollebekk Ltd.

Geotech:
Paterson Group

1:400

SEAL

IBI GROUP
Suite 400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 / 613 241 3300 fax 613 225 9868
ibigroup.com

PROJECT

PROPOSED SELF STORAGE DEVELOPMENT

75 MICHAEL COWPLAND

PROJECT NO: 135470	
DRAWN BY: S.L. / D.D.	CHECKED BY: T.R.B.
PROJECT MGR: R.M.	APPROVED BY: T.R.B.

SHEET TITLE

GENERAL PLAN OF SERVICES

SHEET NUMBER C-001

ISSUE 6

CITY PLAN NO. 18885 CITY FILE No. D07-12-22-0174

File Number: PC2022-0274
November 1, 2022

Pre-Application Consultation Meeting Minutes

Property Address: 60 Denzil Doyle Court
Location: Virtual – Microsoft Teams
Meeting Date: November 1st, 2022

Attendees: **City Staff:**
Molly Smith – File Lead
Steven Payne – Planning Coop
Matthew Ippersiel – Urban Design
Santhosh Kuruvilla – Engineer
Mark Richardson – Forester
Siobhan Kelly – Committee of Adjustment
Hayley Murray – Forestry

Applicant Team:
Jill MacDonald – WSP
Hind Barnieh – Access Storage
Mathieu Desjardins – Huntington Properties
Terry Brule – IBI Group
Ryan Magladry – IBI Group
Derek Noble – Huntington Properties
Andrew Bouwman – Architecture 49
Jie Chen – Architecture 49

Regrets: Neeti Paudel – Transportation Project Manager (City)

Applicant

- Access Storage in partnership with Huntington Properties
- Six buildings proposed, want to maximize buildable area
- Building A 2-storeys, remainder of buildings are a single-storey
- Huntington Properties has owned the property for 15-years
- Building A – 2-storey but climate controlled and has an office component that would only serve customers/site/facility. Office portion would be considered accessory due to nature of use and size. If office use is intended to serve as an office space outside of the site (regional), would not be considered accessory.

City Comments:

Planning

1. Complex Site Plan required. Please be aware of policy or procedures changes as a result of Bill 109.
2. Unclear if minor variances required. Please speak with Molly prior to submission.
3. Trees along Terence Matthews and Michael Cowpland need to be retained, please adjust the site plan layout to provide sufficient setbacks.
4. When submitting, elevations and site plan will need to include the whole site.
5. If possible, bicycle parking should be near main entrances and covered.
6. Additional landscaping and tree planting should be provided. Please look for opportunities to break up hardscaping with shade plantings.
7. Direct connections from the sidewalks should be provided.
8. Planning Rationale Required.

Feel free to contact Molly Smith, Planner (File Lead), at molly.smith@ottawa.ca for follow-up questions.

Minor Variance/Committee of Adjustment (if required)

Minor Variance

- The parking rate calculation depends on how the ancillary admin space functions (Building A)
    - Applicant confirmed that the admin space only services the warehouses on site –warehouse parking rate applicable

Provision	Required	Proposed
Warehouse: 0.8 per 100 m2 for the first 5000 m2 of gross floor area, and 0.4 per 100 m2 above 5000 m2 of gross floor area.	(5000/100) x 0.8 = 40 (3,557/100) x 0.4 = 14.2 40 + 14.2 = 54	54 spaces

- If relief is required, the applicant can apply for a minor variance
- The new Official Plan designates the property Neighbourhood within the Suburban West Transect. If a minor variance is required, planning rationale will be required to support the proposed use and to demonstrate that it maintains the intent/purpose of the new Official Plan.
- PRED staff may support a minor variance for a reduction in parking if it contributes to the retention of trees along Terrence Matthews Cres (New OP - Policy 4.8.2)
- The Committee of Adjustment can grant a minor variance if the following criteria are met:
    1. The variance maintains the general intent and purpose of the Official Plan
    2. The variance maintains the general intent and purpose of the Zoning By-law
    3. The variance is minor in nature

4. The variance is desirable for the appropriate development/use of the lands

Complete Application
For a complete list of the submission requirements, please refer to Section 2 of the application form:

https://app06.ottawa.ca/online_services/forms/ds/minor_variance_en.pdf

Timelines

- The Site Plan Control application should be underway before applying to the Committee of Adjustment for a minor variance
- The Committee of Adjustment process takes approx. 12-14 weeks from application submission to end of the appeal period. Once an applicant submits and the Committee of Adjustment Coordinators deem the application complete, it takes 4-6 weeks to be heard at a public hearing

Urban Design

1. Maintain and improve the planted edge along Terence Matthews. This landscaped edge is present on all other properties on Terrence Matthews and defines the character of the street.
2. Consolidate the two snow storage areas in the narrow north corner of the site (increasing the snow storage area currently proposed).
3. Drive aisles need to be reorganized and widened throughout the site to improve circulation and safety. Create more direct vehicle lanes to avoid the necessity for frequent turning.
4. Consider integrating a central drive aisle leading off of Denzil Doyle, which would be perpendicular to the street. This could become the main organizational element of the site and inform the orientation of the buildings.
5. Rather than have parking spaces distributed in small pockets throughout the site, consolidate spaces in larger groups, perhaps primarily along the new widened vehicle aisle leading off Denzil Doyle (see previous comment).
6. Improve the interface between this site and the existing retirement home to the east. A landscape buffer is needed to screen the storage units from the residence's windows.
7. This application is not subject to review by the Urban Design Review Panel.
8. An Urban Design Brief is required as a part of your submission. This may be combined with your Planning Rationale report. Please refer to the attached Urban Design Brief Terms of Reference to inform the content of the brief.

Feel free to contact Matthew Ippersiel, Urban Designer, at matthew.ippersiel@ottawa.ca for follow-up questions.

Transportation

1. TIA will not be required.
2. Noise Impact Studies required for the following:
    a) Stationary (if there will be any exposed mechanical equipment due to the proximity to neighbouring noise sensitive land uses)
3. The proposed access on Denzil Doyle creates an offset with the existing access on Denzil Doyle Court. Suggest that the access is proposed directly across the existing access on the west side.
4. ROW protection on Michael Cowpland is 26 m. Ensure this is protected and shown on the site plan.
5. The sidewalks along the frontages of Michael Cowpland Drive Terence Matthews Crescent is substandard. Please upgrade the sidewalks per City standards (1.8m min concrete sidewalk).
6. On site plan:
    a) Show all details of the roads abutting the site up to and including the opposite curb; include such items as pavement markings, accesses and/or sidewalks.
    b) Show all curb radii measurements; ensure that all curb radii are reduced as much as possible
    c) Show lane/aisle widths.
7. As the proposed site is for the general public use, AODA legislation applies.
    a) Clearly define accessible parking stalls and ensure they meet AODA standards (include an access aisle next to the parking stall and a pedestrian curb ramp at the end of the access aisle, as required).
    b) Please consider using the City's Accessibility Design Standards, which provide a summary of AODA requirements. https://ottawa.ca/en/city-hall/creating-equal-inclusive-and-diverse-city/accessibility-services/accessibility-design-standards-features#accessibility-design-standards
8. Provide direct and safe pedestrian connections from the parking to the buildings.
9. Turning movements for the largest vehicle should be assessed at the nearby intersections and at the accesses and within the site.
10. Emergency services or building code services should be contacted to ensure there are no issues with the fire route. They provided the following comments:
    a) Assuming the red part is the proposed fire access routes - If so, is the fire route more than 90m dead-end without a designated turnaround? Also, Building B and C do not appear to meet the OBC requirement to "face a street" and have a fire access route within 3-14m of the building face. Building B also appears to have a FDC that is more than 45m from a fire hydrant (although close).

Feel free to contact Neeti Paudel, Transportation Project Manager, at neeti.paudel@ottawa.ca for follow-up questions.

Parks

Parks and Facilities Planning Comments:

1. As per the Parkland Dedication (By-law No. 2022-280) | City of Ottawa, as amended, parkland dedication will be required as a condition of development. In this circumstance given the parcel size and proposed use, Cash in Lieu of parkland would be considered appropriate.
2. Based in the details provided, the proposal would be best considered a commercial development for the purposes of the parkland dedication by-law. The applicant is encouraged to review the parkland dedication by-law should they feel that an alternative land use category be more appropriate. The parkland requirement for a commercial use is calculated as 2% of the gross land area of the site being developed.
3. Please identify in the Planning Rationale (when the initial development application is submitted) how the requirements in the Parkland Dedication (By-law No. 2022-280) will be achieved.
4. Please provide the City with a surveyor's area certificate/memo which specifies the exact gross land area of the property parcel being developed.
5. The value of the land will be determined by the City's Realty Services Branch. The owner is responsible for any appraisal costs incurred by the City.
6. Please note that the park comments are preliminary and will be finalized (and subject to change) upon receipt of the requested supporting documentation. Additionally, if the proposed land use changes, then the parkland dedication requirement will be re-evaluated accordingly.

Feel free to contact Jeff Goettling with Parks and Facilities Planning Services (jeff.goettling@ottawa.ca) for follow-up questions.

Forestry

1. A Tree Conservation Report is needed for this SPC
2. The retention of the well-established trees along the south and south east boundaries of the property are a priority
    a. Under the new Official Plan, referencing section 4.8.2, growth, development and intensification shall maintain the urban forest canopy. Mature, healthy trees should be preserved and provided space on private and public lands including the provision of adequate soil volumes on high quality soil.
3. Snow should not be stored within the critical rootzone of retained trees

Tree Conservation Report requirements:

1. A Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
    a. an approved TCR is a requirement of Site Plan approval.
    b. The TCR may be combined with the LP provided all information is supplied

2. Any removal of privately-owned trees 10cm or larger in diameter, or city-owned trees of any diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.
3. The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR
    a. If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester
    b. Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit
4. The TCR must contain 2 separate plans:
    a. Plan/Map 1 - show existing conditions with tree cover information
    b. Plan/Map 2 - show proposed development with tree cover information
    c. Please ensure retained trees are shown on the landscape plan
5. The TCR must list all trees on site, as well as off-site trees if the CRZ extends into the developed area, by species, diameter and health condition
    a. please identify trees by ownership – private onsite, private on adjoining site, city owned, boundary (trees on a property line)
6. If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained
7. All retained trees must be shown, and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca
8. The location of tree protection fencing must be shown on the plan
9. The City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.

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

Landscape Plan tree planting requirements:

For additional information on the following please contact tracy.smith@Ottawa.ca

Minimum Setbacks

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

Tree specifications

- Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
- Maximize the use of large deciduous species wherever possible to maximize future canopy coverage
- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
- Plant native trees whenever possible
- No root barriers, dead-man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

Hard surface planting

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

Soil Volume

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

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

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

- Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines

Tree Canopy

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

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

Feel free to contact Hayley Murray, Forester, at hayley.murray@ottawa.ca for follow-up questions.

Engineering

Please note the following information regarding the engineering design submission for the above noted site:

1. The Servicing Study Guidelines for Development Applications are available at the following link: https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans

2. Record drawings and utility plans are available for purchase from the City's Information Centre. Contact the City's Information Centre by email at informationcentre@ottawa.ca or by phone at (613) 580-2424 x44455

3. Stormwater quantity control criteria – Refer to Kanata South Business Park Stormwater Management Report (February 1986 by A.J. Robinson & Associates Inc.). See attached report.

4. Stormwater quality control – Consult with the Conservation Authority (MVCA) for their requirements. Include the correspondence with MVCA in the stormwater/site servicing report.

5. Existing watermains, sanitary and storm sewers are available on Denzil Doyle Court., Terence Matthews Cres., and Michael Cowpland Drive for service connections.

6. As per the City of Ottawa Slope Stability Guidelines for Development Applications an engineering report is required for any retaining walls proposed 1.0 m or greater in height within the subject site that addresses the global stability of the wall and provides structural details. A Retaining Wall Stability Analysis Report and Retaining Wall Structural Details are required to be provided from a Professional Engineer licensed in the Province of Ontario that demonstrates the proposed retaining wall structure has been assessed for global instability as per City standards. Please ensure the analysis and required documentation are provided as part of the submission to address this comment.

7. Emergency routes will need to be satisfactory to Fire Services. Please show fire routes on the site plan. For information regarding fire route provisions, please

consult with Kevin Heiss at kevin.heiss@ottawa.ca.

8. Clearly show and label the property lines on all sides of the property.

9. Clearly show and label all the easements (if any) on the property, on all plans.

10. When calculating the post development composite runoff coefficient (C), please provide a drawing showing the individual drainage area and its runoff coefficient.

11. When using the modified rational method to calculate the storage requirements for the site, the underground storage should not be included in the overall available storage. The modified rational method assumes that the restricted flow rate is constant throughout the storm which, in this case, underestimates the storage requirement prior to the 1:100-year head elevation being reached. Alternately, if you wish to include the underground storage, you may use an assumed average release rate equal to 50% of the peak allowable rate. Otherwise, disregard the underground storage as available storage or provide modeling to support the design.

12. Engineering plans are to be submitted on standard A1 size (594mm x 841mm) sheets.

13. Phase 1 ESA and Phase 2 ESA must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

14. Provide the following information for water main boundary conditions:
    1. Location map with water service connection location(s).
    2. Average daily demand (l/s).
    3. Maximum daily demand (l/s).
    4. Maximum hourly demand (l/s).
    5. Fire flow demand (provide detailed fire flow calculations based on Fire Underwriters survey (FUS) Water Supply for Public Fire Protection). Exposure separation distances shall be defined on a figure to support the FUS calculation and required fire flow (RFF).
    6. Hydrant capacity shall be assessed to demonstrate the RFF can be achieved. Please identify which hydrants are being considered to meet the RFF on a fire hydrant coverage plan as part of the boundary conditions request.

15. If you are proposing any exterior light fixtures, all must be included and approved as part of the site plan approval. Therefore, the lights must be clearly identified by make, model and part number. All external light fixtures must meet the criteria for full cut-off classification as recognized by the Illuminating Engineering Society of North America (IESNA or IES), and must result in minimal light spillage onto adjacent properties (as a guideline, 0.5 fc is normally the maximum allowable

spillage). In order to satisfy these criteria, the applicant must provide certification from an acceptable professional engineer. The location of all exterior fixtures, a table showing the fixture types (including make, model, part number), and the mounting heights must be included on a plan.

16. As per Ottawa Sewer Design Guideline section 4.4.4.7, a monitoring maintenance hole shall be required just inside the property line for all non-residential and multi residential buildings connections from a private sewer to a public sewer. See the sewer use By-law 2003-514(14) monitoring devices for details.

Feel free to contact Santhosh Kuruvilla, Infrastructure Project Manager, at Santhosh.kuruvilla@ottawa.ca for follow-up questions.

Other

- Plans are to be standard A1 size (594 mm x 841 mm) or Arch D size (609.6 mm x 914.4 mm) sheets, dimensioned in metric and utilizing an appropriate Metric scale (1:200, 1:250, 1:300, 1:400 or 1:500).
- All PDF submitted documents are to be unlocked and flattened.
- A Waste Reduction Workplan Summary is required for the construction project as required by O.Reg. 102/94, being “Waste Audits and Waste Reduction Work Plans” made under the Environmental Protection Act, RSO 1990, c E.19, as amended.
- You are encouraged to contact the Ward Councillor, about the proposal.

Please refer to the links to Guide to preparing studies and plans and fees for further information. Additional information is available related to building permits, development charges, and the Accessibility Design Standards. Be aware that other fees and permits may be required, outside of the development review process. You may obtain background drawings by contacting geoinformation@ottawa.ca.

It is anticipated that, as a result of the *More Homes for Everyone Act, 2022*, for applications for site plan approval and zoning by-law amendments, new processes in respect of pre-application consultation will be in place as of January 1, 2023. The new processes are anticipated to require a multiple phase pre-application consultation approach before an application will be deemed complete. Applicants who have not filed a complete application by the effective date may be required to undertake further pre-application consultation(s) consistent with the provincial changes. The by-laws to be amended include By-law 2009-320, the Pre-Consultation By-law, By-law 2022-239, the planning fees by-law and By-law 2022-254, the Information and Materials for Planning Application By-law. The revisions are anticipated to be before Council in the period after the new Council takes office and the end of the year.

These pre-con comments are valid for one year. If you submit a development application(s) after this time, you may be required to meet for another pre-consultation meeting and/or the submission requirements may change. You are as well encouraged to contact us for a follow-up meeting if the plan/concept will be further refined.

APPLICANT'S STUDY AND PLAN IDENTIFICATION LIST

Legend: **S** indicates that the study or plan is required with application submission.
A indicates that the study or plan may be required to satisfy a condition of approval/draft approval.

For information and guidance on preparing required studies and plans refer here:

S/A	ENGINEERING		S/A
S	1. Site Servicing Plan	2. Site Servicing Study / Assessment of Adequacy of Public Services	S
S	3. Grade Control and Drainage Plan	4. Geotechnical Study / Slope Stability Study	S
	5. Composite Utility Plan	6. Groundwater Impact Study	
	7. Servicing Options Report	8. Wellhead Protection Study	
	9. Transportation Impact Assessment (TIA)	10. Erosion and Sediment Control Plan / Brief	S
S	11. Storm water Management Report / Brief	12. Hydro geological and Terrain Analysis	
	13. Hydraulic Water main Analysis	14. Noise / Vibration Study	S
	15. Roadway Modification Functional Design	16. Confederation Line Proximity Study	

S/A	PLANNING / DESIGN / SURVEY		S/A
	17. Draft Plan of Subdivision	18. Plan Showing Layout of Parking Garage	
	19. Draft Plan of Condominium	20. Planning Rationale	S
S	21. Site Plan	22. Minimum Distance Separation (MDS)	
	23. Concept Plan Showing Proposed Land Uses and Landscaping	24. Agrology and Soil Capability Study	
	25. Concept Plan Showing Ultimate Use of Land	26. Cultural Heritage Impact Statement	
S	27. Landscape Plan	28. Archaeological Resource Assessment Requirements: **S** (site plan) **A** (subdivision, condo)	
S	29. Survey Plan	30. Shadow Analysis	
S	31. Architectural Building Elevation Drawings (dimensioned)	32. Design Brief (includes the Design Review Panel Submission Requirements)	
	33. Wind Analysis		

S/A	ENVIRONMENTAL		S/A
S	34. Phase 1 Environmental Site Assessment	35. Impact Assessment of Adjacent Waste Disposal/Former Landfill Site	
A	36. Phase 2 Environmental Site Assessment (depends on the outcome of Phase 1)	37. Assessment of Landform Features	
	38. Record of Site Condition	39. Mineral Resource Impact Assessment	
S	40. Tree Conservation Report	41. Environmental Impact Statement / Impact Assessment of Endangered Species	
	42. Mine Hazard Study / Abandoned Pit or Quarry Study	43. Integrated Environmental Review (Draft, as part of Planning Rationale)	

S/A	ADDITIONAL REQUIREMENTS		S/A
S	44. Applicant's Public Consultation Strategy (may be provided as part of the Planning Rationale)	45. Site Lighting Plan	**S**
A	46. Site Lighting Certification Letter	47.	

Meeting Date: November 1, 2022 Application Type: *Site Plan Control*

File Lead (Assigned Planner): Molly Smith Infrastructure Approvals Project Manager: Santhosh Kuruvilla

Site Address (Municipal Address): 60 Denzil Doyle Court *Preliminary Assessment: 1☐ 2☐ 3☐ 4☐ 5

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

It is important to note that the need for additional studies and plans may result during application review. If following the submission of your application, it is determined that material that is not identified in this checklist is required to achieve complete application status, in accordance with the Planning Act and Official Plan requirements, the Planning, Real Estate and Economic Development Department will notify you of outstanding material required within the required 30 day period. Mandatory pre-application consultation will not shorten the City's standard processing timelines, or guarantee that an application will be approved. It is intended to help educate and inform the applicant about submission requirements as well as municipal processes, policies, and key issues in advance of submitting a formal development application. This list is valid for one year following the meeting date. If the application is not submitted within this timeframe the applicant must again pre-consult with the Planning, Real Estate and Economic Development Department.

APPENDIX B

- City of Ottawa Boundary Conditions
- Watermain Demand Calculation Sheet
- FUS Fire Flow Requirement Calculation
- Modeling Output Files
- Water Entry Detail
- Correspondence from Architect and Mechanical Engineer

Boundary Conditions
75 Micheal Cowpland

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	0.18	0.0030
Maximum Daily Demand	0.28	0.0046
Peak Hour	0.49	0.0082
Fire Flow Demand #1	9,000	150

Location

Results

Connection 1 – Denzil Doyle Court

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.1	83.4
Peak Hour	156.5	76.8
Max Day plus Fire Flow	152.3	70.9

[1] Ground Elevation = 102.5 m

Notes

1. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
    a. If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
    b. Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

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

WATERMAIN DEMAND CALCULATION SHEET

IBI GROUP
333 PRESTON STREET
OTTAWA, ONTARIO
K1S 5N4

PROJECT : 75 Michael Cowpland
CLIENT : Huntington Propertyies & Access Storage

FILE: 125600-6.4.4
DATE PRINTED: 30-Jun-23
DESIGN: WZ
PAGE: 1 OF 1

NODE	RESIDENTIAL				NON-RESIDENTIAL (ICI)			AVERAGE DAILY DEMAND (l/s)			MAXIMUM DAILY DEMAND (l/s)			MAXIMUM HOURLY DEMAND (l/s)			FIRE DEMAND (l/min)
	SINGLE FAMILY UNITS	3 bedroom UNITS	2 bedroom UNITS	POPULATION	INDUST. (ha)	COMM. (ha)	INSTIT. (ha)	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	RESIDENTIAL	ICI	TOTAL	
Site						0.0094			0.0030	0.0030		0.0046	0.0046		0.0082	0.0082	9,000

POPULATION DENSITY

Single Family	3.4 persons/unit
3 Bedroom Units	2.7 persons/unit
2 Bedroom Units	1.8 persons/unit

WATER DEMAND RATES

Residential	350 l/cap/day
Commercial Shopping Center	2,500 L/(1000m2)/day
Other Commercial	28,000 L/Ha/day

PEAKING FACTORS

Maximum Daily	
Residential	2.5 x avg. day
Commercial	1.5 x avg. day
Maximum Hourly	
Residential	2.2 x max. day
Commercial	1.8 x max. day

FIRE DEMANDS

Single Family	10,000 l/min (166.7 l/s)
Semi Detached & Townhouse	10,000 l/min (166.7 l/s)

Fire flow for the site is determined using FUS.

IBI GROUP
500-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
ibigroup.com

FIRE UNDERWRITERS SURVEY

75 Michael Cowpland | Huntington Properties
135470-6.0 | Rev #1 | 2023-06-30
Prepared By: AZ | Checked By: RM

STEP	Contents	Discription		Adjustment Factor		Result	
1	**Building A** (2-storey) **Total Effective Floor Area**	1st Floor Area 2nd Floor Area (Storage space exceeding 3m in height, floor area X 3)		Height 3.0m Height 3.1m	1 3	1514 1514 **6056**	m2 m2 m2
2	**Type of Construction**	**Type V** Wood Frame **Type III** Ordinary Construction **Type II** Noncombustible Construction **Type I** Fire Resistive Construction	1.5 1.0 0.8 0.6	Type II Noncombustible Construction	0.8		
3	**Required Fire Flow**	RFF = 220CVA				**13696**	L/min
4	**Occupancy and Contents**	Noncombustible Contents Limited Conbustible Contents Combustible Contents Free Burning Contents Rapid Burning Contents	-25% -15% 0% 15% 25%	Conbustible - F2 Storage Rooms	0%	0	L/min
	Fire Flow					**13696**	L/min
5	**Automatic Sprinkler Protection**	Automatic Sprinkler Conforming to NFPA 13 Standard Water Supply for both the system and Fire Department Hose Lines Fully Supervised System	-30% -10% -10%	Yes Yes No	-30% -10%	-4109 -1370	L/min L/min
	Fire Flow					**8218**	L/min
6	**Exposure Adjustment**	Based on **Table 6** Exposure Adjustement Charges for Subject Building					
	North	Separation (m) Length X Height Factor (m.storeys) Construction Type	9.0 47.6 Type II	with unprotected opening	8%	657	L/min
	South	Separation (m) Length X Height Factor (m.storeys) Construction Type	>30 0 Type II	with unprotected opening	0%	0	L/min
	East	Separation (m) Length X Height Factor (m.storeys) Construction Type	9.3 6.6 Type II	with unprotected opening	6%	493	L/min
	West	Separation (m) Length X Height Factor (m.storeys) Construction Type	>30 0 Type II	with unprotected opening	0%	0	L/min
	Fire Flow					**9368**	L/min
7	**Total Required Fire Flow**	Rounded to Nearest 1000 L/min				**9000**	L/min
						150	L/s

Notes 1. Fire flow calculation are based on Fire Underwriters Survey version 2020.

IBI GROUP
500-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
ibigroup.com

FIRE UNDERWRITERS SURVEY

75 Michael Cowpland | Huntington Properties
135470-6.0 | Rev #1 | 2023-06-30
Prepared By: AZ | Checked By: RM

STEP	Contents	Discription		Adjustment Factor		Result	
1	**Building B** (1-storey) **Total Effective Floor Area**	1st Floor Area (Storage space exceeding 3m in height, floor area X 3)		Height 3.2m	3	1180 **3540**	m2 m2
2	**Type of Construction**	**Type V** Wood Frame **Type III** Ordinary Construction **Type II** Noncombustible Construction **Type I** Fire Resistive Construction	1.5 1.0 0.8 0.6	Type II Noncombustible Construction	0.8		
3	**Required Fire Flow**	RFF = 220CVA				**10472**	L/min
4	**Occupancy and Contents**	Noncombustible Contents Limited Conbustible Contents Combustible Contents Free Burning Contents Rapid Burning Contents	-25% -15% 0% 15% 25%	Conbustible - F2 Storage Rooms	0%	0	L/min
	Fire Flow					**10472**	L/min
5	**Automatic Sprinkler Protection**	Automatic Sprinkler Conforming to NFPA 13 Standard Water Supply for both the system and Fire Department Hose Lines Fully Supervised System	-30% -10% -10%	Yes Yes No	-30% -10%	-3141 -1047	L/min L/min
	Fire Flow					**6283**	L/min
6	**Exposure Adjustment**	Based on **Table 6** Exposure Adjustement Charges for Subject Building					
	North	Separation (m) Length X Height Factor (m.storeys) Construction Type	7.1 16.7 Type II	with unprotected opening	6%	377	L/min
	South	Separation (m) Length X Height Factor (m.storeys) Construction Type	>30 0 Type II	with unprotected opening	0%	0	L/min
	East	Separation (m) Length X Height Factor (m.storeys) Construction Type	>30 0 Type II	with unprotected opening	0%	0	L/min
	West	Separation (m) Length X Height Factor (m.storeys) Construction Type	6.1 54.9 Type II	with unprotected opening	8%	503	L/min
	Fire Flow					**7163**	L/min
7	**Total Required Fire Flow**	Rounded to Nearest 1000 L/min				**7000**	L/min
						117	L/s

Notes 1. Fire flow calculation are based on Fire Underwriters Survey version 2020.

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135470-6.0 | Rev #1 | 2023-06-30
Prepared By: AZ | Checked By: RM

STEP	Contents	Discription		Adjustment Factor		Result	
1	**Building C** (1-storey) **Total Effective Floor Area**	1st Floor Area (Storage space exceeding 3m in height, floor area X 3)		Height 3.2m	3	840 **2520**	m2 m2
2	**Type of Construction**	**Type V** Wood Frame **Type III** Ordinary Construction **Type II** Noncombustible Construction **Type I** Fire Resistive Construction	1.5 1.0 0.8 0.6	Type II Noncombustible Construction	0.8		
3	**Required Fire Flow**	RFF = 220CVA				**8835**	L/min
4	**Occupancy and Contents**	Noncombustible Contents Limited Conbustible Contents Combustible Contents Free Burning Contents Rapid Burning Contents	-25% -15% 0% 15% 25%	Conbustible - F2 Storage Rooms	0%	0	L/min
	Fire Flow					**8835**	L/min
5	**Automatic Sprinkler Protection**	Automatic Sprinkler Conforming to NFPA 13 Standard Water Supply for both the system and Fire Department Hose Lines Fully Supervised System	-30% -10% -10%	Yes Yes No	-30% -10%	-2651 -884	L/min L/min
	Fire Flow					**5301**	L/min
6	**Exposure Adjustment**	Based on **Table 6** Exposure Adjustement Charges for Subject Building					
	North	Separation (m) Length X Height Factor (m.storeys) Construction Type	7.1 15.2 Type II	with unprotected opening	6%	318	L/min
	South	Separation (m) Length X Height Factor (m.storeys) Construction Type	9.0 30.4 Type II	with unprotected opening	7%	371	L/min
	East	Separation (m) Length X Height Factor (m.storeys) Construction Type	6.1 54.9 Type II	with unprotected opening	8%	424	L/min
	West	Separation (m) Length X Height Factor (m.storeys) Construction Type	6.1 54.9 Type II	with unprotected opening	8%	424	L/min
	Fire Flow					**6838**	L/min
7	**Total Required Fire Flow**	Rounded to Nearest 1000 L/min				**7000**	L/min
						117	L/s

Notes 1. Fire flow calculation are based on Fire Underwriters Survey version 2020.

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FIRE UNDERWRITERS SURVEY

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135470-6.0 | Rev #1 | 2023-06-30
Prepared By: AZ | Checked By: RM

STEP	Contents	Discription		Adjustment Factor		Result	
1	**Building D** (1-storey) **Total Effective Floor Area**	1st Floor Area (Storage space exceeding 3m in height, floor area X 3)		Height 3.2m	3	1440 **4320**	m2 m2
2	**Type of Construction**	**Type V** Wood Frame **Type III** Ordinary Construction **Type II** Noncombustible Construction **Type I** Fire Resistive Construction	1.5 1.0 0.8 0.6	Type II Noncombustible Construction	0.8		
3	**Required Fire Flow**	RFF = 220CVA				**11568**	L/min
4	**Occupancy and Contents**	Noncombustible Contents Limited Conbustible Contents Combustible Contents Free Burning Contents Rapid Burning Contents	-25% -15% 0% 15% 25%	Conbustible - F2 Storage Rooms	0%	0	L/min
	Fire Flow					**11568**	L/min
5	**Automatic Sprinkler Protection**	Automatic Sprinkler Conforming to NFPA 13 Standard Water Supply for both the system and Fire Department Hose Lines Fully Supervised System	-30% -10% -10%	Yes Yes No	-30% -10%	-3470 -1157	L/min L/min
	Fire Flow					**6941**	L/min
6	**Exposure Adjustment**	Based on **Table 6** Exposure Adjustement Charges for Subject Building					
	North	Separation (m) Length X Height Factor (m.storeys) Construction Type	>30 0 Type II	with unprotected opening	0%	0	L/min
	South	Separation (m) Length X Height Factor (m.storeys) Construction Type	9.0 64.8 Type II	with unprotected opening	9%	625	L/min
	East	Separation (m) Length X Height Factor (m.storeys) Construction Type	6.1 54.9 Type II	with unprotected opening	8%	555	L/min
	West	Separation (m) Length X Height Factor (m.storeys) Construction Type	>30 0 Type II	with unprotected opening	0%	0	L/min
	Fire Flow					**8121**	L/min
7	**Total Required Fire Flow**	Rounded to Nearest 1000 L/min				**8000**	L/min
						133	L/s

Notes 1. Fire flow calculation are based on Fire Underwriters Survey version 2020.

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FIRE UNDERWRITERS SURVEY

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Prepared By: AZ | Checked By: RM

STEP	Contents	Discription		Adjustment Factor		Result	
1	**Building E** (1-storey) **Total Effective Floor Area**	1st Floor Area (Storage space exceeding 3m in height, floor area X 3)		Height 3.2m	3	1180 **3540**	m2 m2
2	**Type of Construction**	**Type V** Wood Frame **Type III** Ordinary Construction **Type II** Noncombustible Construction **Type I** Fire Resistive Construction	1.5 1.0 0.8 0.6	Type II Noncombustible Construction	0.8		
3	**Required Fire Flow**	RFF = 220CVA				**10472**	L/min
4	**Occupancy and Contents**	Noncombustible Contents Limited Conbustible Contents Combustible Contents Free Burning Contents Rapid Burning Contents	-25% -15% 0% 15% 25%	Conbustible - F2 Storage Rooms	0%	0	L/min
	Fire Flow					**10472**	L/min
5	**Automatic Sprinkler Protection**	Automatic Sprinkler Conforming to NFPA 13 Standard Water Supply for both the system and Fire Department Hose Lines Fully Supervised System	-30% -10% -10%	Yes Yes No	-30% -10%	-3141 -1047	L/min L/min
	Fire Flow					**6283**	L/min
6	**Exposure Adjustment**	Based on **Table 6** Exposure Adjustement Charges for Subject Building					
	North	Separation (m) Length X Height Factor (m.storeys) Construction Type	>30 0 Type II	with unprotected opening	0%	0	L/min
	South	Separation (m) Length X Height Factor (m.storeys) Construction Type	7.1 16.7 Type II	with unprotected opening	6%	377	L/min
	East	Separation (m) Length X Height Factor (m.storeys) Construction Type	>30 0 Type II	with unprotected opening	0%	0	L/min
	West	Separation (m) Length X Height Factor (m.storeys) Construction Type	6.0 39.4 Type II	with unprotected opening	7%	440	L/min
	Fire Flow					**7100**	L/min
7	**Total Required Fire Flow**	Rounded to Nearest 1000 L/min				**7000**	L/min
						117	L/s

Notes 1. Fire flow calculation are based on Fire Underwriters Survey version 2020.

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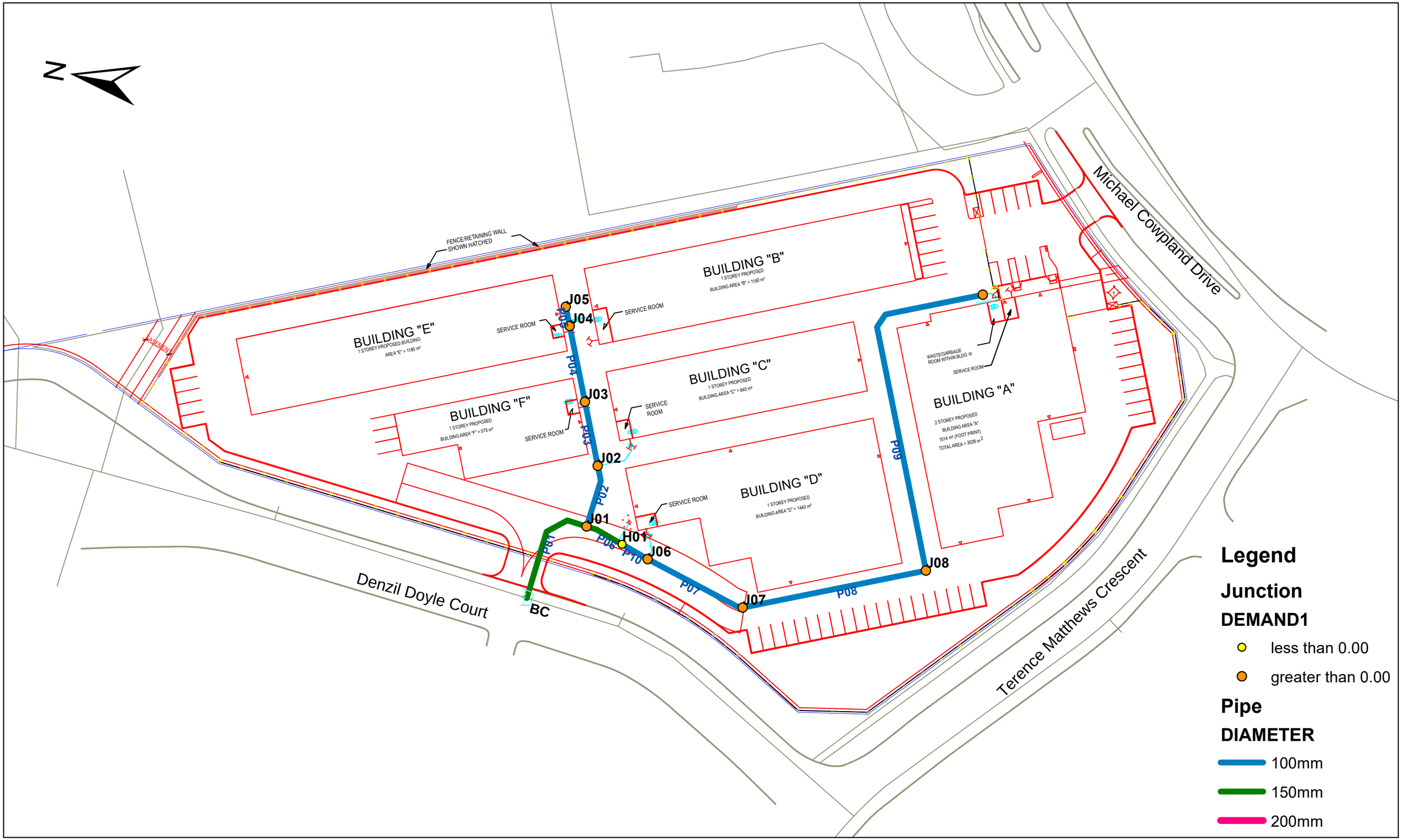
135470-6.0 | Rev #1 | 2023-06-30
Prepared By: AZ | Checked By: RM

STEP	Contents	Discription		Adjustment Factor		Result	
1	**Building F** (1-storey) **Total Effective Floor Area**	1st Floor Area (Storage space exceeding 3m in height, floor area X 3)		Height 3.2m	3	575 **1725**	m2 m2
2	**Type of Construction**	**Type V** Wood Frame **Type III** Ordinary Construction **Type II** Noncombustible Construction **Type I** Fire Resistive Construction	1.5 1.0 0.8 0.6	Type II Noncombustible Construction	0.8		
3	**Required Fire Flow**	RFF = 220CVA				**7310**	L/min
4	**Occupancy and Contents**	Noncombustible Contents Limited Conbustible Contents Combustible Contents Free Burning Contents Rapid Burning Contents	-25% -15% 0% 15% 25%	Conbustible - F2 Storage Rooms	0%	0	L/min
	Fire Flow					**7310**	L/min
5	**Automatic Sprinkler Protection**	Automatic Sprinkler Conforming to NFPA 13 Standard Water Supply for both the system and Fire Department Hose Lines Fully Supervised System	-30% -10% -10%	Yes Yes No	-30% -10%	-2193 -731	L/min L/min
	Fire Flow					**4386**	L/min
6	**Exposure Adjustment**	Based on **Table 6** Exposure Adjustement Charges for Subject Building					
	North	Separation (m) Length X Height Factor (m.storeys) Construction Type	>30 0 Type II	with unprotected opening	0%	0	L/min
	South	Separation (m) Length X Height Factor (m.storeys) Construction Type	7.3 15.2 Type II	with unprotected opening	6%	263	L/min
	East	Separation (m) Length X Height Factor (m.storeys) Construction Type	6.0 39.4 Type II	with unprotected opening	7%	307	L/min
	West	Separation (m) Length X Height Factor (m.storeys) Construction Type	>30 0 Type II	with unprotected opening	0%	0	L/min
	Fire Flow					**4956**	L/min
7	**Total Required Fire Flow**	Rounded to Nearest 1000 L/min				**5000**	L/min
						83	L/s

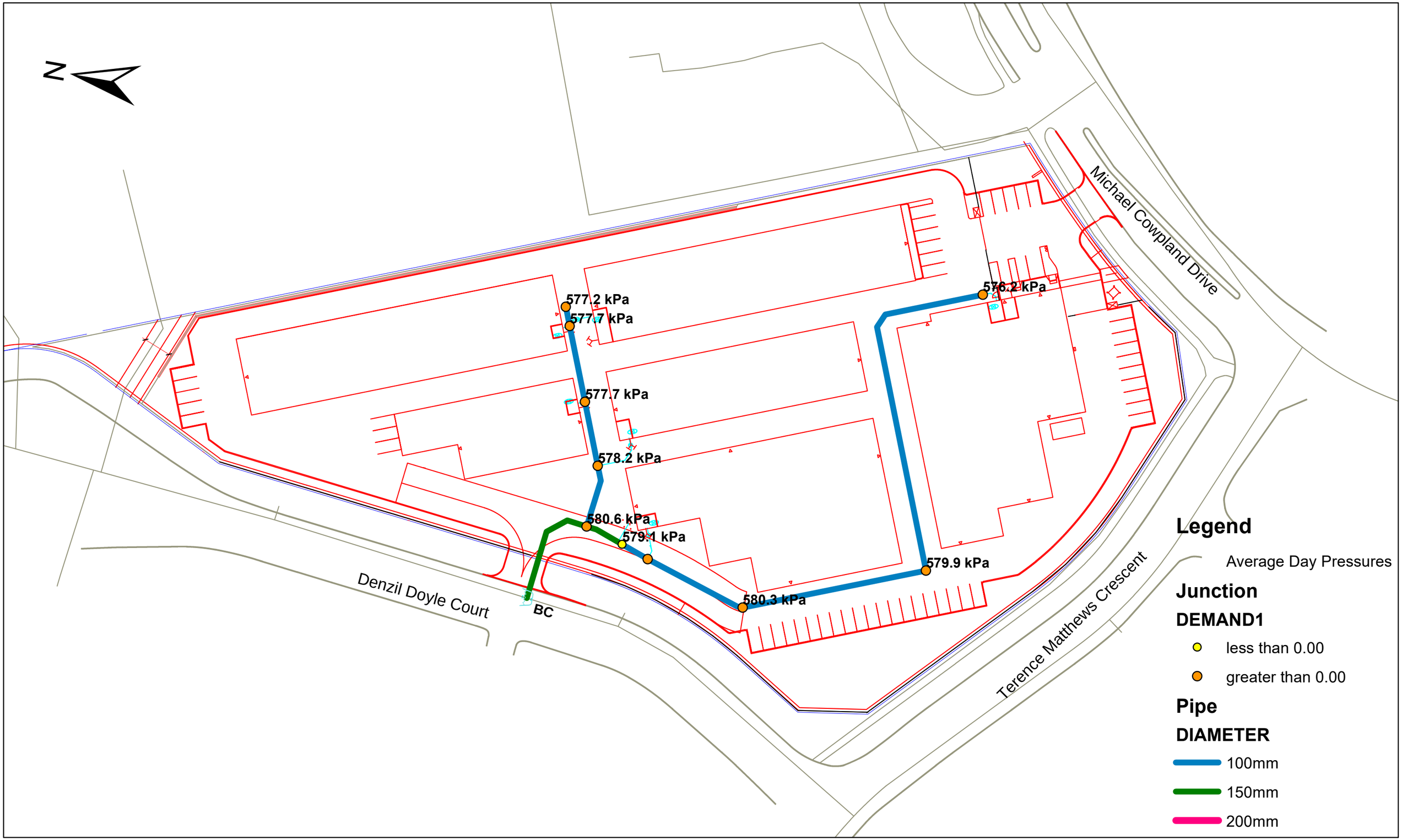
Notes 1. Fire flow calculation are based on Fire Underwriters Survey version 2020.

Junctions and Pipes Layout



Date: 2023-11-14

Average Day Pressures

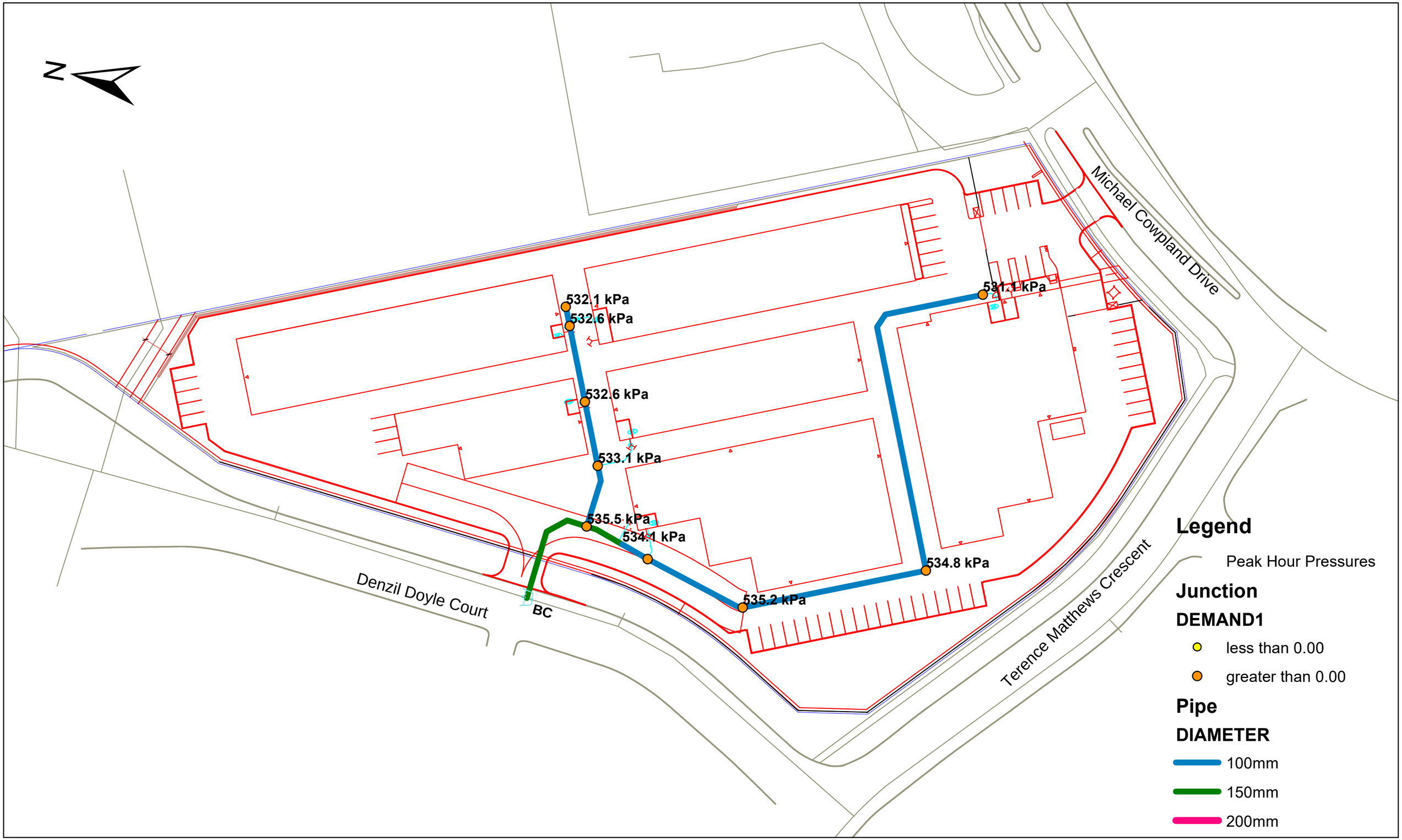


Date: 2023-11-14

Average Day Pressures

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)	Water Age (hrs)
1	☐	H01	0.0000	102.00	161.10	579.13	0.00
2	☐	J01	0.0000	101.85	161.10	580.60	0.00
3	☐	J02	0.0000	102.10	161.10	578.15	0.00
4	☐	J03	0.0000	102.15	161.10	577.66	0.00
5	☐	J04	0.0000	102.15	161.10	577.66	0.00
6	☐	J05	0.0000	102.20	161.10	577.17	0.00
7	☐	J06	0.0000	102.05	161.10	578.64	0.00
8	☐	J07	0.0000	101.88	161.10	580.31	0.00
9	☐	J08	0.0000	101.92	161.10	579.92	0.00
10	☐	J10	0.0031	102.30	161.10	576.19	0.00

Peak Hour Pressures

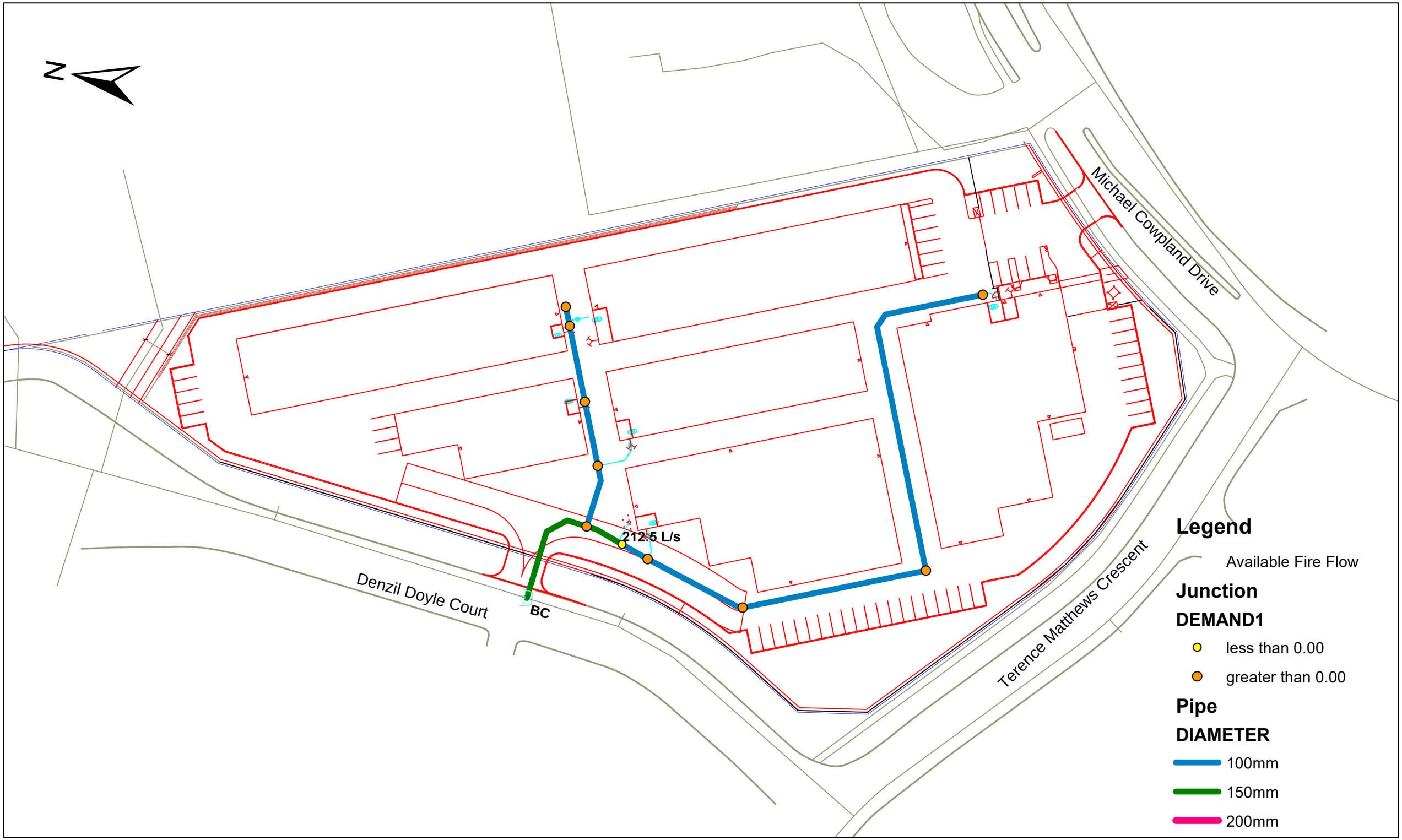


Date: 2023-11-14

Peak Hour Pressures

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)	Water Age (hrs)
1	☐	H01	0.0000	102.00	156.50	534.06	0.00
2	☐	J01	0.0000	101.85	156.50	535.53	0.00
3	☐	J02	0.0000	102.10	156.50	533.08	0.00
4	☐	J03	0.0000	102.15	156.50	532.59	0.00
5	☐	J04	0.0000	102.15	156.50	532.59	0.00
6	☐	J05	0.0000	102.20	156.50	532.10	0.00
7	☐	J06	0.0000	102.05	156.50	533.57	0.00
8	☐	J07	0.0000	101.88	156.50	535.23	0.00
9	☐	J08	0.0000	101.92	156.50	534.84	0.00
10	☐	J10	0.0082	102.30	156.50	531.12	0.00

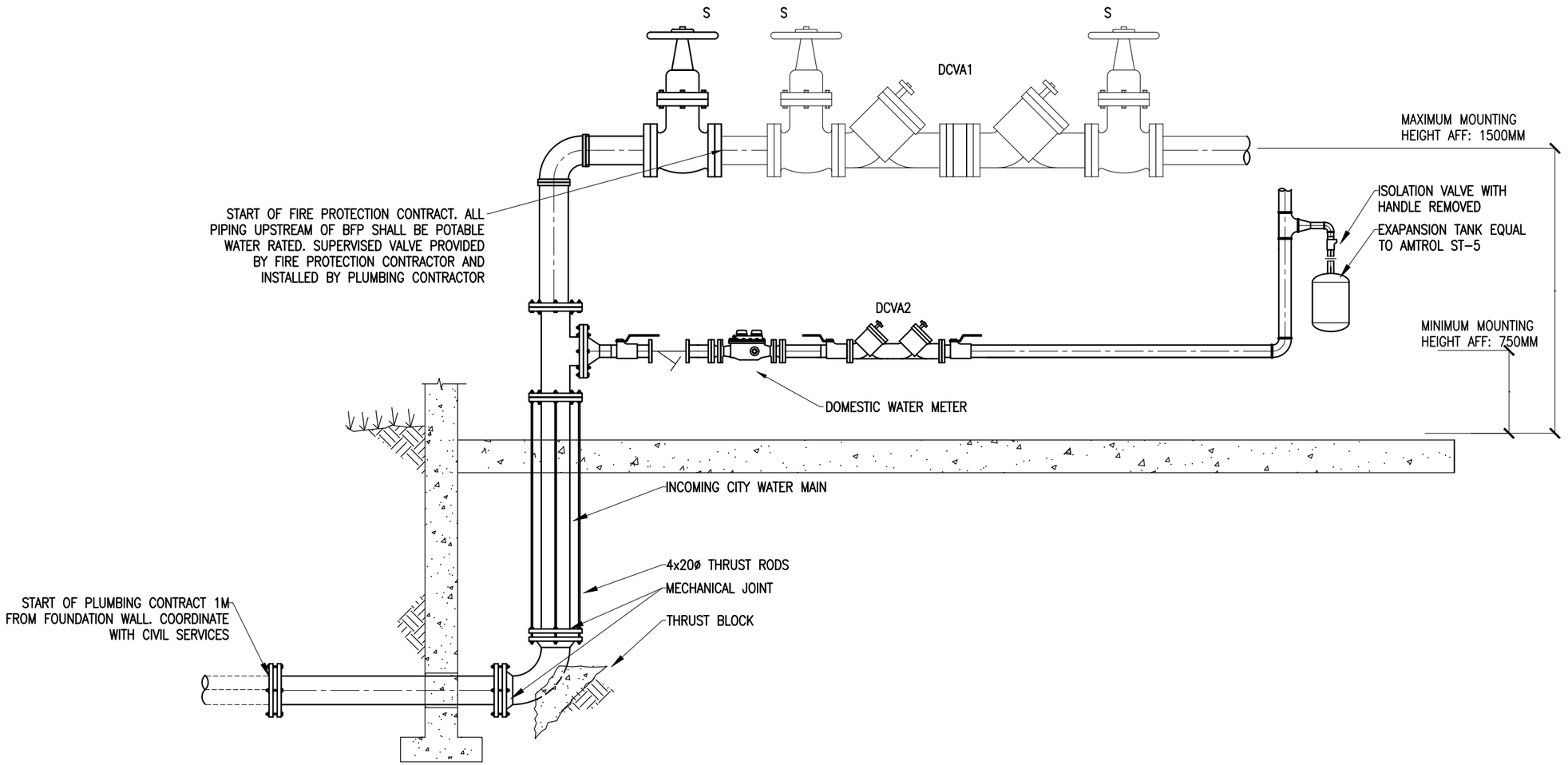
Max Day + Fire Flow



Date: 2023-11-14

Max Day+ Fire Flow

		ID	Static Demand (L/s)	Static Pressure (kPa)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (kPa)	Hydrant Available Flow (L/s)	Hydrant Pressure at Available Flow (kPa)
1	☐	H01	0.00	492.90	152.30	150.00	312.94	212.47	149.96



DATE	REVISION	REF
2023-06-06	UPDATED DETAIL ISSUED FOR SITE PLAN RESPONSE	-
2023-03-03	ISSUED FOR SITE PLAN RESPONSE	-

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Canada K2C 3R8

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613 727-5115 Fax
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PROJECT/PROJET

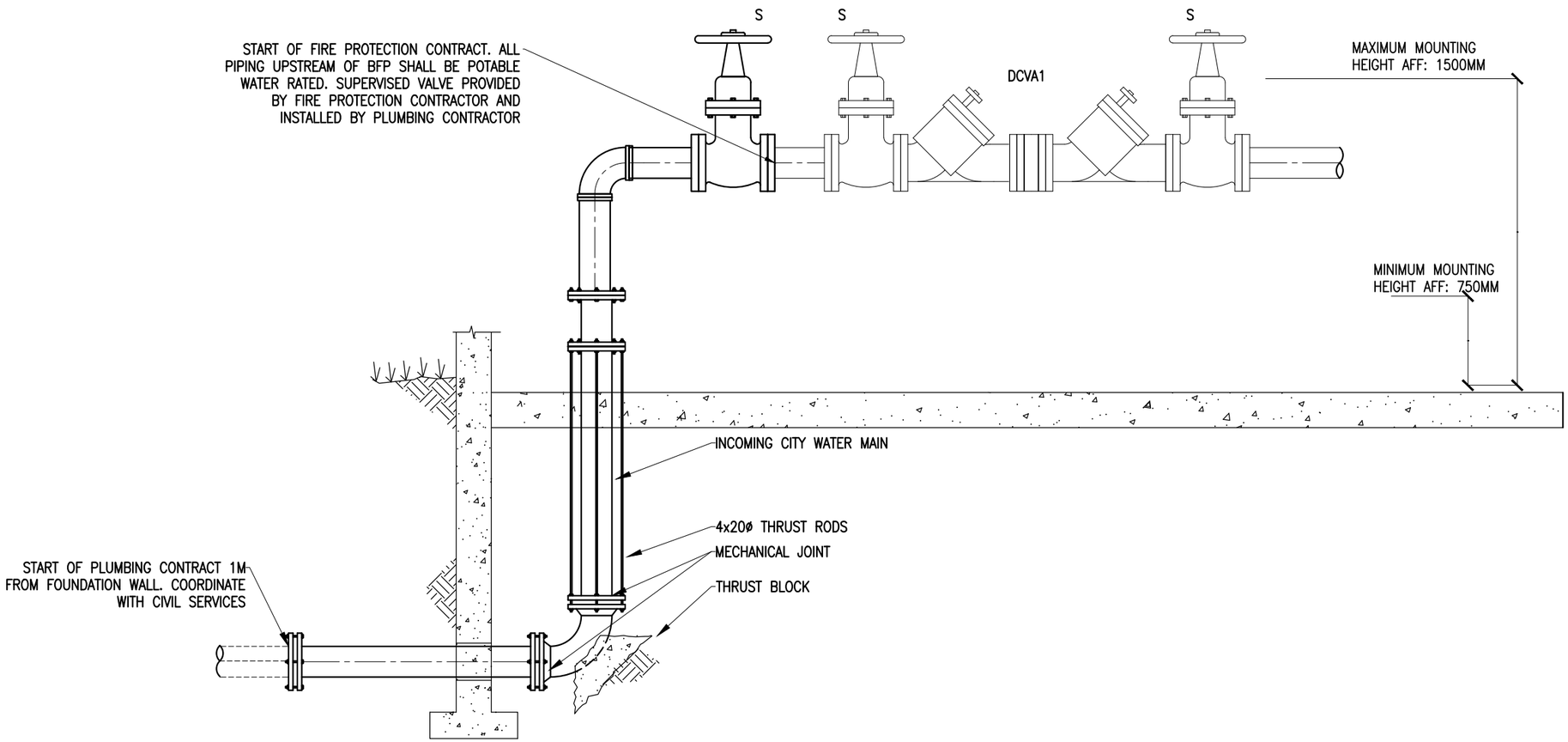
KANATA SOUTHWEST SELF STORAGE

75 MICHAEL COWPLAND DRIVE,
OTTAWA, ON

TITLE/TITRE

BUILDING A WATER
ENTRY DETAIL

Scale / Échelle	N.T.S.	
Design by / Conçu par	J. HANSEN	Project no./ No.du projet: 2021-566
Drawn by / Dessiné par	J. HANSEN	DWG. No. / No. DESSIN: SK1
Reviewed by / Examiné par	R. LEFEBVRE	



DATE	REVISION	REF
2023-06-06	UPDATED DETAIL ISSUED FOR SITE PLAN RESPONSE	-
2023-03-03	ISSUED FOR SITE PLAN RESPONSE	-

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PROJECT/PROJET

KANATA SOUTHWEST SELF STORAGE

75 MICHAEL COWPLAND DRIVE,
OTTAWA, ON

TITLE/TITRE

TYPICAL BUILDING (BUILDING B TO F)
ENTRY DETAIL

Scale / Échelle	N.T.S.	
Design by / Conçu par	J. HANSEN	Project no./ No.du projet: 2021-566
Drawn by / Dessiné par	J. HANSEN	DWG. No. / No. DESSIN: SK2
Reviewed by / Examiné par	R. LEFEBVRE	

Amy Zhuang

From: Bouwman, Andrew <Andrew.Bouwman@architecture49.com>
Sent: Wednesday, November 30, 2022 8:29 AM
To: Amy Zhuang
Cc: Terry Brule; Ryan Magladry; Frank Abrantes; Mathieu Desjardins; Elisabeth Gebremedhin; Hind Barnieh; Chen, Jie
Subject: RE: APD Preferred grading - 60 Denzil Doyle Court

Hi Amy,

All buildings will fall under OBC Section 3.10 “Self Service Storage Buildings”, F-2 Occupancy and non-combustible.

Andrew Bouwman, m.a.a.t.o.
Architectural Technologist

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#
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From: Amy Zhuang <Amy.Zhuang@ibigroup.com>
Sent: November 30, 2022 2:12 AM
To: Hind Barnieh <hbarnieh@accesspd.ca>; Bouwman, Andrew <Andrew.Bouwman@architecture49.com>
Cc: Terry Brule <tbrule@IBIGroup.com>; Ryan Magladry <rmagladry@IBIGroup.com>; Frank Abrantes <fabrantes@accessstorage.ca>; Mathieu Desjardins <mdesjardins@huntingtonproperties.ca>; Elisabeth Gebremedhin <egebremedhin@accesspd.ca>
Subject: RE: APD Preferred grading - 60 Denzil Doyle Court

Hi Hind, thank you for the grading plans!

Just another question – could you confirm if the construction type will be wood frame/ordinary or non-combustible/fire-resistive? Thanks!

Amy Zhuang P.ENG.

Civil Engineer

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Ottawa ON K1S 5N4 Canada
tel +1 613 225 1311 ext 64080

Amy Zhuang

From: Jordan Hansen <jhansen@gwal.com>
Sent: Monday, June 26, 2023 8:23 AM
To: Amy Zhuang
Cc: Chen, Jie; Bouwman, Andrew
Subject: RE: 75 Michael Cowpland - Fire Department Hose Line

Hi Amy,

The sprinkler system will be designed and installed in accordance with NFPA-13 requirements. The sprinkler system will be supplied from the city water connection and the demand will be calculated using the hazard classification plus the appropriate inside/outside hose allowances.

Based on the below it appears this would meet the requirements for a standard water supply.

Thanks,

JORDAN HANSEN C.E.T. | **Mechanical Technologist**
GOODKEY, WEEDMARK & ASSOCIATES LTD.

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Office: (613) 727-5111 ext. 236 Mobile: (613) 282-5291

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Website: www.gwal.com

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From: Amy Zhuang <Amy.Zhuang@ibigroup.com>
Sent: Friday, June 23, 2023 10:44 AM
To: Jordan Hansen <jhansen@gwal.com>
Cc: Chen, Jie <jie.chen@architecture49.com>; Bouwman, Andrew <Andrew.Bouwman@architecture49.com>
Subject: RE: 75 Michael Cowpland - Fire Department Hose Line

Hi Jordan, could you confirm if the water supply is standard for both the sprinkler system and the fire department hose lines? Thanks!

Amy Zhuang P.ENG.

Civil Engineer

APPENDIX C

- Sanitary Sewer Design Sheet
- OPSD 1003.010 Drop Structure

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SANITARY SEWER DESIGN SHEET

75 Michael Cowpland
City of Ottawa
Huntington Properties

LOCATION				RESIDENTIAL										ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA	UNIT TYPES				AREA	POPULATION		RES	PEAK	AREA (Ha)						ICI	PEAK	AREA (Ha)		FLOW				CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	w/ Units (Ha)	SF	TH/SD	1 Bed APT	2 Bed APT	w/o Units (Ha)	IND	CUM	PEAK FACTOR	FLOW (L/s)	INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	PEAK FACTOR	FLOW (L/s)	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
		Building B	MH8A							0.0	0.0	3.80	0.00	0.00	0.0	0.12	0.12	0.00	0.0	1.50	0.06	0.12	0.12	0.04	0.00	0.0	0.10	5.39	21.68	100	1.00	0.665	5.29	98.22%
		Building A	MH8A							0.0	0.0	3.80	0.00	0.00	0.0	0.15	0.15	0.00	0.0	1.50	0.07	0.15	0.27	0.09	0.00	0.0	0.16	5.39	6.31	100	1.00	0.665	5.23	97.01%
		MH8A	MH2A							0.0	0.0	3.80	0.00	0.00	0.0	1.39	1.66	0.00	0.0	1.50	0.81	1.39	1.66	0.55	0.00	0.0	1.35	27.59	12.82	200	0.65	0.851	26.23	95.10%
		MH2A	MH3A							0.0	0.0	3.80	0.00	0.00	0.0	0.00	1.66	0.00	0.0	1.50	0.81	0.00	1.66	0.55	0.00	0.0	1.35	27.59	38.47	200	0.65	0.851	26.23	95.10%
		MH3A	MH4A							0.0	0.0	3.80	0.00	0.00	0.0	0.00	1.66	0.00	0.0	1.50	0.81	0.00	1.66	0.55	0.00	0.0	1.35	27.59	20.51	200	0.65	0.851	26.23	95.10%
																														250				

Design Parameters:

Residential			ICI Areas			
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	28,000	L/Ha/day	
1 Bed	1.4	p/p/u	COM	28,000	L/Ha/day	
2 Bed	2.1	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Other	60	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 200 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+(P/1000)^0.5))0.8
where K = 0.8 Correction Factor
5. Commercial and Institutional Peak Factors based on total area, 1.5 if greater than 20%, otherwise 1.0

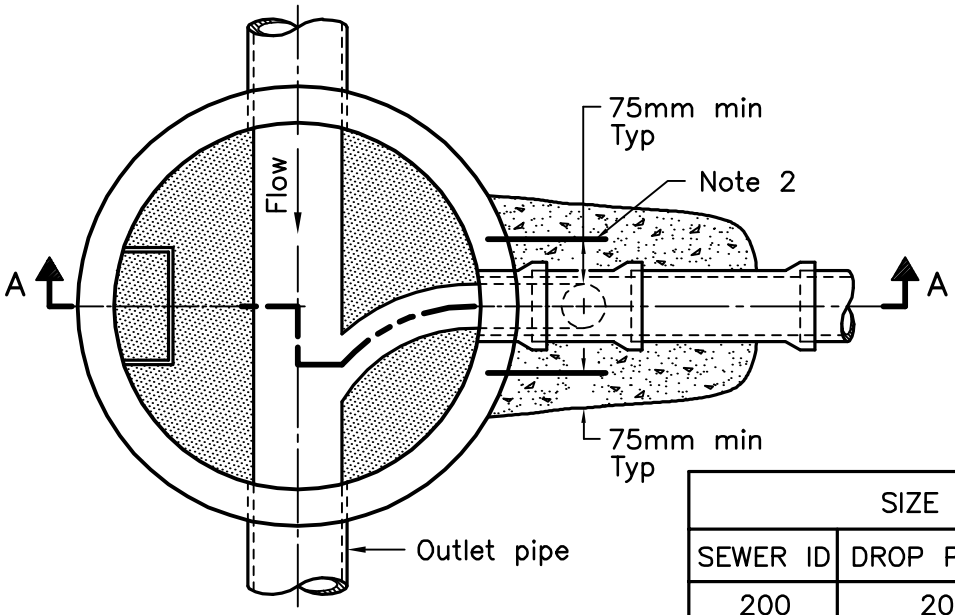
Designed: WZ

Checked: RM

Dwg. Reference: 135470-400

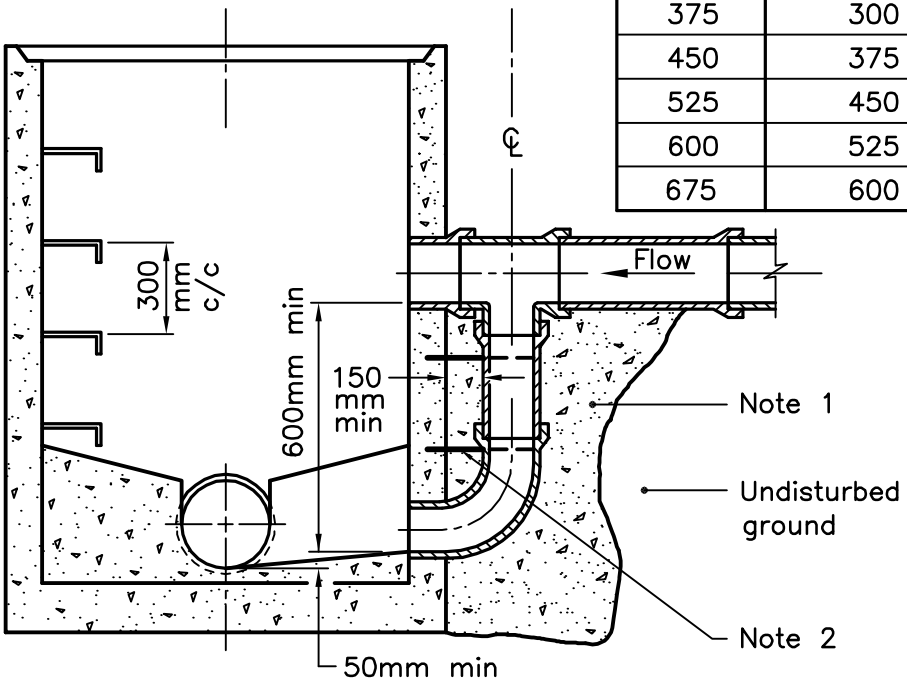
No.	Revision	Date
1	Design Brief - Submission No. 1	2022-12-09
2	Design Brief - Submission No. 2	2023-03-10
3	Design Brief - Submission No. 3	2023-06-30
4	Design Brief - Submission No. 3 Revised	2023-07-19
5	Design Brief - Submission No. 4	2023-09-22

File Reference: 135470-6.04.04 | **Date:** 2022-12-09 | **Sheet No:** 1 of 1



PLAN

SIZE OF DROP PIPE		
SEWER ID	DROP PIPE ID	APPLICATION
200	200	Storm and Sanitary
250	200	Storm and Sanitary
300	250	Storm and Sanitary
375	300	Storm and Sanitary
450	375	Storm
525	450	Storm
600	525	Storm
675	600	Storm



SECTION A–A

NOTES:

1 Concrete shall be placed to undisturbed ground and the outside face of the maintenance hole, but there shall be a minimum of 150mm of 15MPa concrete around the drop pipe.

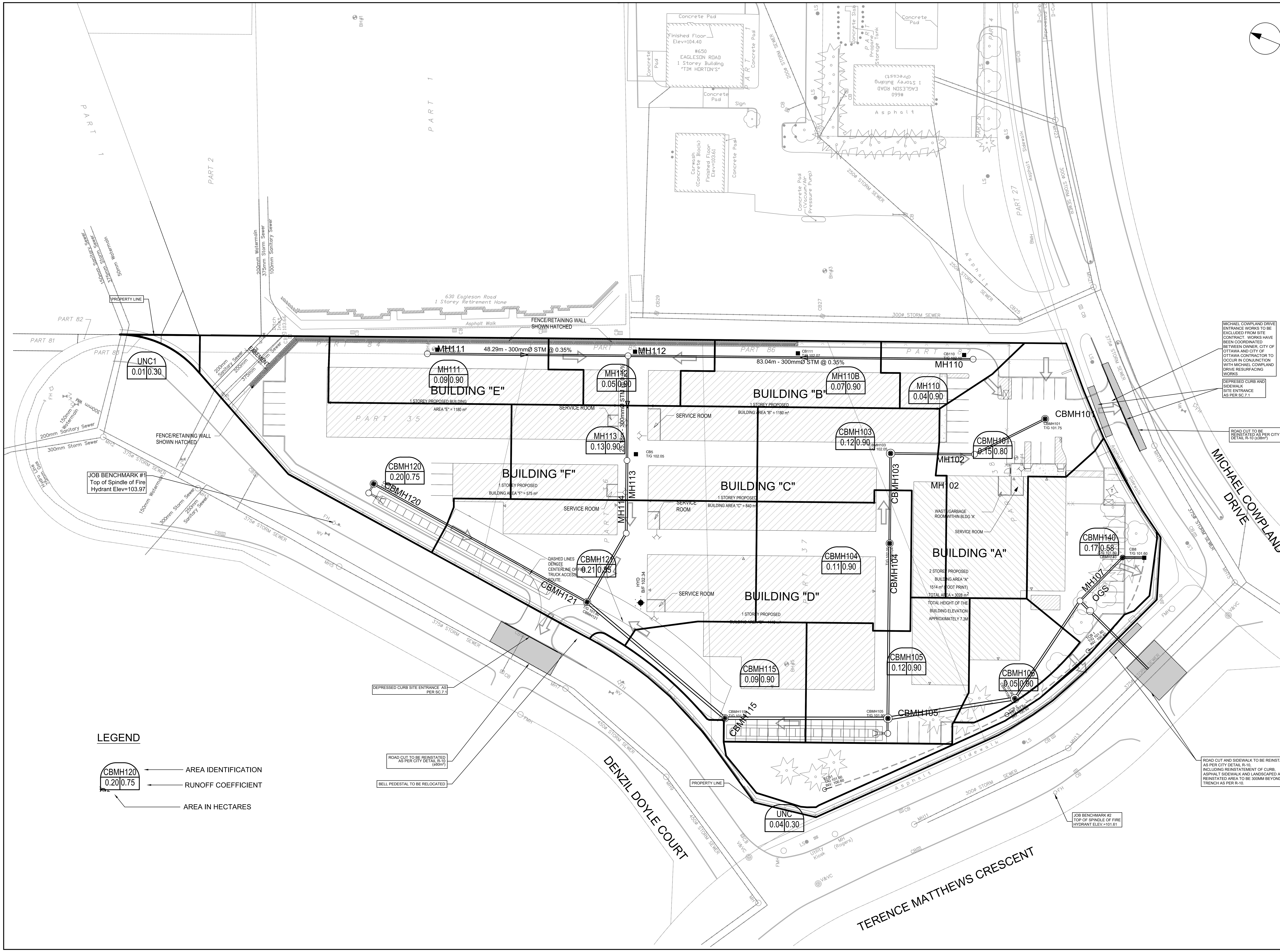
2 Concrete shall be secured to the maintenance hole with 450mm long, 13mm diameter threaded rods and drilled expansion anchors down either side of the drop pipe at 300mm centres.

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2016	Rev	3
CAST–IN–PLACE MAINTENANCE HOLE DROP STRUCTURE TEE			
	OPSD 1003.010		

APPENDIX D

- Storm Drainage Area Plan Drawing C-500
- Storm Sewer Design Sheet
- Ponding Plan Drawing C-600
- Stormwater Management Design Sheet
- Underground Storage Calculation Sheet
- Orifice Sizing Sheet
- Overflow Calculation
- IPEX ICD Specifications
- Kanata South Business Park – Stormwater Management Report
- OGS HydroDome Sizing Summary
- StormTech MC-3500 Underground Storage Chamber Details



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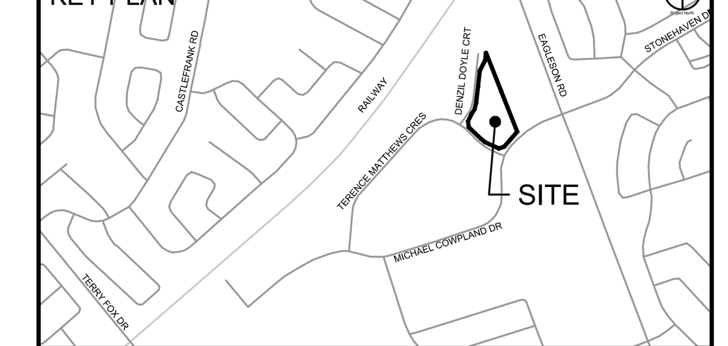
ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR CITY REVIEW	2022-12-09
2	REVISED PER CITY COMMENTS	2023-03-09
3	REVISED PER CITY COMMENTS	2023-07-07
4	REVISED PER CITY COMMENTS	2023-07-19
5	REVISED PER CITY COMMENTS	2023-09-22
6	REVISED PER CITY COMMENTS	2023-11-13

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

KEY PLAN



CONSULTANTS

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PROJECT

PROPOSED SELF STORAGE DEVELOPMENT

75 MICHAEL COWPLAND

PROJECT NO: 135470	
DRAWN BY: **S.L. / D.D.**	CHECKED BY: **T.R.B.**
PROJECT MGR: **R.M.**	APPROVED BY: **T.R.B.**

SHEET TITLE

STORM DRAINAGE AREA PLAN

SHEET NUMBER C-500

ISSUE 6

SCALE CHECK 1 in 10mm

File Location: J:\135470_60_Denzil_Do\7.0_Production\7.03_Design\04_Civil\Sheets\C-500_STORM DRAINAGE AREA PLAN.dwg Last Saved: September 22, 2023, by Ehenrie Plotted: Tuesday, November 14, 2023 11:57:59 AM by Eric Henrie

CITY PLAN NO. 18885 CITY FILE No. D07-12-22-0174

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STORM SEWER DESIGN SHEET

75 Michael Cowpland
City of Ottawa
Huntington Properties

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW														SEWER DATA									
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.25	C= 0.40	C= 0.50	C= 0.58	C= 0.65	C= 0.75	C= 0.80	C= 0.85	C= 0.90	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (2) (mm/hr)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	2yr PEAK FLOW (L/s)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW IND	FIXED FLOW CUM	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	PIPE SIZE (mm) W	PIPE SIZE (mm) H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (2yr) (L/s)	AVAIL CAP (2yr) (%)
	CBMH101	CBMH101	MH102								0.15			0.33	0.33	10.00	0.39	10.39	76.81				25.62				0.00	0.00	25.62	59.68	18.97	300			0.35	0.818	34.06	57.07%
		MH102	CBMH103											0.00	0.33	10.39	0.41	10.80	75.35				25.14				0.00	0.00	25.14	59.68	20.22	300			0.35	0.818	34.55	57.88%
	CBMH103	CBMH103	CBMH104										0.12	0.30	0.63	10.80	0.44	11.24	73.87				46.82				0.00	0.00	46.82	59.68	21.65	300			0.35	0.818	12.86	21.55%
	CBMH104	CBMH104	CBMH105										0.11	0.28	0.91	11.24	0.87	12.11	72.35				65.77				0.00	0.00	65.77	91.46	42.11	375			0.25	0.802	25.68	28.08%
	MH111	MH111	MH112										0.09	0.23	0.23	10.00	0.98	10.98	76.81				17.29				0.00	0.00	17.29	59.68	48.29	300			0.35	0.818	42.39	71.02%
	MH110, MH110B	MH110	MH112										0.11	0.28	0.28	10.00	1.69	11.69	76.81				21.14				0.00	0.00	21.14	59.68	83.04	300			0.35	0.818	38.54	64.58%
	MH112	MH112	MH113										0.05	0.13	0.63	11.69	0.51	12.21	70.87				44.33				0.00	0.00	44.33	59.68	25.18	300			0.35	0.818	15.36	25.73%
	MH113	MH113	MH114										0.13	0.33	0.95	12.21	0.36	12.57	69.26				65.85				0.00	0.00	65.85	91.46	17.52	375			0.25	0.802	25.60	28.00%
		MH114	CBMH121											0.00	0.95	12.57	0.40	12.96	68.17				64.82				0.00	0.00	64.82	91.46	19.04	375			0.25	0.802	26.64	29.13%
		UGChamber 2	MH109											0.00	0.00	10.00	0.02	10.02	76.81				0.00				0.00	0.00	0.00	100.88	2.01	300			1.00	1.383	100.88	100.00%
		MH109	CBMH120											0.00	0.00	10.02	0.03	10.05	76.71				0.00				0.00	0.00	0.00	100.88	2.49	300			1.00	1.383	100.88	100.00%
	CBMH120	CBMH120	CBMH121							0.20				0.42	0.42	10.00	1.20	11.20	76.81				32.03				0.00	0.00	32.03	59.68	58.70	300			0.35	0.818	27.65	46.34%
	CBMH121	CBMH121	CBMH115									0.21		0.50	1.86	11.20	0.90	12.10	72.50				135.14				0.00	0.00	135.14	179.46	43.35	525			0.16	0.803	44.33	24.70%
	CBMH115	CBMH115	CBMH105										0.09	0.23	2.09	12.10	0.81	12.91	69.60				145.40				0.00	0.00	145.40	179.46	39.24	525			0.16	0.803	34.06	18.98%
		UGChamber1	MH108											0.00	0.00	10.00	0.02	10.02	76.81				0.00				0.00	0.00	0.00	100.88	1.27	300			1.00	1.383	100.88	100.00%
		MH108	CBMH105											0.00	0.00	10.02	0.04	10.06	76.75				0.00				0.00	0.00	0.00	100.88	3.62	300			1.00	1.383	100.88	100.00%
	CBMH105	CBMH105	CBMH106										0.12	0.30	3.30	12.91	0.61	13.52	67.19				221.61				0.00	0.00	221.61	248.09	30.91	600			0.15	0.850	26.48	10.67%
	CBMH106	CBMH106	MH107										0.05	0.14	3.43	13.52	0.42	13.93	65.51				224.92				114.00	114.00	***110.00***	129.34	28.27	375			0.50	1.134	19.34	14.95%
	CBMH140	CBMH140	MH107					0.17						0.28	0.28	10.00	0.30	10.30	76.81				21.55				5.00	5.00	***4.50***	59.68	14.61	300			0.35	0.818	55.18	92.46%
		MH107	OGS											0.00	3.71	13.93	0.05	13.98	64.41				239.23				0.00	119.00	***114.50***	129.34	3.45	375			0.50	1.134	14.84	11.47%
		OGS	Existing											0.00	3.71	13.98	0.29	14.27	64.28				238.74				0.00	119.00	***114.50***	129.34	19.66	375			0.50	1.134	14.84	11.47%
												Total	1.61	3.71	TRUE																375						

All Private Sewers downstream of ICD are sized based on Maximum Permissible ICD release rate.

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 732.951 / (TC+6.199)^0.810] 2 YEAR
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

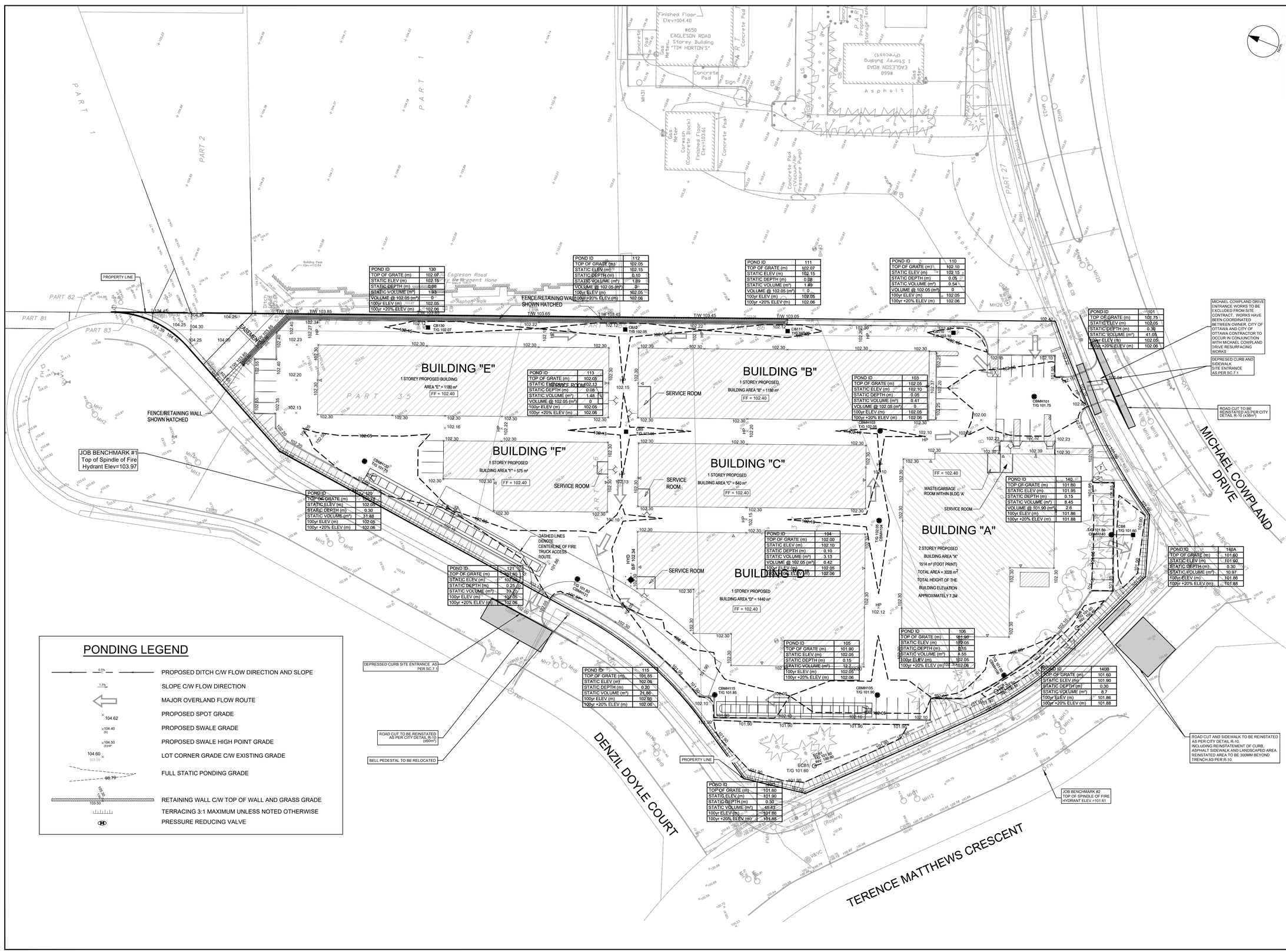
Designed: WZ

Checked: RM

Dwg. Reference: 135470-500

No.	Revision	Date
1	Design Brief - Submission No. 1	2022-12-09
2	Design Brief - Submission No. 2	2022-03-09
3	Design Brief - Submission No. 3	2023-06-30
4	Design Brief - Submission No. 3 Revised	2023-07-19
5	Design Brief - Submission No. 4	2023-09-22

File Reference: 135470-6.04.04
Date: 2022-12-09
Sheet No: 1 of 1



POND ID	130
TOP OF GRATE (m)	102.07
STATIC ELEV (m)	102.15
STATIC DEPTH (m)	0.08
STATIC VOLUME (m³)	1.93
VOLUME @ 102.05 (m³)	0
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	112
TOP OF GRATE (m)	102.05
STATIC ELEV (m)	102.15
STATIC DEPTH (m)	0.10
STATIC VOLUME (m³)	1.89
VOLUME @ 102.05 (m³)	0
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	111
TOP OF GRATE (m)	102.07
STATIC ELEV (m)	102.15
STATIC DEPTH (m)	0.08
STATIC VOLUME (m³)	1.49
VOLUME @ 102.05 (m³)	0
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	110
TOP OF GRATE (m)	102.10
STATIC ELEV (m)	102.15
STATIC DEPTH (m)	0.05
STATIC VOLUME (m³)	0.54
VOLUME @ 102.05 (m³)	0
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	101
TOP OF GRATE (m)	102.75
STATIC ELEV (m)	102.05
STATIC DEPTH (m)	0.30
STATIC VOLUME (m³)	41.05
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	113
TOP OF GRATE (m)	102.05
STATIC ELEV (m)	102.13
STATIC DEPTH (m)	0.08
STATIC VOLUME (m³)	1.48
VOLUME @ 102.05 (m³)	0
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	103
TOP OF GRATE (m)	102.05
STATIC ELEV (m)	102.10
STATIC DEPTH (m)	0.05
STATIC VOLUME (m³)	0.41
VOLUME @ 102.05 (m³)	0
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	140
TOP OF GRATE (m)	101.80
STATIC ELEV (m)	101.95
STATIC DEPTH (m)	0.15
STATIC VOLUME (m³)	8.45
VOLUME @ 101.90 (m³)	2.6
100yr ELEV (m)	101.86
100yr +20% ELEV (m)	101.88

POND ID	120
TOP OF GRATE (m)	102.75
STATIC ELEV (m)	102.05
STATIC DEPTH (m)	0.30
STATIC VOLUME (m³)	31.88
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	121
TOP OF GRATE (m)	101.80
STATIC ELEV (m)	102.05
STATIC DEPTH (m)	0.25
STATIC VOLUME (m³)	33.20
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	104
TOP OF GRATE (m)	102.00
STATIC ELEV (m)	102.10
STATIC DEPTH (m)	0.10
STATIC VOLUME (m³)	3.13
VOLUME @ 102.05 (m³)	0.42
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	105
TOP OF GRATE (m)	101.90
STATIC ELEV (m)	102.05
STATIC DEPTH (m)	0.15
STATIC VOLUME (m³)	12.7
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	106
TOP OF GRATE (m)	101.90
STATIC ELEV (m)	102.05
STATIC DEPTH (m)	0.15
STATIC VOLUME (m³)	8.55
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	115
TOP OF GRATE (m)	101.85
STATIC ELEV (m)	102.06
STATIC DEPTH (m)	0.20
STATIC VOLUME (m³)	21.86
100yr ELEV (m)	102.05
100yr +20% ELEV (m)	102.06

POND ID	107
TOP OF GRATE (m)	101.60
STATIC ELEV (m)	101.90
STATIC DEPTH (m)	0.30
STATIC VOLUME (m³)	48.43
100yr ELEV (m)	101.90
100yr +20% ELEV (m)	101.88

POND ID	140A
TOP OF GRATE (m)	101.60
STATIC ELEV (m)	101.90
STATIC DEPTH (m)	0.30
STATIC VOLUME (m³)	10.97
100yr ELEV (m)	101.86
100yr +20% ELEV (m)	101.88

POND ID	140B
TOP OF GRATE (m)	101.60
STATIC ELEV (m)	101.90
STATIC DEPTH (m)	0.30
STATIC VOLUME (m³)	8.7
100yr ELEV (m)	101.86
100yr +20% ELEV (m)	101.88

PONDING LEGEND

- PROPOSED DITCH C/W FLOW DIRECTION AND SLOPE
- SLOPE C/W FLOW DIRECTION
- MAJOR OVERLAND FLOW ROUTE
- PROPOSED SPOT GRADE
- PROPOSED SWALE GRADE
- PROPOSED SWALE HIGH POINT GRADE
- LOT CORNER GRADE C/W EXISTING GRADE
- FULL STATIC PONDING GRADE
- RETAINING WALL C/W TOP OF WALL AND GRASS GRADE
- TERRACING 3:1 MAXIMUM UNLESS NOTED OTHERWISE
- PRESSURE REDUCING VALVE

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ISSUES

No.	DESCRIPTION	DATE
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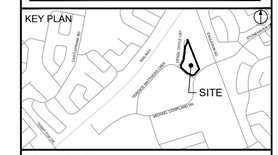
SEE 010, 011, 012 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS

KEY PLAN



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PROJECT

PROPOSED SELF STORAGE DEVELOPMENT

75 MICHAEL COWPLAND

PROJECT NO: 135470	
DRAWN BY: S.L. / D.D.	CHECKED BY: T.R.B.
PROJECT MGR: R.M.	APPROVED BY: T.R.B.

SHEET TITLE

PONDING PLAN

SHEET NUMBER	ISSUE
C-600	6

SCALE CHECK
1mm

CITY PLAN NO. 18885 CITY FILE No. D07-12-22-0174

File Location: J:\135470_60_Denzil_Dr\7.0_Production\7.03_Design\04_Civil\Sheets\C-600_PONDING PLAN.dwg Last Saved: September 22, 2023, by Ehenrie Plotted: Tuesday, November 14, 2023 11:58:43 AM by Eric Henrie

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PROJECT: 75 Michael Cowpland
DATE: 2023-09-21
FILE: 135470-6.04
REV #: -
DESIGNED BY: WZ
CHECKED BY: RM

STORMWATER MANAGEMENT

Formulas and Descriptions

i_{2yr} = 1:2 year Intensity = $732.951 / (T_c+6.199)^{0.810}$
i_{5yr} = 1:5 year Intensity = $998.071 / (T_c+6.053)^{0.814}$
i_{100yr} = 1:100 year Intensity = $1735.688 / (T_c+6.014)^{0.820}$
T_c = Time of Concentration (min)
C = Average Runoff Coefficient
A = Area (Ha)
Q = Flow = 2.78CiA (L/s)

Maximum Allowable Release Rate

Restricted Flowrate (based on 74.2 L/s/Ha)

A_{site} = 1.66 Ha

$Q_{restricted}$ = 123.17 L/s

Uncontrolled Release ($Q_{uncontrolled} = 2.78*C*i_{100yr}*A_{uncontrolled}$)

C = 0.375
T_c = 10 min
i_{100yr} = 178.56 mm/hr
$A_{uncontrolled}$ = 0.0456 Ha

$Q_{uncontrolled}$ = 8.49 L/s

Maximum Allowable Release Rate ($Q_{max\ allowable} = Q_{restricted} - Q_{uncontrolled}$)

$Q_{max\ allowable}$ = 114.68 L/s

Release Rate Summary

	Area	Flow
Site	1.614	114.00
Uncontrolled	0.05	8.49
	1.660	**122.49**
Allowable		**123.17**
		TRUE

MODIFIED RATIONAL METHOD (100-Year & 2-Year Ponding)

Drainage Area — ***Area Tributary to CBMH106***

Area (Ha) = 1.42
C = 0.86
Restricted Flow Q_r (L/s) = 54.00
ICD Flow Rate = 108.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 100yr (m^3)
42	72.57	247.13	54.00	193.13	486.69
47	66.91	227.85	54.00	173.85	490.25
52	62.14	211.62	54.00	157.62	**491.76**
57	58.07	197.75	54.00	143.75	491.61
62	54.54	185.74	54.00	131.74	490.09

100-Year +20% Ponding

100YRQp 20% (L/s)	Qp - Qr (L/s)	Volume 100+20 (m^3)
253.94	199.94	**623.81**

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance	100+20 Overflow	100+20 Required	100+20 Balance
0.00	491.76	146.16	348.49	0.00	0.00	623.81	129.16
							41.40

overflows to: Street

Drainage Area — ***Area Tributary to CBMH140***

Area (Ha) = 0.19
C = 0.58
Restricted Flow Q_r (L/s) = 6.00

100-Year Ponding

T_c Variable (min)	i_{100yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{100yr}A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 100yr (m^3)
46	67.96	20.80	6.00	14.80	40.85
51	63.03	19.29	6.00	13.29	40.68
56	58.83	18.01	6.00	12.01	**40.35**
61	55.21	16.90	6.00	10.90	39.89
66	52.05	15.93	6.00	9.93	39.32

100-Year +20% Ponding

100YRQp 20% (L/s)	Qp - Qr (L/s)	Volume 100+20 (m^3)
21.61	15.61	**52.45**

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance	100+20 Overflow	100+20 Required	100+20 Balance
0.00	40.35	67.70	0	0.00	0.00	52.45	0.00
							0.00

overflows to: Street

Drainage Area — ***/ to CBMH106***

Area (Ha) = 1.424
C = 0.90
Restricted Flow Q_r (L/s) = 54.00
ICD Flow Rate = 108.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 2yr (m^3)
24	46.37	165.27	54.00	111.27	160.23
25	45.17	160.97	54.00	106.97	160.45
26	44.03	156.91	54.00	102.91	**160.53**
27	42.95	153.07	54.00	99.07	160.49
28	41.93	149.43	54.00	95.43	160.33

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	160.53	146.16	348.49	0.00

overflows to: Street

Drainage Area — ***/ to CBMH140***

Area (Ha) = 0.190
C = 0.90
Restricted Flow Q_r (L/s) = 6.00

2-Year Ponding

T_c Variable (min)	i_{2yr} (mm/hour)	Peak Flow $Q_p = 2.78xCi_{2yr}A$ (L/s)	Q_r (L/s)	$Q_p - Q_r$ (L/s)	Volume 2yr (m^3)
40	32.86	15.62	6.00	9.62	23.10
41	32.30	15.35	6.00	9.35	23.01
42	31.76	15.10	6.00	9.10	**22.92**
43	31.23	14.85	6.00	8.85	22.82
44	30.73	14.61	6.00	8.61	22.72

Storage (m^3)

Overflow	Required	Surface	Sub-surface	Balance
0.00	22.92	67.70	0	0.00

overflows to: Street

IBI GROUP
500-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

PROJECT:	75 Michael Cowpland
DATE:	2023-09-21
FILE:	135470.6.04
REV #:	-
DESIGNED BY:	WZ
CHECKED BY:	RM

UNDERGROUND STORAGE CALCULATIONS - 60 Denzil Doyle

Pipe Storage				***All***	
From	**To**	**Length**	**Diameter**	**X-sec Area**	**Volume**
CBMH101	MH102	18.97	300	0.071	1.34
MH102	CBMH103	20.22	300	0.071	1.43
CBMH103	CBMH104	21.65	300	0.071	1.53
CBMH104	CBMH105	42.11	375	0.110	4.65
MH111	MH112	48.29	300	0.071	3.41
MH110	MH112	83.04	300	0.071	5.87
MH112	MH113	25.18	300	0.071	1.78
MH113	MH114	17.52	375	0.110	1.93
MH114	CBMH121	19.04	375	0.110	2.10
CBMH120	CBMH121	58.70	300	0.071	4.15
CBMH121	CBMH115	43.35	525	0.216	9.38
CBMH115	CBMH105	39.24	525	0.216	8.49
CBMH105	CBMH106	30.91	600	0.283	8.74
				Total	54.82

Structure Storage				***All***		
	Base	**Top**	**Height**	**diameter**	**X-sec Area**	**Volume**
CBMH101	99.463	102.05	2.59	1200	1.131	2.93
MH102	99.367	102.05	2.68	1200	1.131	3.03
CBMH103	99.236	102.05	2.81	1200	1.131	3.18
CBMH104	99.141	102.05	2.91	1200	1.131	3.29
MH111	99.666	102.05	2.38	1200	1.131	2.70
MH110	99.788	102.05	2.26	1200	1.131	2.56
CB130	100.670	102.05	1.38	600	0.360	0.50
CB12	100.650	102.05	1.40	600	0.360	0.50
CB111	100.670	102.05	1.38	600	0.360	0.50
CB110	100.700	102.05	1.35	600	0.360	0.49
MH112	99.437	102.05	2.61	1200	1.131	2.96
MH113	99.329	102.05	2.72	1200	1.440	3.92
MH114	99.265	102.05	2.78	1200	1.440	4.01
CBMH120	99.383	102.05	2.67	1200	1.440	3.84
CBMH121	99.157	102.05	2.89	1200	1.440	4.17
CBMH115	99.058	102.05	2.99	1200	1.440	4.31
CBMH105	98.975	102.05	3.07	1500	2.250	6.92
CBMH106	98.899	102.05	3.15	1200	1.440	4.54
					Total	54.32

TOTAL AREA All	**109.15**

IBI GROUP
400-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

PROJECT: 75 Michael Cowpland
DATE: 2023-09-21
FILE: 135470 - 6.04.04
REV #: -
DESIGNED BY: WZ
CHECKED BY: RM

ORIFICE SIZING

Orifice coefficients	
Cv =	0.60

							Theoretical		Recommended	
	Invert	Diameter	Centre ICD	Max. Pond Elevation	Hydraulic Slope	Target Flow	Orifice	Actual Flow	Orifice	Actual Flow
	(m)	(mm)	(m)	(m)	(m)	(l/s)	(m)	(l/s)	(m)	(l/s)
CBMH106	98.900	825	99.313	102.05	2.738	108.0	0.157	108.00	0.157	108.0
CBMH140	98.885	300	99.035	101.95	2.915	6.0	0.036	6.00	0.036	6.0
						114.00				**113.97**

IBI Group
333 Preston Street - Suite 400
Ottawa, Ontario
K1S 5N4

PROJECT:	75 Michael Cowpland
	City of Ottawa
DEVELOPER :	Huntington Properties
JOB #:	135470 - 6.04.04
DATE:	2023-09-21
DESIGN:	WZ

FLOW EVALUATION:

Manning's Formula *City of Ottawa sewer design guidelines 6.4.1*
Q cap = 1000 * (A * $R^{2/3}$ * S^1/2) / n

Flow Calculations:

Drainage Area	***Overall Site except Landscaped Area***	
Depth	**0.01**	**m**
Grade	**2**	**%**
Roughness:	0.013	Asphalt
Parameters		
Area	0.082	sq.m
Wetted Per.	8.519	m
Hydr. Radius	0.010	
Q = (1/N)(A)(R^0.66)(S^0.5)		
$Q_{CAPACITY}$ =	**41.40**	**l/s**
Target Release rate =	41.40	l/s

Overflow to west site entrance

Dimensions Used for Area

Width	8.5	m
Depth	0.01	m

PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

Our HF, HF Sump and MHF ICD's are designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter or larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 5 preset flow curves, these ICDs have the ability to provide constant flow rates: 9lps (143 gpm) and greater

Product Function

TEMPEST HF (High Flow): designed to manage moderate to higher flows 15 L/s (240 gpm) or greater and prevent the propagation of odour and floatables. With this device, the cross-sectional area of the device is larger than the orifice diameter and has been designed to limit head losses. The HF ICD can also be ordered without flow control when only odour and floatable control is required.

TEMPEST HF (High Flow) Sump: The height of a sewer outlet pipe in a catch basin is not always conveniently located. At times it may be located very close to the catch basin floor, not providing enough sump for one of the other TEMPEST ICDs with universal back plate to be installed. In these applications, the HF Sump is offered. The HF Sump offers the same features and benefits as the HF ICD; however, is designed to raise the outlet in a square or round catch basin structure. When installed, the HF sump is fixed in place and not easily removed. Any required service to the device is performed through a clean-out located in the top of the device which can be often accessed from ground level.

TEMPEST MHF (Medium to High Flow): The MHF plate or plug is designed to control flow rates 9 L/s (143 gpm) or greater. It is not designed to prevent the propagation of odour and floatables.

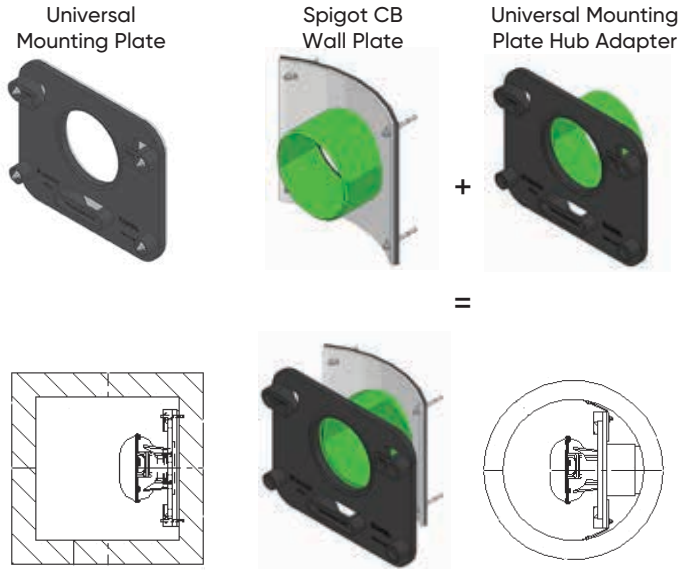
Product Construction

The HF, HF Sump and MHF ICDs are built to be light weight at a maximum weight of 6.8 Kg (14.6 lbs).

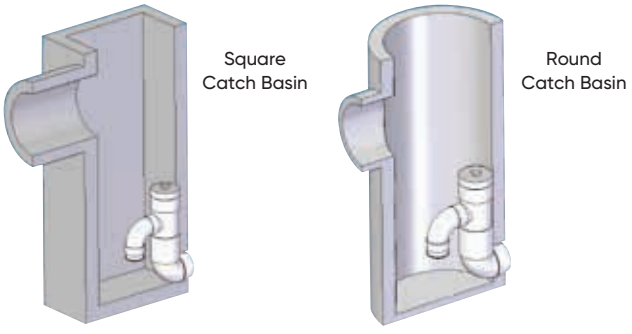
Product Applications

The HF and MHF ICD's are available to accommodate both square and round applications:

Square Application **Round Application**



The HF Sump is available to accommodate low to no sump applications in both square and round catch basins:



SANTHOSH

STORMWATER MANAGEMENT
REPORT
CITY OF KANATA
KANATA SOUTH BUSINESS PARK

Prepared By: A.J. Robinson & Associates Inc.
February 1986

INTRODUCTION

The Kanata South Business Park is a 38.5 ha tract of land currently desiginated by the Regional Offical Plan for industrial use. The site is located within the City of Kanata and is bounded by Eagleson Road on the east, old Hazeldean Road on the west, the C.P. Railway on the north and O.H.E.C. Right-of-Way on the south.

This property, including approximately 80 ha to the south, has been the subject of previous development plans by the Township of Goulbourn and most recently by Oceatain Properties. The City of Kanata has purchased the land described above and intends to develop a high class light industrial/business park, complete with storm and sanitary sewers, water and curbed roadways.

The purpose of this report is to present for review and approval, the proposed stormwater management design analysis, conclusions and proposed design criteria. Both quality and quantity aspects are addressed.

EXISTING DRAINAGE/PREDEVELOPMENT FLOWS

The existing drainage for the site is shown on the grading and drainage plan (Drawing No. 8555-GI). The total site drainage area of 43 ha includes a portion of Eagleson Road from the railway to the south side of the hydro property. It is noted that a portion of the railway right-of-way and lands to the north, drain along the north boundary to the existing roadside ditch on old Hazeldean Road. Since this drainage pattern will not be altered and does not drain through the site, this area has been excluded from the analysis.

As the topography indicates drainage is generally from east to west to defined ditches which drain to the south into Monahan Creek, a municipal drain, and then into the Jock River.

The predevelopment flow conditions were modelled using OTTHYMO with the design storms and CN values being established from

previous hydrological studies (refer to Bibliography). Figure 1 shows the breakdown of drainage sub-basins for the predevelopment flow analysis resulting in the following calculated peak flow rates, off the Business Park, at the soutwest corner:

5 years - 1.64 m^3/sec
100 years - 3.40 m^3/sec

The computer runs for the modelled system are attached as Appendix 1.

POST DEVELOPMENT CONDITIONS

The City of Kanata has established stormwater management design criterion which stipulate that on an overall site basis, the 5 year and 100 year post development peak release rates must not exceed the predevelopment peak flow rate for the corresponding return period.

With these criteria in mind, it was decided to analyse the following scenarios for stormwater management for the proposed development:

(1) 5 year post development storm sewer system with stormwater management pond sized for 5 and 100 year storm run-off.

(2) Retention of 5 year run-off to predevelopment levels on individual lots, 5 year predevelopment flow sizing of storm sewers and stormwater management pond sized for the differences between the 5 and 100 year volume.

(3) On-lot retention to 5 and 100 year predevelopment flow rates, and 5 year predevelopment flow sizing of storm sewers.

Due to the type of analysis requried for post development scenarios, the computer model OTTSWMM was used to evaluate the three alternatives described.

The first scenario was very quickly rejected due to the extremely large storm sewers required (max size 2000 mm), the large volume of storage required (6900 m^3) and the corresponding area of land necessary to construct the pond (1.3 ha). The first alternative was simply not cost effective.

The OTTSWMM model simulated the 5 year event with each lot controlling the 5 year run-off in parking lots draining via controlled outlets to the storm sewer. During the 100 year event the excess run-off, beyond the 5 year, overflowed to the major system and was conveyed via swales and roadways to the proposed pond, located in the southwest corner of the site. The additional storage volume required to satisfy the 100 year release rate for the Business Park is approximately 3200 m^3. In reviewing this option, several things became evident:

(i) Due to a calculated 100 year flood level of Monahan Creek of 95.4 m and a corresponding maximum design water level for the proposed pond of 95.4 the effectiveness of a pond to control run-off and eliminate flooding was questionable.

(ii) The construction of the pond and outlets necessitated considerable grading in a peat bog and caused approximately 0.66 ha of saleable land to be eliminated from the park.

(iii) Since on-site controls for the 5 year release rate were being considered anyway, it was felt that the additional storage and controls to handle the 100 year flows were not that much more restrictive. It was felt that the 3200 m^3 required for the pond could simply be distributed over the developed acreage of the park resulting in approximately 100 m^3/ha additional storage volume.

Based on the third scenario the off-lot release rates, to maintain predevelopment flow rates at the outlet, were determined

to be the following:

5 year - 35.8 l/s/ha
100 years - 74.2 l/s/ha

It is noted that the storage volumes determined by OTTSWMM were based on a 73% imperviousness rate. Individual lots when developed will vary in coverage and imperviousness, thus actual storage volumes required, to maintain the stipulated release rates, will vary.

Typical minimum size lots (0.4 ha) were evaluated to confirm that this proposal was practical and relatively easily attainable.

Based on this analysis, the third scenario is proposed for the stormwater management control for this development.

WATER QUALITY

With the proposed quantity control measures in mind, the water quality aspects of the development were addressed with the following conclusions being presented:

(1) The light industrial/business park type industries are considered to produce a relatively low level of pollutants.

(2) The development is in the upper reaches of a large watershed draining to the Rideau River. The outlet from the site is to a municipal drain which is running at a very flat grade, thereby, presenting ample opportunity for pollutants to settle out.

(3) On-site control of stormwater by parking lot and possibly roof top storage will result in a reduction of pollutant loadings.

(4) Laboratory and field observations, indicate that installation of an orifice in the outlet of a

catchbasin with a sump, has brought about a greater retention of grit and other solids after a storm event than observed with a conventional storm sewer outlet. The constricted release of flow from the orifice causes stormwater to backup in the catchbasin thereby keeping the turbulent zone of the water away from the sump and also reducing velocities in the catchbasin. These actions facilitate settling of suspended solids into the sump.

Based on the above, it is felt that the proposed quantity control measures will also serve to ensure that the proposed development will not unduly effect the quality of water flowing from the site into Monahan Creek and thus to the Rideau River.

STORMWATER MANAGEMENT DESIGN CRITERIA

The following design criteria are proposed for the overall stormwater management for the Business Park:

1. Individual lot developers will be required to provide on lot grading and drainage controls to control site drainage to predevelopment release rates for both the 5 year and 100 year storm events.

2. The maximum off-lot release rates, on an area basis, will not exceed the following:

   5 year release rate - 35.8 l/s/ha
   100 year release rate - 74.2 l/s/ha

3. Lot grading and drainage controls will generally be up to the developer, however, the design and construction will require approval and certification from the City of Kanata.

4. Control of stormwater release off-site into the pipe network shall be with an orifice fixed to the outlet pipe of the catchbasin/manhole.

5. The minimum orifice size shall be 4700 mm^2. The depth of ponding of water over the orifice must be designed accordingly to meet the maximum allowable release rate and minimum orifice size.

6. The minimum cover of backfill over the orifice shall be 1.4 metres. Certain lots may require the orifice to be placed in a separate manhole located away form the low point in the parking lot.

7. All parking lot catchbasins/manholes shall contain sumps and will require regular maintenance. Sumps may have to be cleaned out more often than a conventional parking lot drainage network.

8. The storm sewer system will be designed by the rational method using an average run-off co-efficient of 0.25 for developed areas. It is noted that the peak run-off from the storm sewer system calculated using this criterion is 1.80 m^3/s comparing to 1.64 m^3/s calculated using the OTTHYMO model.

MONAHAN CREEK

As shown on Drawing Nos. 8555-10 and 8555-11 it is proposed that the storm sewer system for the site will outlet to an open ditch running west along the Hydro lands and then southerly to Monahan Drain. Based on minimum cover requirements for the storm sewer and to minimize fill required within the development, the outlet grade of the ditch at Monahan Creek is proposed to be set at 93.52. The existing grade at this point of 94.4. Thus, to obtain outlet for the site, it will be necesary to deepen Monahan Creek from the point of outlet to the existing, and relatively new, culvert at Eagleson Road.

The proposed and existing grade of the deepened drain is shown on Drawing No. 8555-11. The grade up to Fernbank Road corresponds to the proposed grade presented in the Seto-Walt Report. At Fernbank Road, it is proposed to lower the existing culvert to

the new design grade. Based on a peak 25 year flow, calculated by Seto-Walt, of 4.36 m^3/s, the existing 1.47 m culvert is slightly undersized with a capacity of 3.88 m^3/s. If the culvert is damaged or is not suitable for reinstallation, it would be replaced with a 1.65 m culvert, to achieve free flow under the 25 year storm event. As part of the final design, we propose to review the flow calculation to confirm the above proposal.

It is noted that work on the drain, downstream of Eagleson Road, has been undertaken in the recent past and that the culvert at Eagleson Road has been replaced with a 1.95 m x 4.4 m concrete box culvert with a capacity of 18.9 m^3/s. With this in mind and considering the fact that flooding levels suggested by the Seto-Walt Report are lower when the culvert structures are removed (refer to Figures 4-7b and 4-8b of that report), along with the proposal to outlet the development to the drain at predevelopment levels, it is felt that the downstream effects of channelization of the drain will be minimal, if any.

It is proposed that, since Monahan Creek is a municipal drain, the work will be carried out under Seciton 77 of the Drainage Act, whereby certain works (lowering and widening included) may be authorized and carried out by the drainage superintendent of the municipality without petitioning and without the necessity of an Engineer's Report.

FLOOD CONTROLS

In recognition of the maximum 100 year flood level of 95.4 established by the Kostuch Report, it is proposed that all roads and buildings will be kept at least 0.3 m above this elevation and that property owners will be advised accordingly. Seto-Walt calculated a maximum flood level of 96.0, however, since the Kostuch study utilized more sophisticated routing techniques and the topographical mapping is more accurate and comparable to current mapping, it is felt that the 95.4 m level is more representative.

The potential storage volume on the site below the 95.4 contour

level is limited to the southwest corner of the site and is estimated at 7000 m^3. The additional volume of storage created by the excavation of the outlet ditch to Monahan Creek is approximately 7500 m^3. Thus, the total volume of available storage is approximately the same after development.

BIBLIOGRAPHY

1) Flood Risk Mapping of Kizell Drain and Shirley's Brook.
A.J. Robinson and Associates Inc., May 1985.

2) Sawmill Creek Water Quality and Quantity Study.
A.J. Robinson and Associates Inc., July 1984.

3) Hazeldean South Industrial Park Monahan Drain Drainage
Study. R.M. Kostuch Associates Ltd., July 1976.

4) Flood and Erosion Study of the Monahan Creek Drainage Basin.
Seto-Walt and Associates Ltd., April 1975.

APPENDIX I

OTTHYMO RUNS

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**********************************************************************************************
**********************************************************************************************
**                                                                                          **
**       U N I V E R S I T Y   O F   O T T A W A   H Y D R O L O G I C   M O D E L          **
**                                                                                          **
**                          O T T H Y M O   ( V E R S I O N   1 . 0 )                       **
**                                                                                          **
**                                  N O V E M B E R   1 9 8 2                               **
**                                                                                          **
**********************************************************************************************
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THIS MODEL IS THE UNIVERSITY OF OTTAWA VERSION OF THE HYDROLOGIC MODEL (HYMO) DEVELOPED BY J. R. WILLIAMS AND R. W. HANN (1973) OF THE U.S. DEPT. OF AGRICULTURE. IT HAS THREE NEW SUBROUTINES, URBHYD, KINRTE, AND NASHYD, AND HAS BEEN MODIFIED SUCH THAT IT CAN BE USED IN BOTH ENGLISH AND METRIC UNITS.

THE MODEL WAS DEVELOPED IN THE FRAME OF THE IMPSWM (IMPLEMENTATION OF STORMWATER MANAGEMENT) PROGRAM AT THE DEPARTMENT OF CIVIL ENGINEERING, UNIVERSITY OF OTTAWA. THE DOCUMENTATION FOR THE MODEL CAN BE FOUND IN THE IMPSWM URBAN DRAINAGE MODELLING PROCEDURES (1982).

THE DETAILS ABOUT THE COPYRIGHT AND DISCLAIMER CAN BE FOUND BETWEEN LINES 22 AND 44 IN THE LISTING. THE USER AGREES TO RESPECT THE COPYRIGHT AND THE DISCLAIMER.

THE ENGLISH UNITS OPTION HAS BEEN SPECIFIED

```
*
*    KANATA SOUTH INDUSTRIAL PARK
*      PREDEVELOPMENT FLOWS
*       5 YR  12 HR SCS TYPE
*      STORM DISTRIBUTION
*
START                 RAINFALL STARTS AT 0.0 HRS
COMPUTE HYD           ID=1 HYD NO=100 DT=0.100 DA=5.48
                      AA=0.0 AB=0.0
                      CN=*=93 IA=0.185 K=0.224 TP=0.189
                      N1=120
```

RAINFALL HYETOGRAPH

.0400 .0400 .0400 .0400 .0400
.0400 .0400 .0400 .0400 .0400
.0400 .0400 .0400 .0400 .0400
.0400 .0400 .0400 .0400 .0400
.0799 .0799 .0799 .0799 .0799
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.1599 .1599 .1599 .1599 .1599
.2398 .2398 .2398 .2398 .2398
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.3597 .3597 .3597 .3597 .3597
.1599 .1599 .1599 .1599 .1599
.1199 .1199 .1199 .1199 .1199
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.0400 .0400 .0400 .0400 .0400
.0400 .0400 .0400 .0400 .0400
.0400 .0400 .0400 .0400 .0400
.0400 .0400 .0400 .0400 .0400
.0400 .0400 .0400 .0400 .0400

SHAPE CONSTANT, N = 2.996
UNIT PEAK = 12.75CFS

SUM OF THE UNIT HYDROGRAPH CO-ORDINATES = 9.96
PEAK DISCHARGE = 5.87 CFS RUNOFF = 1.277 INCHES TIME TO PEAK = 5.900 HRS
TOTAL RAINFALL = 1.998 INCHES RUNOFF VOLUMETRICCOEFFICIENT 0.64

PRINT HYD ID=1

HYDROGRAPH FROM AREA 100

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	5.35	12.000	0.17	18.000	0.00	24.000	0.00
0.100	0.00	6.100	4.81	12.100	0.12	18.100	0.00	24.100	0.00
0.200	0.00	6.200	3.28	12.200	0.09	18.200	0.00	24.200	0.00
0.300	0.00	6.300	2.70	12.300	0.06	18.300	0.00	24.300	0.00
0.400	0.00	6.400	2.37	12.400	0.05	18.400	0.00	24.400	0.00
0.500	0.00	6.500	2.02	12.500	0.04	18.500	0.00	24.500	0.00
0.600	0.00	6.600	1.71	12.600	0.03	18.600	0.00	24.600	0.00
0.700	0.00	6.700	1.49	12.700	0.03	18.700	0.00	24.700	0.00
0.800	0.00	6.800	1.30	12.800	0.02	18.800	0.00	24.800	0.00
0.900	0.00	6.900	1.23	12.900	0.02	18.900	0.00	24.900	0.00
1.000	0.00	7.000	1.12	13.000	0.02	19.000	0.00	25.000	0.00
1.100	0.00	7.100	1.02	13.100	0.02	19.100	0.00	25.100	0.00
1.200	0.00	7.200	0.94	13.200	0.01	19.200	0.00	25.200	0.00
1.300	0.00	7.300	0.88	13.300	0.01	19.300	0.00	25.300	0.00
1.400	0.00	7.400	0.83	13.400	0.01	19.400	0.00	25.400	0.00
1.500	0.00	7.500	0.80	13.500	0.01	19.500	0.00	25.500	0.00
1.600	0.00	7.600	0.77	13.600	0.01	19.600	0.00	25.600	0.00
1.700	0.00	7.700	0.74	13.700	0.01	19.700	0.00	25.700	0.00

3.900	0.04	9.900	0.80	15.900	0.00	21.900	0.00	27.900	0.00
4.000	0.05	10.000	0.77	16.000	0.00	22.000	0.00	28.000	0.00
4.100	0.07	10.100	0.74	16.100	0.00	22.100	0.00	28.100	0.00
4.200	0.09	10.200	0.72	16.200	0.00	22.200	0.00	28.200	0.00
4.300	0.11	10.300	0.71	16.300	0.00	22.300	0.00	28.300	0.00
4.400	0.14	10.400	0.69	16.400	0.00	22.400	0.00	28.400	0.00
4.500	0.17	10.500	0.68	16.500	0.00	22.500	0.00	28.500	0.00
4.600	0.21	10.600	0.67	16.600	0.00	22.600	0.00	28.600	0.00
4.700	0.25	10.700	0.67	16.700	0.00	22.700	0.00	28.700	0.00
4.800	0.29	10.800	0.66	16.800	0.00	22.800	0.00	28.800	0.00
4.900	0.33	10.900	0.65	16.900	0.00	22.900	0.00	28.900	0.00
5.000	0.40	11.000	0.65	17.000	0.00	23.000	0.00	29.000	0.00
5.100	0.50	11.100	0.64	17.100	0.00	23.100	0.00	29.100	0.00
5.200	0.60	11.200	0.64	17.200	0.00	23.200	0.00	29.200	0.00
5.300	0.69	11.300	0.64	17.300	0.00	23.300	0.00	29.300	0.00
5.400	0.77	11.400	0.63	17.400	0.00	23.400	0.00	29.400	0.00
5.500	2.03	11.500	0.63	17.500	0.00	23.500	0.00	29.500	0.00
5.600	4.41	11.600	0.63	17.600	0.00	23.600	0.00	29.600	0.00
5.700	7.20	11.700	0.63	17.700	0.00	23.700	0.00	29.700	0.00
5.800	9.96	11.800	0.63	17.800	0.00	23.800	0.00	29.800	0.00
5.900	12.54	11.900	0.62	17.900	0.00	23.900	0.00	29.900	0.00

```
0       RUNOFF VOLUME =      0.753 INCHES
        PEAK DISCHARGE RATE =     12.54 CFS


    ADD HYD             ID=6 HYD NO=520 ID I=1 ID II=5
          PEAK FLOW =        25.35 CFS          RUNOFF VOLUME =        0.835 INCHES
0           ADD HYD       ID=6    HYD NO=520     ID I=1         ID II=5
    COMPUTE HYD         ID=2 HYD NO=104 DT=0.100 DA=41.5
                        AA=0.0 AB=0.0
                        CN*=78.6 IA=0.185 K=0.317 TP=0.268
                        NI=120
                        RAIN CODE=-1
        SHAPE CONSTANT, N =  3.001
        UNIT PEAK =      68.21CFS

        SUM OF THE UNIT HYDROGRAPH CO-ORDINATES =      9.99
        PEAK DISCHARGE =     19.80 CFS   RUNOFF =   0.724 INCHES TIME TO PEAK =    6.000 HRS
        TOTAL RAINFALL =      1.998 INCHES RUNOFF VOLUMETRICCOEFFICIENT  0.36
    PRINT HYD           ID=2
0                                HYDROGRAPH FROM AREA 104
```

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	19.80	12.000	1.02	18.000	0.00	24.000	0.00
0.100	0.00	6.100	18.42	12.100	0.86	18.100	0.00	24.100	0.00
0.200	0.00	6.200	16.00	12.200	0.68	18.200	0.00	24.200	0.00
0.300	0.00	6.300	13.74	12.300	0.54	18.300	0.00	24.300	0.00
0.400	0.00	6.400	12.06	12.400	0.42	18.400	0.00	24.400	0.00
0.500	0.00	6.500	10.50	12.500	0.34	18.500	0.00	24.500	0.00
0.600	0.00	6.600	8.98	12.600	0.28	18.600	0.00	24.600	0.00
0.700	0.00	6.700	7.70	12.700	0.24	18.700	0.00	24.700	0.00
0.800	0.00	6.800	6.76	12.800	0.21	18.800	0.00	24.800	0.00

0.900	0.00	6.900	6.14	12.900	0.18	18.900	0.00	24.900	0.00
1.000	0.00	7.000	5.68	13.000	0.16	19.000	0.00	25.000	0.00
1.100	0.00	7.100	5.24	13.100	0.15	19.100	0.00	25.100	0.00
1.200	0.00	7.200	4.87	13.200	0.13	19.200	0.00	25.200	0.00
1.300	0.00	7.300	4.57	13.300	0.12	19.300	0.00	25.300	0.00
1.400	0.00	7.400	4.35	13.400	0.11	19.400	0.00	25.400	0.00
1.500	0.00	7.500	4.18	13.500	0.10	19.500	0.00	25.500	0.00
1.600	0.00	7.600	4.04	13.600	0.09	19.600	0.00	25.600	0.00
1.700	0.00	7.700	3.93	13.700	0.08	19.700	0.00	25.700	0.00
1.800	0.00	7.800	3.83	13.800	0.07	19.800	0.00	25.800	0.00
1.900	0.00	7.900	3.75	13.900	0.06	19.900	0.00	25.900	0.00
2.000	0.00	8.000	3.60	14.000	0.06	20.000	0.00	26.000	0.00
2.100	0.00	8.100	3.39	14.100	0.05	20.100	0.00	26.100	0.00
2.200	0.00	8.200	3.17	14.200	0.05	20.200	0.00	26.200	0.00
2.300	0.00	8.300	2.98	14.300	0.04	20.300	0.00	26.300	0.00
2.400	0.00	8.400	2.84	14.400	0.04	20.400	0.00	26.400	0.00
2.500	0.00	8.500	2.72	14.500	0.03	20.500	0.00	26.500	0.00
2.600	0.00	8.600	2.63	14.600	0.03	20.600	0.00	26.600	0.00
2.700	0.00	8.700	2.56	14.700	0.03	20.700	0.00	26.700	0.00
2.800	0.00	8.800	2.50	14.800	0.02	20.800	0.00	26.800	0.00
2.900	0.00	8.900	2.46	14.900	0.02	20.900	0.00	26.900	0.00
3.000	0.00	9.000	2.42	15.000	0.02	21.000	0.00	27.000	0.00
3.100	0.00	9.100	2.38	15.100	0.02	21.100	0.00	27.100	0.00
3.200	0.00	9.200	2.35	15.200	0.02	21.200	0.00	27.200	0.00
3.300	0.00	9.300	2.33	15.300	0.01	21.300	0.00	27.300	0.00
3.400	0.00	9.400	2.31	15.400	0.01	21.400	0.00	27.400	0.00
3.500	0.01	9.500	2.20	15.500	0.01	21.500	0.00	27.500	0.00
3.600	0.02	9.600	2.03	15.600	0.01	21.600	0.00	27.600	0.00
3.700	0.03	9.700	1.84	15.700	0.01	21.700	0.00	27.700	0.00
3.800	0.04	9.800	1.69	15.800	0.01	21.800	0.00	27.800	0.00
3.900	0.05	9.900	1.57	15.900	0.01	21.900	0.00	27.900	0.00
4.000	0.08	10.000	1.48	16.000	0.01	22.000	0.00	28.000	0.00
4.100	0.10	10.100	1.41	16.100	0.01	22.100	0.00	28.100	0.00
4.200	0.14	10.200	1.36	16.200	0.01	22.200	0.00	28.200	0.00
4.300	0.17	10.300	1.32	16.300	0.00	22.300	0.00	28.300	0.00
4.400	0.21	10.400	1.29	16.400	0.00	22.400	0.00	28.400	0.00
4.500	0.25	10.500	1.27	16.500	0.00	22.500	0.00	28.500	0.00
4.600	0.31	10.600	1.25	16.600	0.00	22.600	0.00	28.600	0.00
4.700	0.38	10.700	1.23	16.700	0.00	22.700	0.00	28.700	0.00
4.800	0.46	10.800	1.21	16.800	0.00	22.800	0.00	28.800	0.00
4.900	0.51	10.900	1.20	16.900	0.00	22.900	0.00	28.900	0.00
5.000	0.61	11.000	1.18	17.000	0.00	23.000	0.00	29.000	0.00
5.100	0.75	11.100	1.17	17.100	0.00	23.100	0.00	29.100	0.00
5.200	0.91	11.200	1.16	17.200	0.00	23.200	0.00	29.200	0.00
5.300	1.06	11.300	1.15	17.300	0.00	23.300	0.00	29.300	0.00
5.400	1.21	11.400	1.14	17.400	0.00	23.400	0.00	29.400	0.00
5.500	2.63	11.500	1.14	17.500	0.00	23.500	0.00	29.500	0.00
5.600	5.67	11.600	1.13	17.600	0.00	23.600	0.00	29.600	0.00
5.700	9.60	11.700	1.12	17.700	0.00	23.700	0.00	29.700	0.00
5.800	14.04	11.800	1.12	17.800	0.00	23.800	0.00	29.800	0.00
5.900	18.34	11.900	1.11	17.900	0.00	23.900	0.00	29.900	0.00

0 RUNOFF VOLUME = 0.724 INCHES
PEAK DISCHARGE RATE = 19.80 CFS

1.600	0.00	7.800	0.72	13.800	0.01	19.800	0.00	25.800	0.00
1.900	0.00	7.900	0.71	13.900	0.00	19.900	0.00	25.900	0.00
2.000	0.00	8.000	0.66	14.000	0.00	20.000	0.00	26.000	0.00
2.100	0.00	8.100	0.60	14.100	0.00	20.100	0.00	26.100	0.00
2.200	0.00	8.200	0.55	14.200	0.00	20.200	0.00	26.200	0.00
2.300	0.00	8.300	0.52	14.300	0.00	20.300	0.00	26.300	0.00
2.400	0.00	8.400	0.50	14.400	0.00	20.400	0.00	26.400	0.00
2.500	0.00	8.500	0.48	14.500	0.00	20.500	0.00	26.500	0.00
2.600	0.00	8.600	0.47	14.600	0.00	20.600	0.00	26.600	0.00
2.700	0.00	8.700	0.46	14.700	0.00	20.700	0.00	26.700	0.00
2.800	0.00	8.800	0.45	14.800	0.00	20.800	0.00	26.800	0.00
2.900	0.00	8.900	0.44	14.900	0.00	20.900	0.00	26.900	0.00
3.000	0.00	9.000	0.44	15.000	0.00	21.000	0.00	27.000	0.00
3.100	0.00	9.100	0.43	15.100	0.00	21.100	0.00	27.100	0.00
3.200	0.00	9.200	0.43	15.200	0.00	21.200	0.00	27.200	0.00
3.300	0.00	9.300	0.42	15.300	0.00	21.300	0.00	27.300	0.00
3.400	0.00	9.400	0.42	15.400	0.00	21.400	0.00	27.400	0.00
3.500	0.01	9.500	0.38	15.500	0.00	21.500	0.00	27.500	0.00
3.600	0.01	9.600	0.34	15.600	0.00	21.600	0.00	27.600	0.00
3.700	0.02	9.700	0.30	15.700	0.00	21.700	0.00	27.700	0.00
3.800	0.03	9.800	0.27	15.800	0.00	21.800	0.00	27.800	0.00
3.900	0.03	9.900	0.26	15.900	0.00	21.900	0.00	27.900	0.00
4.000	0.04	10.000	0.25	16.000	0.00	22.000	0.00	28.000	0.00
4.100	0.06	10.100	0.24	16.100	0.00	22.100	0.00	28.100	0.00
4.200	0.08	10.200	0.23	16.200	0.00	22.200	0.00	28.200	0.00
4.300	0.09	10.300	0.23	16.300	0.00	22.300	0.00	28.300	0.00
4.400	0.11	10.400	0.22	16.400	0.00	22.400	0.00	28.400	0.00
4.500	0.13	10.500	0.22	16.500	0.00	22.500	0.00	28.500	0.00
4.600	0.16	10.600	0.22	16.600	0.00	22.600	0.00	28.600	0.00
4.700	0.19	10.700	0.22	16.700	0.00	22.700	0.00	28.700	0.00
4.800	0.21	10.800	0.21	16.800	0.00	22.800	0.00	28.800	0.00
4.900	0.24	10.900	0.21	16.900	0.00	22.900	0.00	28.900	0.00
5.000	0.29	11.000	0.21	17.000	0.00	23.000	0.00	29.000	0.00
5.100	0.35	11.100	0.21	17.100	0.00	23.100	0.00	29.100	0.00
5.200	0.41	11.200	0.21	17.200	0.00	23.200	0.00	29.200	0.00
5.300	0.46	11.300	0.21	17.300	0.00	23.300	0.00	29.300	0.00
5.400	0.50	11.400	0.21	17.400	0.00	23.400	0.00	29.400	0.00
5.500	1.37	11.500	0.21	17.500	0.00	23.500	0.00	29.500	0.00
5.600	2.74	11.600	0.20	17.600	0.00	23.600	0.00	29.600	0.00
5.700	4.03	11.700	0.20	17.700	0.00	23.700	0.00	29.700	0.00
5.800	5.06	11.800	0.20	17.800	0.00	23.800	0.00	29.800	0.00
5.900	5.87	11.900	0.20	17.900	0.00	23.900	0.00	29.900	0.00

0 RUNOFF VOLUME = 1.277 INCHES
PEAK DISCHARGE RATE = 5.87 CFS

COMPUTE HYD ID=2 HYD NO=101 DT=0.100 DA=2.38
AA=0.0 AB=0.0
CN*=93 TA=0.185 K=0.141 TP=0.119
N1=120
RAIN CODE=-1
SHAPE CONSTANT, N = 2.996
UNIT PEAK = 8.80CFS

SUM OF THE UNIT HYDROGRAPH CO-ORDINATES = 9.78
PEAK DISCHARGE = 2.94 CFS RUNOFF = 1.254 INCHES TIME TO PEAK = 5.900 HRS
TOTAL RAINFALL = 1.998 INCHES RUNOFF VOLUMETRICCOEFFICIENT 0.63

PRINT HYD ID=2

HYDROGRAPH FROM AREA 101

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	2.07	12.000	0.05	18.000	0.00	24.000	0.00
0.100	0.00	6.100	1.42	12.100	0.03	18.100	0.00	24.100	0.00
0.200	0.00	6.200	1.11	12.200	0.02	18.200	0.00	24.200	0.00
0.300	0.00	6.300	0.99	12.300	0.01	18.300	0.00	24.300	0.00
0.400	0.00	6.400	0.94	12.400	0.01	18.400	0.00	24.400	0.00
0.500	0.00	6.500	0.75	12.500	0.01	18.500	0.00	24.500	0.00
0.600	0.00	6.600	0.60	12.600	0.01	18.600	0.00	24.600	0.00
0.700	0.00	6.700	0.52	12.700	0.01	18.700	0.00	24.700	0.00
0.800	0.00	6.800	0.48	12.800	0.00	18.800	0.00	24.800	0.00
0.900	0.00	6.900	0.45	12.900	0.00	18.900	0.00	24.900	0.00
1.000	0.00	7.000	0.39	13.000	0.00	19.000	0.00	25.000	0.00
1.100	0.00	7.100	0.35	13.100	0.00	19.100	0.00	25.100	0.00
1.200	0.00	7.200	0.32	13.200	0.00	19.200	0.00	25.200	0.00
1.300	0.00	7.300	0.31	13.300	0.00	19.300	0.00	25.300	0.00
1.400	0.00	7.400	0.30	13.400	0.00	19.400	0.00	25.400	0.00
1.500	0.00	7.500	0.29	13.500	0.00	19.500	0.00	25.500	0.00
1.600	0.00	7.600	0.28	13.600	0.00	19.600	0.00	25.600	0.00
1.700	0.00	7.700	0.27	13.700	0.00	19.700	0.00	25.700	0.00
1.800	0.00	7.800	0.27	13.800	0.00	19.800	0.00	25.800	0.00
1.900	0.00	7.900	0.27	13.900	0.00	19.900	0.00	25.900	0.00
2.000	0.00	8.000	0.23	14.000	0.00	20.000	0.00	26.000	0.00
2.100	0.00	8.100	0.21	14.100	0.00	20.100	0.00	26.100	0.00
2.200	0.00	8.200	0.19	14.200	0.00	20.200	0.00	26.200	0.00
2.300	0.00	8.300	0.19	14.300	0.00	20.300	0.00	26.300	0.00
2.400	0.00	8.400	0.18	14.400	0.00	20.400	0.00	26.400	0.00
2.500	0.00	8.500	0.18	14.500	0.00	20.500	0.00	26.500	0.00
2.600	0.00	8.600	0.18	14.600	0.00	20.600	0.00	26.600	0.00
2.700	0.00	8.700	0.18	14.700	0.00	20.700	0.00	26.700	0.00
2.800	0.00	8.800	0.17	14.800	0.00	20.800	0.00	26.800	0.00
2.900	0.00	8.900	0.17	14.900	0.00	20.900	0.00	26.900	0.00
3.000	0.00	9.000	0.17	15.000	0.00	21.000	0.00	27.000	0.00
3.100	0.00	9.100	0.17	15.100	0.00	21.100	0.00	27.100	0.00
3.200	0.00	9.200	0.17	15.200	0.00	21.200	0.00	27.200	0.00
3.300	0.00	9.300	0.17	15.300	0.00	21.300	0.00	27.300	0.00
3.400	0.00	9.400	0.17	15.400	0.00	21.400	0.00	27.400	0.00
3.500	0.00	9.500	0.14	15.500	0.00	21.500	0.00	27.500	0.00
3.600	0.01	9.600	0.12	15.600	0.00	21.600	0.00	27.600	0.00
3.700	0.01	9.700	0.11	15.700	0.00	21.700	0.00	27.700	0.00
3.800	0.01	9.800	0.10	15.800	0.00	21.800	0.00	27.800	0.00
3.900	0.02	9.900	0.10	15.900	0.00	21.900	0.00	27.900	0.00
4.000	0.03	10.000	0.09	16.000	0.00	22.000	0.00	28.000	0.00
4.100	0.03	10.100	0.09	16.100	0.00	22.100	0.00	28.100	0.00
4.200	0.04	10.200	0.09	16.200	0.00	22.200	0.00	28.200	0.00
4.300	0.05	10.300	0.09	16.300	0.00	22.300	0.00	28.300	0.00
4.400	0.05	10.400	0.09	16.400	0.00	22.400	0.00	28.400	0.00

4.500	0.07	10.500	0.09	16.500	0.00	22.500	0.00	28.500	0.00
4.600	0.08	10.600	0.09	16.600	0.00	22.600	0.00	28.600	0.00
4.700	0.10	10.700	0.09	16.700	0.00	22.700	0.00	28.700	0.00
4.800	0.11	10.800	0.09	16.800	0.00	22.800	0.00	28.800	0.00
4.900	0.11	10.900	0.09	16.900	0.00	22.900	0.00	28.900	0.00
5.000	0.15	11.000	0.09	17.000	0.00	23.000	0.00	29.000	0.00
5.100	0.18	11.100	0.09	17.100	0.00	23.100	0.00	29.100	0.00
5.200	0.21	11.200	0.09	17.200	0.00	23.200	0.00	29.200	0.00
5.300	0.22	11.300	0.09	17.300	0.00	23.300	0.00	29.300	0.00
5.400	0.24	11.400	0.09	17.400	0.00	23.400	0.00	29.400	0.00
5.500	1.03	11.500	0.09	17.500	0.00	23.500	0.00	29.500	0.00
5.600	1.79	11.600	0.09	17.600	0.00	23.600	0.00	29.600	0.00
5.700	2.31	11.700	0.09	17.700	0.00	23.700	0.00	29.700	0.00
5.800	2.68	11.800	0.09	17.800	0.00	23.800	0.00	29.800	0.00
5.900	2.94	11.900	0.09	17.900	0.00	23.900	0.00	29.900	0.00

0 RUNOFF VOLUME = 1.254 INCHES
PEAK DISCHARGE RATE = 2.94 CFS

ADD HYD ID=3 HYD NO=500 ID I=1 ID II=2
PEAK FLOW = 6.80 CFS RUNOFF VOLUME = 1.270 INCHES
0 ADD HYD ID=3 HYD NO=500 ID I=1 ID II=2
COMPUTE HYD ID=4 HYD NO=102 DT=0.100 DA=5.85
AA=0.0 AB=0.0
CN=78.6 IA=0.185 K=0.143 TP=0.121
N1=120
RAIN CODE=-1
SHAPE CONSTANT, N = 3.004
UNIT PEAK = 21.31CFS

SUM OF THE UNIT HYDROGRAPH CO-ORDINATES = 9.79
PEAK DISCHARGE = 4.01 CFS RUNOFF = 0.710 INCHES TIME TO PEAK = 5.900 HRS
TOTAL RAINFALL = 1.998 INCHES RUNOFF VOLUMETRICCOEFFICIENT 0.36
PRINT HYD ID=4
0 HYDROGRAPH FROM AREA 102

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	2.92	12.000	0.10	18.000	0.00	24.000	0.00
0.100	0.00	6.100	2.02	12.100	0.05	18.100	0.00	24.100	0.00
0.200	0.00	6.200	1.61	12.200	0.03	18.200	0.00	24.200	0.00
0.300	0.00	6.300	1.44	12.300	0.02	18.300	0.00	24.300	0.00
0.400	0.00	6.400	1.39	12.400	0.02	18.400	0.00	24.400	0.00
0.500	0.00	6.500	1.12	12.500	0.02	18.500	0.00	24.500	0.00
0.600	0.00	6.600	0.91	12.600	0.01	18.600	0.00	24.600	0.00
0.700	0.00	6.700	0.79	12.700	0.01	18.700	0.00	24.700	0.00
0.800	0.00	6.800	0.73	12.800	0.01	18.800	0.00	24.800	0.00
0.900	0.00	6.900	0.69	12.900	0.01	18.900	0.00	24.900	0.00
1.000	0.00	7.000	0.61	13.000	0.00	19.000	0.00	25.000	0.00
1.100	0.00	7.100	0.55	13.100	0.00	19.100	0.00	25.100	0.00
1.200	0.00	7.200	0.51	13.200	0.00	19.200	0.00	25.200	0.00
1.300	0.00	7.300	0.49	13.300	0.00	19.300	0.00	25.300	0.00
1.400	0.00	7.400	0.47	13.400	0.00	19.400	0.00	25.400	0.00

1.500	0.00	7.500	0.46	13.500	0.00	19.500	0.00	25.500	0.00
1.600	0.00	7.600	0.45	13.600	0.00	19.600	0.00	25.600	0.00
1.700	0.00	7.700	0.44	13.700	0.00	19.700	0.00	25.700	0.00
1.800	0.00	7.800	0.44	13.800	0.00	19.800	0.00	25.800	0.00
1.900	0.00	7.900	0.43	13.900	0.00	19.900	0.00	25.900	0.00
2.000	0.00	8.000	0.38	14.000	0.00	20.000	0.00	26.000	0.00
2.100	0.00	8.100	0.34	14.100	0.00	20.100	0.00	26.100	0.00
2.200	0.00	8.200	0.32	14.200	0.00	20.200	0.00	26.200	0.00
2.300	0.00	8.300	0.31	14.300	0.00	20.300	0.00	26.300	0.00
2.400	0.00	8.400	0.30	14.400	0.00	20.400	0.00	26.400	0.00
2.500	0.00	8.500	0.30	14.500	0.00	20.500	0.00	26.500	0.00
2.600	0.00	8.600	0.30	14.600	0.00	20.600	0.00	26.600	0.00
2.700	0.00	8.700	0.29	14.700	0.00	20.700	0.00	26.700	0.00
2.800	0.00	8.800	0.29	14.800	0.00	20.800	0.00	26.800	0.00
2.900	0.00	8.900	0.29	14.900	0.00	20.900	0.00	26.900	0.00
3.000	0.00	9.000	0.29	15.000	0.00	21.000	0.00	27.000	0.00
3.100	0.00	9.100	0.29	15.100	0.00	21.100	0.00	27.100	0.00
3.200	0.00	9.200	0.29	15.200	0.00	21.200	0.00	27.200	0.00
3.300	0.00	9.300	0.29	15.300	0.00	21.300	0.00	27.300	0.00
3.400	0.00	9.400	0.29	15.400	0.00	21.400	0.00	27.400	0.00
3.500	0.00	9.500	0.24	15.500	0.00	21.500	0.00	27.500	0.00
3.600	0.01	9.600	0.20	15.600	0.00	21.600	0.00	27.600	0.00
3.700	0.01	9.700	0.18	15.700	0.00	21.700	0.00	27.700	0.00
3.800	0.01	9.800	0.17	15.800	0.00	21.800	0.00	27.800	0.00
3.900	0.01	9.900	0.16	15.900	0.00	21.900	0.00	27.900	0.00
4.000	0.02	10.000	0.16	16.000	0.00	22.000	0.00	28.000	0.00
4.100	0.02	10.100	0.16	16.100	0.00	22.100	0.00	28.100	0.00
4.200	0.03	10.200	0.15	16.200	0.00	22.200	0.00	28.200	0.00
4.300	0.04	10.300	0.15	16.300	0.00	22.300	0.00	28.300	0.00
4.400	0.04	10.400	0.15	16.400	0.00	22.400	0.00	28.400	0.00
4.500	0.05	10.500	0.15	16.500	0.00	22.500	0.00	28.500	0.00
4.600	0.07	10.600	0.15	16.600	0.00	22.600	0.00	28.600	0.00
4.700	0.08	10.700	0.15	16.700	0.00	22.700	0.00	28.700	0.00
4.800	0.09	10.800	0.15	16.800	0.00	22.800	0.00	28.800	0.00
4.900	0.10	10.900	0.15	16.900	0.00	22.900	0.00	28.900	0.00
5.000	0.13	11.000	0.15	17.000	0.00	23.000	0.00	29.000	0.00
5.100	0.16	11.100	0.15	17.100	0.00	23.100	0.00	29.100	0.00
5.200	0.18	11.200	0.15	17.200	0.00	23.200	0.00	29.200	0.00
5.300	0.20	11.300	0.15	17.300	0.00	23.300	0.00	29.300	0.00
5.400	0.22	11.400	0.15	17.400	0.00	23.400	0.00	29.400	0.00
5.500	1.04	11.500	0.15	17.500	0.00	23.500	0.00	29.500	0.00
5.600	1.95	11.600	0.15	17.600	0.00	23.600	0.00	29.600	0.00
5.700	2.74	11.700	0.15	17.700	0.00	23.700	0.00	29.700	0.00
5.800	3.42	11.800	0.15	17.800	0.00	23.800	0.00	29.800	0.00
5.900	4.01	11.900	0.15	17.900	0.00	23.900	0.00	29.900	0.00

RUNOFF VOLUME = 0.710 INCHES
PEAK DISCHARGE RATE = 4.01 CFS

ADD HYD ID=5 HYD NO=510 ID I=4 ID I1=3
PEAK FLOW = 12.81 CFS RUNOFF VOLUME = 1.031 INCHES
ADD HYD ID=5 HYD NO=510 ID I=4 ID I1=3
COMPUTE HYD ID=1 HYD NO=103 DT=0.100 DA=23.89

AA=0.0 AB=0.0
CN=78.6 IA=0.185 K=0.255 TP=0.216
NI=120
RAIN CODE=-1

SHAPE CONSTANT, N = 3.007
UNIT PEAK = 48.79CFS

SUM OF THE UNIT HYDROGRAPH CO-ORDINATES = 9.98
PEAK DISCHARGE = 12.54 CFS RUNOFF = 0.723 INCHES TIME TO PEAK = 5.900 HRS
TOTAL RAINFALL = 1.998 INCHES RUNOFF VOLUMETRICCOEFFICIENT 0.36

PRINT HYD ID=1

HYDROGRAPH FROM AREA 103

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	12.50	12.000	0.55	18.000	0.00	24.000	0.00
0.100	0.00	6.100	10.62	12.100	0.42	18.100	0.00	24.100	0.00
0.200	0.00	6.200	8.64	12.200	0.31	18.200	0.00	24.200	0.00
0.300	0.00	6.300	7.24	12.300	0.23	18.300	0.00	24.300	0.00
0.400	0.00	6.400	6.36	12.400	0.18	18.400	0.00	24.400	0.00
0.500	0.00	6.500	5.49	12.500	0.14	18.500	0.00	24.500	0.00
0.600	0.00	6.600	4.65	12.600	0.12	18.600	0.00	24.600	0.00
0.700	0.00	6.700	4.02	12.700	0.10	18.700	0.00	24.700	0.00
0.800	0.00	6.800	3.63	12.800	0.09	18.800	0.00	24.800	0.00
0.900	0.00	6.900	3.35	12.900	0.08	18.900	0.00	24.900	0.00
1.000	0.00	7.000	3.09	13.000	0.07	19.000	0.00	25.000	0.00
1.100	0.00	7.100	2.83	13.100	0.06	19.100	0.00	25.100	0.00
1.200	0.00	7.200	2.63	13.200	0.05	19.200	0.00	25.200	0.00
1.300	0.00	7.300	2.48	13.300	0.05	19.300	0.00	25.300	0.00
1.400	0.00	7.400	2.36	13.400	0.04	19.400	0.00	25.400	0.00
1.500	0.00	7.500	2.27	13.500	0.03	19.500	0.00	25.500	0.00
1.600	0.00	7.600	2.20	13.600	0.03	19.600	0.00	25.600	0.00
1.700	0.00	7.700	2.14	13.700	0.03	19.700	0.00	25.700	0.00
1.800	0.00	7.800	2.09	13.800	0.02	19.800	0.00	25.800	0.00
1.900	0.00	7.900	2.05	13.900	0.02	19.900	0.00	25.900	0.00
2.000	0.00	8.000	1.94	14.000	0.02	20.000	0.00	26.000	0.00
2.100	0.00	8.100	1.79	14.100	0.02	20.100	0.00	26.100	0.00
2.200	0.00	8.200	1.66	14.200	0.01	20.200	0.00	26.200	0.00
2.300	0.00	8.300	1.56	14.300	0.01	20.300	0.00	26.300	0.00
2.400	0.00	8.400	1.49	14.400	0.01	20.400	0.00	26.400	0.00
2.500	0.00	8.500	1.44	14.500	0.01	20.500	0.00	26.500	0.00
2.600	0.00	8.600	1.40	14.600	0.01	20.600	0.00	26.600	0.00
2.700	0.00	8.700	1.37	14.700	0.01	20.700	0.00	26.700	0.00
2.800	0.00	8.800	1.35	14.800	0.01	20.800	0.00	26.800	0.00
2.900	0.00	8.900	1.33	14.900	0.01	20.900	0.00	26.900	0.00
3.000	0.00	9.000	1.31	15.000	0.00	21.000	0.00	27.000	0.00
3.100	0.00	9.100	1.30	15.100	0.00	21.100	0.00	27.100	0.00
3.200	0.00	9.200	1.29	15.200	0.00	21.200	0.00	27.200	0.00
3.300	0.00	9.300	1.28	15.300	0.00	21.300	0.00	27.300	0.00
3.400	0.00	9.400	1.27	15.400	0.00	21.400	0.00	27.400	0.00
3.500	0.01	9.500	1.18	15.500	0.00	21.500	0.00	27.500	0.00
3.600	0.01	9.600	1.06	15.600	0.00	21.600	0.00	27.600	0.00
3.700	0.02	9.700	0.94	15.700	0.00	21.700	0.00	27.700	0.00
3.800	0.03	9.800	0.86	15.800	0.00	21.800	0.00	27.800	0.00

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    ADD HYD              ID=3 HYD NO=530 ID 1=2 ID 11=6
          PEAK FLOW =          42.68 CFS          RUNOFF VOLUME =          0.777 INCHES
0          ADD HYD        ID=3     HYD NO=530      ID 1=2          ID 11=6
    COMPUTE HYD          1D=4 HYD NO=105 DT=0.100 DA=38.39
                         AA=0.0 AB=0.0
                         CN*=78.6 IA=0.185 K=0.411 TP=0.347
                         NI=120
                         RAIN CODE=-1
        SHAPE CONSTANT, N =  2.998
        UNIT PEAK =          48.68CFS

        SUM OF THE UNIT HYDROGRAPH CO-ORDINATES =       10.00
        PEAK DISCHARGE =        15.54 CFS    RUNOFF =    0.725 INCHES TIME TO PEAK =     6.100 HRS
        TOTAL RAINFALL =         1.998 INCHES RUNOFF VOLUMETRICCOEFFICIENT  0.36
    PRINT HYD            ID=4
0                                  HYDROGRAPH FROM AREA 105
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TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	15.20	12.000	1.04	18.000	0.00	24.000	0.00
0.100	0.00	6.100	15.54	12.100	0.93	18.100	0.00	24.100	0.00
0.200	0.00	6.200	14.68	12.200	0.81	18.200	0.00	24.200	0.00
0.300	0.00	6.300	13.36	12.300	0.68	18.300	0.00	24.300	0.00
0.400	0.00	6.400	12.04	12.400	0.57	18.400	0.00	24.400	0.00
0.500	0.00	6.500	10.76	12.500	0.47	18.500	0.00	24.500	0.00
0.600	0.00	6.600	9.50	12.600	0.40	18.600	0.00	24.600	0.00
0.700	0.00	6.700	8.31	12.700	0.34	18.700	0.00	24.700	0.00
0.800	0.00	6.800	7.28	12.800	0.30	18.800	0.00	24.800	0.00
0.900	0.00	6.900	6.45	12.900	0.26	18.900	0.00	24.900	0.00
1.000	0.00	7.000	5.78	13.000	0.23	19.000	0.00	25.000	0.00
1.100	0.00	7.100	5.24	13.100	0.21	19.100	0.00	25.100	0.00
1.200	0.00	7.200	4.82	13.200	0.19	19.200	0.00	25.200	0.00
1.300	0.00	7.300	4.52	13.300	0.17	19.300	0.00	25.300	0.00
1.400	0.00	7.400	4.28	13.400	0.16	19.400	0.00	25.400	0.00
1.500	0.00	7.500	4.08	13.500	0.15	19.500	0.00	25.500	0.00
1.600	0.00	7.600	3.93	13.600	0.14	19.600	0.00	25.600	0.00
1.700	0.00	7.700	3.81	13.700	0.13	19.700	0.00	25.700	0.00
1.800	0.00	7.800	3.71	13.800	0.12	19.800	0.00	25.800	0.00
1.900	0.00	7.900	3.63	13.900	0.11	19.900	0.00	25.900	0.00
2.000	0.00	8.000	3.52	14.000	0.10	20.000	0.00	26.000	0.00
2.100	0.00	8.100	3.37	14.100	0.09	20.100	0.00	26.100	0.00
2.200	0.00	8.200	3.20	14.200	0.08	20.200	0.00	26.200	0.00
2.300	0.00	8.300	3.04	14.300	0.08	20.300	0.00	26.300	0.00
2.400	0.00	8.400	2.90	14.400	0.07	20.400	0.00	26.400	0.00
2.500	0.00	8.500	2.78	14.500	0.07	20.500	0.00	26.500	0.00
2.600	0.00	8.600	2.65	14.600	0.06	20.600	0.00	26.600	0.00
2.700	0.00	8.700	2.59	14.700	0.06	20.700	0.00	26.700	0.00
2.800	0.00	8.800	2.52	14.800	0.05	20.800	0.00	26.800	0.00
2.900	0.00	8.900	2.46	14.900	0.05	20.900	0.00	26.900	0.00
3.000	0.00	9.000	2.41	15.000	0.04	21.000	0.00	27.000	0.00
3.100	0.00	9.100	2.37	15.100	0.04	21.100	0.00	27.100	0.00
3.200	0.00	9.200	2.33	15.200	0.04	21.200	0.00	27.200	0.00

	3.300	0.00	9.300	2.30	15.300	0.03	21.300	0.00	27.300	0.00
	3.400	0.00	9.400	2.27	15.400	0.03	21.400	0.00	27.400	0.00
	3.500	0.01	9.500	2.21	15.500	0.03	21.500	0.00	27.500	0.00
	3.600	0.01	9.600	2.09	15.600	0.03	21.600	0.00	27.600	0.00
	3.700	0.02	9.700	1.95	15.700	0.02	21.700	0.00	27.700	0.00
	3.800	0.03	9.800	1.81	15.800	0.02	21.800	0.00	27.800	0.00
	3.900	0.04	9.900	1.69	15.900	0.02	21.900	0.00	27.900	0.00
	4.000	0.05	10.000	1.59	16.000	0.02	22.000	0.00	28.000	0.00
	4.100	0.07	10.100	1.50	16.100	0.02	22.100	0.00	28.100	0.00
	4.200	0.10	10.200	1.44	16.200	0.02	22.200	0.00	28.200	0.00
	4.300	0.13	10.300	1.38	16.300	0.02	22.300	0.00	28.300	0.00
	4.400	0.16	10.400	1.34	16.400	0.01	22.400	0.00	28.400	0.00
	4.500	0.19	10.500	1.30	16.500	0.01	22.500	0.00	28.500	0.00
	4.600	0.24	10.600	1.27	16.600	0.01	22.600	0.00	28.600	0.00
	4.700	0.29	10.700	1.25	16.700	0.01	22.700	0.00	28.700	0.00
	4.800	0.35	10.800	1.23	16.800	0.01	22.800	0.00	28.800	0.00
	4.900	0.40	10.900	1.21	16.900	0.01	22.900	0.00	28.900	0.00
	5.000	0.48	11.000	1.19	17.000	0.01	23.000	0.00	29.000	0.00
	5.100	0.58	11.100	1.17	17.100	0.01	23.100	0.00	29.100	0.00
	5.200	0.70	11.200	1.16	17.200	0.01	23.200	0.00	29.200	0.00
	5.300	0.83	11.300	1.15	17.300	0.01	23.300	0.00	29.300	0.00
	5.400	0.95	11.400	1.13	17.400	0.01	23.400	0.00	29.400	0.00
	5.500	1.73	11.500	1.12	17.500	0.01	23.500	0.00	29.500	0.00
	5.600	3.54	11.600	1.11	17.600	0.01	23.600	0.00	29.600	0.00
	5.700	6.24	11.700	1.10	17.700	0.00	23.700	0.00	29.700	0.00
	5.800	9.49	11.800	1.09	17.800	0.00	23.800	0.00	29.800	0.00
	5.900	12.99	11.900	1.09	17.900	0.00	23.900	0.00	29.900	0.00

0 RUNOFF VOLUME = 0.725 INCHES
PEAK DISCHARGE RATE = 15.54 CFS

ADD HYD ID=5 HYD NO=540 ID 1=4 ID II=3
PEAK FLOW = 57.83 CFS RUNOFF VOLUME = 0.760 INCHES
0 ADD HYD ID=5 HYD NO=540 ID I=4 ID II=3
PRINT HYD ID=5
0 HYDROGRAPH FROM AREA 540

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	57.83	12.000	2.93	18.000	0.00	24.000	0.00
0.100	0.00	6.100	52.21	12.100	2.42	18.100	0.00	24.100	0.00
0.200	0.00	6.200	45.33	12.200	1.94	18.200	0.00	24.200	0.00
0.300	0.00	6.300	39.48	12.300	1.55	18.300	0.00	24.300	0.00
0.400	0.00	6.400	35.15	12.400	1.24	18.400	0.00	24.400	0.00
0.500	0.00	6.500	30.62	12.500	1.02	18.500	0.00	24.500	0.00
0.600	0.00	6.600	26.34	12.600	0.85	18.600	0.00	24.600	0.00
0.700	0.00	6.700	22.84	12.700	0.72	18.700	0.00	24.700	0.00
0.800	0.00	6.800	20.21	12.800	0.63	18.800	0.00	24.800	0.00
0.900	0.00	6.900	18.30	12.900	0.55	18.900	0.00	24.900	0.00
1.000	0.00	7.000	16.66	13.000	0.49	19.000	0.00	25.000	0.00
1.100	0.00	7.100	15.24	13.100	0.44	19.100	0.00	25.100	0.00
1.200	0.00	7.200	14.10	13.200	0.39	19.200	0.00	25.200	0.00
1.300	0.00	7.300	13.25	13.300	0.35	19.300	0.00	25.300	0.00

1.400	0.00	7.400	12.59	13.400	0.32	19.400	0.00	25.400	0.00
1.500	0.00	7.500	12.08	13.500	0.29	19.500	0.00	25.500	0.00
1.600	0.00	7.600	11.67	13.600	0.26	19.600	0.00	25.600	0.00
1.700	0.00	7.700	11.33	13.700	0.24	19.700	0.00	25.700	0.00
1.800	0.00	7.800	11.06	13.800	0.22	19.800	0.00	25.800	0.00
1.900	0.00	7.900	10.84	13.900	0.20	19.900	0.00	25.900	0.00
2.000	0.00	8.000	10.33	14.000	0.18	20.000	0.00	26.000	0.00
2.100	0.00	8.100	9.70	14.100	0.16	20.100	0.00	26.100	0.00
2.200	0.00	8.200	9.10	14.200	0.15	20.200	0.00	26.200	0.00
2.300	0.00	8.300	8.60	14.300	0.13	20.300	0.00	26.300	0.00
2.400	0.00	8.400	8.21	14.400	0.12	20.400	0.00	26.400	0.00
2.500	0.00	8.500	7.89	14.500	0.11	20.500	0.00	26.500	0.00
2.600	0.00	8.600	7.65	14.600	0.10	20.600	0.00	26.600	0.00
2.700	0.00	8.700	7.45	14.700	0.09	20.700	0.00	26.700	0.00
2.800	0.00	8.800	7.29	14.800	0.08	20.800	0.00	26.800	0.00
2.900	0.00	8.900	7.15	14.900	0.08	20.900	0.00	26.900	0.00
3.000	0.00	9.000	7.04	15.000	0.07	21.000	0.00	27.000	0.00
3.100	0.00	9.100	6.94	15.100	0.06	21.100	0.00	27.100	0.00
3.200	0.00	9.200	6.86	15.200	0.06	21.200	0.00	27.200	0.00
3.300	0.00	9.300	6.79	15.300	0.05	21.300	0.00	27.300	0.00
3.400	0.01	9.400	6.73	15.400	0.05	21.400	0.00	27.400	0.00
3.500	0.04	9.500	6.35	15.500	0.04	21.500	0.00	27.500	0.00
3.600	0.07	9.600	5.82	15.600	0.04	21.600	0.00	27.600	0.00
3.700	0.10	9.700	5.32	15.700	0.04	21.700	0.00	27.700	0.00
3.800	0.15	9.800	4.90	15.800	0.03	21.800	0.00	27.800	0.00
3.900	0.19	9.900	4.58	15.900	0.03	21.900	0.00	27.900	0.00
4.000	0.27	10.000	4.33	16.000	0.03	22.000	0.00	28.000	0.00
4.100	0.37	10.100	4.14	16.100	0.03	22.100	0.00	28.100	0.00
4.200	0.48	10.200	4.00	16.200	0.02	22.200	0.00	28.200	0.00
4.300	0.59	10.300	3.88	16.300	0.02	22.300	0.00	28.300	0.00
4.400	0.70	10.400	3.79	16.400	0.02	22.400	0.00	28.400	0.00
4.500	0.87	10.500	3.71	16.500	0.02	22.500	0.00	28.500	0.00
4.600	1.07	10.600	3.65	16.600	0.02	22.600	0.00	28.600	0.00
4.700	1.28	10.700	3.59	16.700	0.01	22.700	0.00	28.700	0.00
4.800	1.49	10.800	3.55	16.800	0.01	22.800	0.00	28.800	0.00
4.900	1.69	10.900	3.50	16.900	0.01	22.900	0.00	28.900	0.00
5.000	2.06	11.000	3.47	17.000	0.01	23.000	0.00	29.000	0.00
5.100	2.52	11.100	3.43	17.100	0.01	23.100	0.00	29.100	0.00
5.200	3.00	11.200	3.40	17.200	0.01	23.200	0.00	29.200	0.00
5.300	3.46	11.300	3.37	17.300	0.01	23.300	0.00	29.300	0.00
5.400	3.90	11.400	3.35	17.400	0.01	23.400	0.00	29.400	0.00
5.500	9.83	11.500	3.33	17.500	0.01	23.500	0.00	29.500	0.00
5.600	20.10	11.600	3.31	17.600	0.01	23.600	0.00	29.600	0.00
5.700	32.20	11.700	3.29	17.700	0.01	23.700	0.00	29.700	0.00
5.800	44.64	11.800	3.28	17.800	0.01	23.800	0.00	29.800	0.00
5.900	56.68	11.900	3.26	17.900	0.00	23.900	0.00	29.900	0.00

0 RUNOFF VOLUME = 0.760 INCHES
PEAK DISCHARGE RATE = 57.80 CFS

FINISH

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**                                                                              **
**       U N I V E R S I T Y   O F   O T T A W A   H Y D R O L O G I C   M O D E L **
**                                                                              **
**                        O T T H Y M O   ( V E R S I O N   1 . 0 )             **
**                                                                              **
**                              N O V E M B E R   1 9 8 2                       **
**                                                                              **
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THIS MODEL IS THE UNIVERSITY OF OTTAWA VERSION OF THE HYDROLOGIC MODEL (HYMO) DEVELOPED BY J. R. WILLIAMS AND R. W. HANN (1973) OF THE U.S. DEPT. OF AGRICULTURE. IT HAS THREE NEW SUBROUTINES, URBHYD, KINRTE, AND NASHYD, AND HAS BEEN MODIFIED SUCH THAT IT CAN BE USED IN BOTH ENGLISH AND METRIC UNITS.

THE MODEL WAS DEVELOPED IN THE FRAME OF THE IMPSWM (IMPLEMENTATION OF STORMWATER MANAGEMENT) PROGRAM AT THE DEPARTMENT OF CIVIL ENGINEERING, UNIVERSITY OF OTTAWA. THE DOCUMENTATION FOR THE MODEL CAN BE FOUND IN THE IMPSWM URBAN DRAINAGE MODELLING PROCEDURES (1982).

THE DETAILS ABOUT THE COPYRIGHT AND DISCLAIMER CAN BE FOUND BETWEEN LINES 22 AND 44 IN THE LISTING. THE USER AGREES TO RESPECT THE COPYRIGHT AND THE DISCLAIMER.

THE ENGLISH UNITS OPTION HAS BEEN SPECIFIED

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*
*   KANATA SOUTH INDUSTRIAL PARK
*     PREDEVELOPMENT FLOWS
*    100 YR  12 HR SCS TYPE
*      STORM DISTRIBUTION
*
START                   RAINFALL STARTS AT 0.0 HRS
COMPUTE HYD             ID=1 HYD NO=100 DT=0.100 DA=5.48
                        AA=0.0 AB=0.0
                        CN#=93 IA=0.185 K=0.224 TP=0.189
                        N1=120
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RAINFALL HYETOGRAPH

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SHAPE CONSTANT, N = 2.996
UNIT PEAK = 12.75CFS

SUM OF THE UNIT HYDROGRAPH CO-ORDINATES = 9.96
PEAK DISCHARGE = 10.45 CFS RUNOFF = 2.313 INCHES TIME TO PEAK = 5.900 HRS
TOTAL RAINFALL = 3.104 INCHES RUNOFF VOLUMETRICCOEFFICIENT 0.75

PRINT HYD ID=1

HYDROGRAPH FROM AREA 100

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	9.40	12.000	0.28	18.000	0.00	24.000	0.00
0.100	0.00	6.100	7.35	12.100	0.20	18.100	0.00	24.100	0.00
0.200	0.00	6.200	5.69	12.200	0.14	18.200	0.00	24.200	0.00
0.300	0.00	6.300	4.68	12.300	0.10	18.300	0.00	24.300	0.00
0.400	0.00	6.400	4.08	12.400	0.08	18.400	0.00	24.400	0.00
0.500	0.00	6.500	3.48	12.500	0.06	18.500	0.00	24.500	0.00
0.600	0.00	6.600	2.93	12.600	0.05	18.600	0.00	24.600	0.00
0.700	0.00	6.700	2.55	12.700	0.04	18.700	0.00	24.700	0.00
0.800	0.00	6.800	2.29	12.800	0.04	18.800	0.00	24.800	0.00
0.900	0.00	6.900	2.10	12.900	0.03	18.900	0.00	24.900	0.00
1.000	0.00	7.000	1.91	13.000	0.03	19.000	0.00	25.000	0.00
1.100	0.00	7.100	1.73	13.100	0.02	19.100	0.00	25.100	0.00
1.200	0.00	7.200	1.60	13.200	0.02	19.200	0.00	25.200	0.00
1.300	0.00	7.300	1.49	13.300	0.02	19.300	0.00	25.300	0.00
1.400	0.00	7.400	1.41	13.400	0.02	19.400	0.00	25.400	0.00
1.500	0.00	7.500	1.34	13.500	0.01	19.500	0.00	25.500	0.00
1.600	0.00	7.600	1.29	13.600	0.01	19.600	0.00	25.600	0.00
1.700	0.00	7.700	1.25	13.700	0.01	19.700	0.00	25.700	0.00

1.800	0.00	7.800	1.21	13.800	0.01	19.800	0.00	25.800	0.00
1.900	0.00	7.900	1.18	13.900	0.01	19.900	0.00	25.900	0.00
2.000	0.00	8.000	1.09	14.000	0.01	20.000	0.00	26.000	0.00
2.100	0.00	8.100	1.00	14.100	0.01	20.100	0.00	26.100	0.00
2.200	0.00	8.200	0.92	14.200	0.00	20.200	0.00	26.200	0.00
2.300	0.00	8.300	0.86	14.300	0.00	20.300	0.00	26.300	0.00
2.400	0.00	8.400	0.82	14.400	0.00	20.400	0.00	26.400	0.00
2.500	0.00	8.500	0.79	14.500	0.00	20.500	0.00	26.500	0.00
2.600	0.01	8.600	0.77	14.600	0.00	20.600	0.00	26.600	0.00
2.700	0.02	8.700	0.76	14.700	0.00	20.700	0.00	26.700	0.00
2.800	0.03	8.800	0.74	14.800	0.00	20.800	0.00	26.800	0.00
2.900	0.05	8.900	0.73	14.900	0.00	20.900	0.00	26.900	0.00
3.000	0.06	9.000	0.72	15.000	0.00	21.000	0.00	27.000	0.00
3.100	0.08	9.100	0.71	15.100	0.00	21.100	0.00	27.100	0.00
3.200	0.09	9.200	0.70	15.200	0.00	21.200	0.00	27.200	0.00
3.300	0.11	9.300	0.69	15.300	0.00	21.300	0.00	27.300	0.00
3.400	0.12	9.400	0.69	15.400	0.00	21.400	0.00	27.400	0.00
3.500	0.14	9.500	0.63	15.500	0.00	21.500	0.00	27.500	0.00
3.600	0.15	9.600	0.55	15.600	0.00	21.600	0.00	27.600	0.00
3.700	0.17	9.700	0.49	15.700	0.00	21.700	0.00	27.700	0.00
3.800	0.18	9.800	0.45	15.800	0.00	21.800	0.00	27.800	0.00
3.900	0.19	9.900	0.42	15.900	0.00	21.900	0.00	27.900	0.00
4.000	0.23	10.000	0.40	16.000	0.00	22.000	0.00	28.000	0.00
4.100	0.27	10.100	0.39	16.100	0.00	22.100	0.00	28.100	0.00
4.200	0.31	10.200	0.38	16.200	0.00	22.200	0.00	28.200	0.00
4.300	0.34	10.300	0.37	16.300	0.00	22.300	0.00	28.300	0.00
4.400	0.37	10.400	0.37	16.400	0.00	22.400	0.00	28.400	0.00
4.500	0.43	10.500	0.36	16.500	0.00	22.500	0.00	28.500	0.00
4.600	0.49	10.600	0.36	16.600	0.00	22.600	0.00	28.600	0.00
4.700	0.55	10.700	0.35	16.700	0.00	22.700	0.00	28.700	0.00
4.800	0.60	10.800	0.35	16.800	0.00	22.800	0.00	28.800	0.00
4.900	0.64	10.900	0.35	16.900	0.00	22.900	0.00	28.900	0.00
5.000	0.74	11.000	0.34	17.000	0.00	23.000	0.00	29.000	0.00
5.100	0.87	11.100	0.34	17.100	0.00	23.100	0.00	29.100	0.00
5.200	0.98	11.200	0.34	17.200	0.00	23.200	0.00	29.200	0.00
5.300	1.07	11.300	0.34	17.300	0.00	23.300	0.00	29.300	0.00
5.400	1.14	11.400	0.34	17.400	0.00	23.400	0.00	29.400	0.00
5.500	2.86	11.500	0.34	17.500	0.00	23.500	0.00	29.500	0.00
5.600	5.40	11.600	0.33	17.600	0.00	23.600	0.00	29.600	0.00
5.700	7.62	11.700	0.33	17.700	0.00	23.700	0.00	29.700	0.00
5.800	9.26	11.800	0.33	17.800	0.00	23.800	0.00	29.800	0.00
5.900	10.45	11.900	0.33	17.900	0.00	23.900	0.00	29.900	0.00

RUNOFF VOLUME = 2.313 INCHES
PEAK DISCHARGE RATE = 10.45 CFS

COMPUTE HYD ID=2 HYD NO=101 DT=0.100 DA=2.38
AA=0.0 AB=0.0
CN*=93 IA=0.185 K=0.141 TP=0.119
NI=120
RAIN CODE=-1
SHAPE CONSTANT, N = 2.996
UNIT PEAK = 8.80CFS

SUM OF THE UNIT HYDROGRAPH CO-ORDINATES = 9.78
PEAK DISCHARGE = 5.12 CFS RUNOFF = 2.270 INCHES TIME TO PEAK = 5.900 HRS
TOTAL RAINFALL = 3.104 INCHES RUNOFF VOLUMETRICCOEFFICIENT 0.73

PRINT HYD ID=2

HYDROGRAPH FROM AREA 101

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	3.60	12.000	0.09	18.000	0.00	24.000	0.00
0.100	0.00	6.100	2.45	12.100	0.05	18.100	0.00	24.100	0.00
0.200	0.00	6.200	1.92	12.200	0.03	18.200	0.00	24.200	0.00
0.300	0.00	6.300	1.69	12.300	0.02	18.300	0.00	24.300	0.00
0.400	0.00	6.400	1.60	12.400	0.02	18.400	0.00	24.400	0.00
0.500	0.00	6.500	1.27	12.500	0.01	18.500	0.00	24.500	0.00
0.600	0.00	6.600	1.03	12.600	0.01	18.600	0.00	24.600	0.00
0.700	0.00	6.700	0.89	12.700	0.01	18.700	0.00	24.700	0.00
0.800	0.00	6.800	0.80	12.800	0.01	18.800	0.00	24.800	0.00
0.900	0.00	6.900	0.75	12.900	0.01	18.900	0.00	24.900	0.00
1.000	0.00	7.000	0.66	13.000	0.00	19.000	0.00	25.000	0.00
1.100	0.00	7.100	0.59	13.100	0.00	19.100	0.00	25.100	0.00
1.200	0.00	7.200	0.54	13.200	0.00	19.200	0.00	25.200	0.00
1.300	0.00	7.300	0.51	13.300	0.00	19.300	0.00	25.300	0.00
1.400	0.00	7.400	0.49	13.400	0.00	19.400	0.00	25.400	0.00
1.500	0.00	7.500	0.48	13.500	0.00	19.500	0.00	25.500	0.00
1.600	0.00	7.600	0.46	13.600	0.00	19.600	0.00	25.600	0.00
1.700	0.00	7.700	0.45	13.700	0.00	19.700	0.00	25.700	0.00
1.800	0.00	7.800	0.44	13.800	0.00	19.800	0.00	25.800	0.00
1.900	0.00	7.900	0.44	13.900	0.00	19.900	0.00	25.900	0.00
2.000	0.00	8.000	0.38	14.000	0.00	20.000	0.00	26.000	0.00
2.100	0.00	8.100	0.34	14.100	0.00	20.100	0.00	26.100	0.00
2.200	0.00	8.200	0.32	14.200	0.00	20.200	0.00	26.200	0.00
2.300	0.00	8.300	0.31	14.300	0.00	20.300	0.00	26.300	0.00
2.400	0.00	8.400	0.30	14.400	0.00	20.400	0.00	26.400	0.00
2.500	0.00	8.500	0.30	14.500	0.00	20.500	0.00	26.500	0.00
2.600	0.01	8.600	0.29	14.600	0.00	20.600	0.00	26.600	0.00
2.700	0.01	8.700	0.29	14.700	0.00	20.700	0.00	26.700	0.00
2.800	0.02	8.800	0.29	14.800	0.00	20.800	0.00	26.800	0.00
2.900	0.03	8.900	0.29	14.900	0.00	20.900	0.00	26.900	0.00
3.000	0.03	9.000	0.28	15.000	0.00	21.000	0.00	27.000	0.00
3.100	0.04	9.100	0.28	15.100	0.00	21.100	0.00	27.100	0.00
3.200	0.05	9.200	0.28	15.200	0.00	21.200	0.00	27.200	0.00
3.300	0.05	9.300	0.28	15.300	0.00	21.300	0.00	27.300	0.00
3.400	0.06	9.400	0.28	15.400	0.00	21.400	0.00	27.400	0.00
3.500	0.07	9.500	0.23	15.500	0.00	21.500	0.00	27.500	0.00
3.600	0.07	9.600	0.19	15.600	0.00	21.600	0.00	27.600	0.00
3.700	0.08	9.700	0.17	15.700	0.00	21.700	0.00	27.700	0.00
3.800	0.09	9.800	0.16	15.800	0.00	21.800	0.00	27.800	0.00
3.900	0.09	9.900	0.16	15.900	0.00	21.900	0.00	27.900	0.00
4.000	0.12	10.000	0.15	16.000	0.00	22.000	0.00	28.000	0.00
4.100	0.14	10.100	0.15	16.100	0.00	22.100	0.00	28.100	0.00
4.200	0.15	10.200	0.15	16.200	0.00	22.200	0.00	28.200	0.00
4.300	0.17	10.300	0.15	16.300	0.00	22.300	0.00	28.300	0.00
4.400	0.18	10.400	0.15	16.400	0.00	22.400	0.00	28.400	0.00

4.500	0.21	10.500	0.14	16.500	0.00	22.500	0.00	28.500	0.00
4.600	0.24	10.600	0.14	16.600	0.00	22.600	0.00	28.600	0.00
4.700	0.27	10.700	0.14	16.700	0.00	22.700	0.00	28.700	0.00
4.800	0.28	10.800	0.14	16.800	0.00	22.800	0.00	28.800	0.00
4.900	0.30	10.900	0.14	16.900	0.00	22.900	0.00	28.900	0.00
5.000	0.37	11.000	0.14	17.000	0.00	23.000	0.00	29.000	0.00
5.100	0.44	11.100	0.14	17.100	0.00	23.100	0.00	29.100	0.00
5.200	0.48	11.200	0.14	17.200	0.00	23.200	0.00	29.200	0.00
5.300	0.51	11.300	0.14	17.300	0.00	23.300	0.00	29.300	0.00
5.400	0.53	11.400	0.14	17.400	0.00	23.400	0.00	29.400	0.00
5.500	2.10	11.500	0.14	17.500	0.00	23.500	0.00	29.500	0.00
5.600	3.45	11.600	0.14	17.600	0.00	23.600	0.00	29.600	0.00
5.700	4.38	11.700	0.14	17.700	0.00	23.700	0.00	29.700	0.00
5.800	4.79	11.800	0.14	17.800	0.00	23.800	0.00	29.800	0.00
5.900	5.12	11.900	0.14	17.900	0.00	23.900	0.00	29.900	0.00

RUNOFF VOLUME = 2.270 INCHES
PEAK DISCHARGE RATE = 5.12 CFS

ADD HYD ID=3 HYD NO=500 ID I=1 ID II=2
PEAK FLOW = 15.57 CFS RUNOFF VOLUME = 2.300 INCHES
ADD HYD ID=3 HYD NO=500 ID I=1 ID II=2

COMPUTE HYD ID=4 HYD NO=102 DT=0.100 DA=5.85
AA=0.0 AB=0.0
CN=78.6 IA=0.185 K=0.143 TP=0.121
NI=120
RAIN CODE=-1
SHAPE CONSTANT, N = 3.004
UNIT PEAK = 21.31CFS

SUM OF THE UNIT HYDROGRAPH CO-ORDINATES = 9.79
PEAK DISCHARGE = 8.31 CFS RUNOFF = 1.479 INCHES TIME TO PEAK = 5.900 HRS
TOTAL RAINFALL = 3.104 INCHES RUNOFF VOLUMETRICCOEFFICIENT 0.48

PRINT HYD ID=4

HYDROGRAPH FROM AREA 102

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	5.99	12.000	0.18	18.000	0.00	24.000	0.00
0.100	0.00	6.100	4.12	12.100	0.10	18.100	0.00	24.100	0.00
0.200	0.00	6.200	3.26	12.200	0.06	18.200	0.00	24.200	0.00
0.300	0.00	6.300	2.90	12.300	0.05	18.300	0.00	24.300	0.00
0.400	0.00	6.400	2.77	12.400	0.04	18.400	0.00	24.400	0.00
0.500	0.00	6.500	2.23	12.500	0.03	18.500	0.00	24.500	0.00
0.600	0.00	6.600	1.80	12.600	0.02	18.600	0.00	24.600	0.00
0.700	0.00	6.700	1.57	12.700	0.02	18.700	0.00	24.700	0.00
0.800	0.00	6.800	1.43	12.800	0.01	18.800	0.00	24.800	0.00
0.900	0.00	6.900	1.35	12.900	0.01	18.900	0.00	24.900	0.00
1.000	0.00	7.000	1.19	13.000	0.01	19.000	0.00	25.000	0.00
1.100	0.00	7.100	1.07	13.100	0.01	19.100	0.00	25.100	0.00
1.200	0.00	7.200	1.00	13.200	0.01	19.200	0.00	25.200	0.00
1.300	0.00	7.300	0.95	13.300	0.00	19.300	0.00	25.300	0.00
1.400	0.00	7.400	0.91	13.400	0.00	19.400	0.00	25.400	0.00

1.500	0.00	7.500	0.89	13.500	0.00	19.500	0.00	25.500	0.00
1.600	0.00	7.600	0.87	13.600	0.00	19.600	0.00	25.600	0.00
1.700	0.00	7.700	0.85	13.700	0.00	19.700	0.00	25.700	0.00
1.800	0.00	7.800	0.84	13.800	0.00	19.800	0.00	25.800	0.00
1.900	0.00	7.900	0.83	13.900	0.00	19.900	0.00	25.900	0.00
2.000	0.00	8.000	0.73	14.000	0.00	20.000	0.00	26.000	0.00
2.100	0.00	8.100	0.65	14.100	0.00	20.100	0.00	26.100	0.00
2.200	0.00	8.200	0.61	14.200	0.00	20.200	0.00	26.200	0.00
2.300	0.00	8.300	0.59	14.300	0.00	20.300	0.00	26.300	0.00
2.400	0.00	8.400	0.58	14.400	0.00	20.400	0.00	26.400	0.00
2.500	0.00	8.500	0.57	14.500	0.00	20.500	0.00	26.500	0.00
2.600	0.00	8.600	0.56	14.600	0.00	20.600	0.00	26.600	0.00
2.700	0.01	8.700	0.56	14.700	0.00	20.700	0.00	26.700	0.00
2.800	0.01	8.800	0.55	14.800	0.00	20.800	0.00	26.800	0.00
2.900	0.02	8.900	0.55	14.900	0.00	20.900	0.00	26.900	0.00
3.000	0.03	9.000	0.55	15.000	0.00	21.000	0.00	27.000	0.00
3.100	0.03	9.100	0.55	15.100	0.00	21.100	0.00	27.100	0.00
3.200	0.04	9.200	0.54	15.200	0.00	21.200	0.00	27.200	0.00
3.300	0.04	9.300	0.54	15.300	0.00	21.300	0.00	27.300	0.00
3.400	0.05	9.400	0.54	15.400	0.00	21.400	0.00	27.400	0.00
3.500	0.05	9.500	0.45	15.500	0.00	21.500	0.00	27.500	0.00
3.600	0.06	9.600	0.37	15.600	0.00	21.600	0.00	27.600	0.00
3.700	0.06	9.700	0.34	15.700	0.00	21.700	0.00	27.700	0.00
3.800	0.07	9.800	0.32	15.800	0.00	21.800	0.00	27.800	0.00
3.900	0.08	9.900	0.31	15.900	0.00	21.900	0.00	27.900	0.00
4.000	0.10	10.000	0.30	16.000	0.00	22.000	0.00	28.000	0.00
4.100	0.12	10.100	0.29	16.100	0.00	22.100	0.00	28.100	0.00
4.200	0.13	10.200	0.29	16.200	0.00	22.200	0.00	28.200	0.00
4.300	0.15	10.300	0.29	16.300	0.00	22.300	0.00	28.300	0.00
4.400	0.16	10.400	0.28	16.400	0.00	22.400	0.00	28.400	0.00
4.500	0.20	10.500	0.28	16.500	0.00	22.500	0.00	28.500	0.00
4.600	0.23	10.600	0.28	16.600	0.00	22.600	0.00	28.600	0.00
4.700	0.25	10.700	0.28	16.700	0.00	22.700	0.00	28.700	0.00
4.800	0.28	10.800	0.28	16.800	0.00	22.800	0.00	28.800	0.00
4.900	0.30	10.900	0.28	16.900	0.00	22.900	0.00	28.900	0.00
5.000	0.38	11.000	0.28	17.000	0.00	23.000	0.00	29.000	0.00
5.100	0.46	11.100	0.28	17.100	0.00	23.100	0.00	29.100	0.00
5.200	0.51	11.200	0.28	17.200	0.00	23.200	0.00	29.200	0.00
5.300	0.56	11.300	0.27	17.300	0.00	23.300	0.00	29.300	0.00
5.400	0.60	11.400	0.27	17.400	0.00	23.400	0.00	29.400	0.00
5.500	2.55	11.500	0.27	17.500	0.00	23.500	0.00	29.500	0.00
5.600	4.56	11.600	0.27	17.600	0.00	23.600	0.00	29.600	0.00
5.700	6.11	11.700	0.27	17.700	0.00	23.700	0.00	29.700	0.00
5.800	7.33	11.800	0.27	17.800	0.00	23.800	0.00	29.800	0.00
5.900	8.31	11.900	0.28	17.900	0.00	23.900	0.00	29.900	0.00

RUNOFF VOLUME = 1.479 INCHES
PEAK DISCHARGE RATE = 8.31 CFS

ADD HYD ID=5 HYD NO=510 ID I=4 ID II=3
PEAK FLOW = 23.98 CFS RUNOFF VOLUME = 1.950 INCHES
ADD HYD ID=5 HYD NO=510 ID I=4 ID II=3
COMPUTE HYD ID=1 HYD NO=103 DT=0.100 DA=23.89

AA=0.0 AB=0.0
CN*=78.6 IA=0.185 K=0.255 TP=0.216
NT=120
RAIN CODE=-1
SHAPE CONSTANT, N = 3.007
UNIT PEAK = 48.79CFS

SUM OF THE UNIT HYDROGRAPH CO-ORDINATES = 9.98
PEAK DISCHARGE = 26.79 CFS RUNOFF = 1.507 INCHES TIME TO PEAK = 5.900 HRS
TOTAL RAINFALL = 3.104 INCHES RUNOFF VOLUMETRICCOEFFICIENT 0.49
PRINT HYD ID=1

HYDROGRAPH FROM AREA 103

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	26.25	12.000	1.02	18.000	0.00	24.000	0.00
0.100	0.00	6.100	22.08	12.100	0.78	18.100	0.00	24.100	0.00
0.200	0.00	6.200	17.83	12.200	0.58	18.200	0.00	24.200	0.00
0.300	0.00	6.300	14.82	12.300	0.43	18.300	0.00	24.300	0.00
0.400	0.00	6.400	12.91	12.400	0.33	18.400	0.00	24.400	0.00
0.500	0.00	6.500	11.08	12.500	0.26	18.500	0.00	24.500	0.00
0.600	0.00	6.600	9.36	12.600	0.22	18.600	0.00	24.600	0.00
0.700	0.00	6.700	8.10	12.700	0.18	18.700	0.00	24.700	0.00
0.800	0.00	6.800	7.29	12.800	0.16	18.800	0.00	24.800	0.00
0.900	0.00	6.900	6.71	12.900	0.14	18.900	0.00	24.900	0.00
1.000	0.00	7.000	6.16	13.000	0.12	19.000	0.00	25.000	0.00
1.100	0.00	7.100	5.64	13.100	0.11	19.100	0.00	25.100	0.00
1.200	0.00	7.200	5.22	13.200	0.10	19.200	0.00	25.200	0.00
1.300	0.00	7.300	4.91	13.300	0.08	19.300	0.00	25.300	0.00
1.400	0.00	7.400	4.67	13.400	0.07	19.400	0.00	25.400	0.00
1.500	0.00	7.500	4.47	13.500	0.06	19.500	0.00	25.500	0.00
1.600	0.00	7.600	4.32	13.600	0.06	19.600	0.00	25.600	0.00
1.700	0.00	7.700	4.19	13.700	0.05	19.700	0.00	25.700	0.00
1.800	0.00	7.800	4.08	13.800	0.04	19.800	0.00	25.800	0.00
1.900	0.00	7.900	3.98	13.900	0.04	19.900	0.00	25.900	0.00
2.000	0.00	8.000	3.75	14.000	0.03	20.000	0.00	26.000	0.00
2.100	0.00	8.100	3.47	14.100	0.03	20.100	0.00	26.100	0.00
2.200	0.00	8.200	3.21	14.200	0.03	20.200	0.00	26.200	0.00
2.300	0.00	8.300	3.02	14.300	0.02	20.300	0.00	26.300	0.00
2.400	0.00	8.400	2.87	14.400	0.02	20.400	0.00	26.400	0.00
2.500	0.00	8.500	2.77	14.500	0.02	20.500	0.00	26.500	0.00
2.600	0.01	8.600	2.69	14.600	0.02	20.600	0.00	26.600	0.00
2.700	0.02	8.700	2.63	14.700	0.01	20.700	0.00	26.700	0.00
2.800	0.04	8.800	2.58	14.800	0.01	20.800	0.00	26.800	0.00
2.900	0.05	8.900	2.54	14.900	0.01	20.900	0.00	26.900	0.00
3.000	0.07	9.000	2.50	15.000	0.01	21.000	0.00	27.000	0.00
3.100	0.09	9.100	2.47	15.100	0.01	21.100	0.00	27.100	0.00
3.200	0.12	9.200	2.44	15.200	0.01	21.200	0.00	27.200	0.00
3.300	0.14	9.300	2.42	15.300	0.01	21.300	0.00	27.300	0.00
3.400	0.16	9.400	2.40	15.400	0.01	21.400	0.00	27.400	0.00
3.500	0.18	9.500	2.24	15.500	0.00	21.500	0.00	27.500	0.00
3.600	0.20	9.600	2.00	15.600	0.00	21.600	0.00	27.600	0.00
3.700	0.23	9.700	1.78	15.700	0.00	21.700	0.00	27.700	0.00
3.800	0.25	9.800	1.63	15.800	0.00	21.800	0.00	27.800	0.00

3.900	0.27	9.900	1.52	15.900	0.00	21.900	0.00	27.900	0.00
4.000	0.32	10.000	1.45	16.000	0.00	22.000	0.00	28.000	0.00
4.100	0.38	10.100	1.39	16.100	0.00	22.100	0.00	28.100	0.00
4.200	0.45	10.200	1.36	16.200	0.00	22.200	0.00	28.200	0.00
4.300	0.51	10.300	1.33	16.300	0.00	22.300	0.00	28.300	0.00
4.400	0.56	10.400	1.31	16.400	0.00	22.400	0.00	28.400	0.00
4.500	0.65	10.500	1.29	16.500	0.00	22.500	0.00	28.500	0.00
4.600	0.76	10.600	1.27	16.600	0.00	22.600	0.00	28.600	0.00
4.700	0.87	10.700	1.25	16.700	0.00	22.700	0.00	28.700	0.00
4.800	0.97	10.800	1.24	16.800	0.00	22.800	0.00	28.800	0.00
4.900	1.06	10.900	1.23	16.900	0.00	22.900	0.00	28.900	0.00
5.000	1.24	11.000	1.21	17.000	0.00	23.000	0.00	29.000	0.00
5.100	1.46	11.100	1.21	17.100	0.00	23.100	0.00	29.100	0.00
5.200	1.73	11.200	1.20	17.200	0.00	23.200	0.00	29.200	0.00
5.300	1.94	11.300	1.19	17.300	0.00	23.300	0.00	29.300	0.00
5.400	2.12	11.400	1.18	17.400	0.00	23.400	0.00	29.400	0.00
5.500	5.14	11.500	1.18	17.500	0.00	23.500	0.00	29.500	0.00
5.600	10.56	11.600	1.18	17.600	0.00	23.600	0.00	29.600	0.00
5.700	16.52	11.700	1.17	17.700	0.00	23.700	0.00	29.700	0.00
5.800	21.98	11.800	1.17	17.800	0.00	23.800	0.00	29.800	0.00
5.900	26.79	11.900	1.17	17.900	0.00	23.900	0.00	29.900	0.00

RUNOFF VOLUME = 1.507 INCHES
PEAK DISCHARGE RATE = 26.79 CFS

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ADD HYD              ID=6 HYD NO=520 ID I=1 ID II=5
      PEAK FLOW =          50.67 CFS          RUNOFF VOLUME =          1.668 INCHES
        ADD HYD       ID=6     HYD NO=520     ID I=1          ID II=5
COMPUTE HYD          ID=2 HYD NO=104 DT=0.100 DA=41.5
                     AA=0.0 AB=0.0
                     CN*=78.6 IA=0.185 K=0.317 TP=0.268
                     NI=120
                     RAIN CODE=-1
    SHAPE CONSTANT, N =  3.001
    UNIT PEAK =       68.21CFS

    SUM OF THE UNIT HYDROGRAPH CO-ORDINATES =       9.99
    PEAK DISCHARGE =      42.05 CFS   RUNOFF =   1.509 INCHES TIME TO PEAK =     6.000 HRS
    TOTAL RAINFALL =       3.104 INCHES RUNOFF VOLUMETRICCOEFFICIENT  0.49
PRINT HYD            ID=2
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HYDROGRAPH FROM AREA 104

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	42.05	12.000	1.91	18.000	0.00	24.000	0.00
0.100	0.00	6.100	38.67	12.100	1.61	18.100	0.00	24.100	0.00
0.200	0.00	6.200	33.31	12.200	1.28	18.200	0.00	24.200	0.00
0.300	0.00	6.300	28.38	12.300	1.00	18.300	0.00	24.300	0.00
0.400	0.00	6.400	24.70	12.400	0.79	18.400	0.00	24.400	0.00
0.500	0.00	6.500	21.34	12.500	0.64	18.500	0.00	24.500	0.00
0.600	0.00	6.600	18.19	12.600	0.53	18.600	0.00	24.600	0.00
0.700	0.00	6.700	15.56	12.700	0.45	18.700	0.00	24.700	0.00
0.800	0.00	6.800	13.62	12.800	0.39	18.800	0.00	24.800	0.00

0.900	0.00	6.900	12.34	12.900	0.34	18.900	0.00	24.900	0.00
1.000	0.00	7.000	11.39	13.000	0.31	19.000	0.00	25.000	0.00
1.100	0.00	7.100	10.50	13.100	0.28	19.100	0.00	25.100	0.00
1.200	0.00	7.200	9.73	13.200	0.25	19.200	0.00	25.200	0.00
1.300	0.00	7.300	9.12	13.300	0.22	19.300	0.00	25.300	0.00
1.400	0.00	7.400	8.65	13.400	0.20	19.400	0.00	25.400	0.00
1.500	0.00	7.500	8.29	13.500	0.18	19.500	0.00	25.500	0.00
1.600	0.00	7.600	7.99	13.600	0.16	19.600	0.00	25.600	0.00
1.700	0.00	7.700	7.74	13.700	0.15	19.700	0.00	25.700	0.00
1.800	0.00	7.800	7.52	13.800	0.13	19.800	0.00	25.800	0.00
1.900	0.00	7.900	7.34	13.900	0.12	19.900	0.00	25.900	0.00
2.000	0.00	8.000	7.04	14.000	0.11	20.000	0.00	26.000	0.00
2.100	0.00	8.100	6.61	14.100	0.10	20.100	0.00	26.100	0.00
2.200	0.00	8.200	6.18	14.200	0.09	20.200	0.00	26.200	0.00
2.300	0.00	8.300	5.80	14.300	0.08	20.300	0.00	26.300	0.00
2.400	0.00	8.400	5.51	14.400	0.07	20.400	0.00	26.400	0.00
2.500	0.00	8.500	5.28	14.500	0.06	20.500	0.00	26.500	0.00
2.600	0.01	8.600	5.09	14.600	0.06	20.600	0.00	26.600	0.00
2.700	0.03	8.700	4.94	14.700	0.05	20.700	0.00	26.700	0.00
2.800	0.05	8.800	4.82	14.800	0.05	20.800	0.00	26.800	0.00
2.900	0.07	8.900	4.73	14.900	0.04	20.900	0.00	26.900	0.00
3.000	0.11	9.000	4.64	15.000	0.04	21.000	0.00	27.000	0.00
3.100	0.14	9.100	4.57	15.100	0.03	21.100	0.00	27.100	0.00
3.200	0.17	9.200	4.51	15.200	0.03	21.200	0.00	27.200	0.00
3.300	0.21	9.300	4.45	15.300	0.03	21.300	0.00	27.300	0.00
3.400	0.25	9.400	4.40	15.400	0.02	21.400	0.00	27.400	0.00
3.500	0.28	9.500	4.19	15.500	0.02	21.500	0.00	27.500	0.00
3.600	0.32	9.600	3.86	15.600	0.02	21.600	0.00	27.600	0.00
3.700	0.36	9.700	3.50	15.700	0.02	21.700	0.00	27.700	0.00
3.800	0.39	9.800	3.21	15.800	0.02	21.800	0.00	27.800	0.00
3.900	0.43	9.900	2.98	15.900	0.01	21.900	0.00	27.900	0.00
4.000	0.50	10.000	2.80	16.000	0.01	22.000	0.00	28.000	0.00
4.100	0.59	10.100	2.67	16.100	0.01	22.100	0.00	28.100	0.00
4.200	0.69	10.200	2.58	16.200	0.01	22.200	0.00	28.200	0.00
4.300	0.80	10.300	2.50	16.300	0.01	22.300	0.00	28.300	0.00
4.400	0.89	10.400	2.44	16.400	0.01	22.400	0.00	28.400	0.00
4.500	1.02	10.500	2.39	16.500	0.01	22.500	0.00	28.500	0.00
4.600	1.19	10.600	2.35	16.600	0.01	22.600	0.00	28.600	0.00
4.700	1.36	10.700	2.32	16.700	0.01	22.700	0.00	28.700	0.00
4.800	1.53	10.800	2.28	16.800	0.01	22.800	0.00	28.800	0.00
4.900	1.69	10.900	2.25	16.900	0.00	22.900	0.00	28.900	0.00
5.000	1.94	11.000	2.23	17.000	0.00	23.000	0.00	29.000	0.00
5.100	2.30	11.100	2.20	17.100	0.00	23.100	0.00	29.100	0.00
5.200	2.68	11.200	2.18	17.200	0.00	23.200	0.00	29.200	0.00
5.300	3.04	11.300	2.16	17.300	0.00	23.300	0.00	29.300	0.00
5.400	3.38	11.400	2.14	17.400	0.00	23.400	0.00	29.400	0.00
5.500	6.78	11.500	2.13	17.500	0.00	23.500	0.00	29.500	0.00
5.600	13.75	11.600	2.11	17.600	0.00	23.600	0.00	29.600	0.00
5.700	22.47	11.700	2.10	17.700	0.00	23.700	0.00	29.700	0.00
5.800	31.41	11.800	2.09	17.800	0.00	23.800	0.00	29.800	0.00
5.900	39.70	11.900	2.08	17.900	0.00	23.900	0.00	29.900	0.00

RUNOFF VOLUME = 1.509 INCHES
PEAK DISCHARGE RATE = 42.05 CFS

```
ADD HYD              ID=3 HYD NO=530 ID I=2 ID II=6
        PEAK FLOW =        90.37 CFS        RUNOFF VOLUME =        1.584 INCHES
        ADD HYD      ID=3     HYD NO=530     ID I=2        ID II=6
COMPUTE HYD          ID=4 HYD NO=105 DT=0.100 DA=38.39
                     AA=0.0 AB=0.0
                     CN#=78.6 IA=0.185 K=0.411 TP=0.347
                     MI=120
                     RAIN CODE=-1
    SHAPE CONSTANT, N =  2.998
    UNIT PEAK =      48.68CFS

    SUM OF THE UNIT HYDROGRAPH CO-ORDINATES =      10.00
    PEAK DISCHARGE =      33.04 CFS   RUNOFF =    1.510 INCHES TIME TO PEAK =     6.100 HRS
    TOTAL RAINFALL =      3.104 INCHES RUNOFF VOLUMETRICCOEFFICIENT  0.49
PRINT HYD            ID=4
```

HYDROGRAPH FROM AREA 105

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	32.75	12.000	1.95	18.000	0.01	24.000	0.00
0.100	0.00	6.100	33.04	12.100	1.75	18.100	0.01	24.100	0.00
0.200	0.00	6.200	30.93	12.200	1.51	18.200	0.01	24.200	0.00
0.300	0.00	6.300	27.91	12.300	1.27	18.300	0.01	24.300	0.00
0.400	0.00	6.400	24.96	12.400	1.06	18.400	0.00	24.400	0.00
0.500	0.00	6.500	22.15	12.500	0.89	18.500	0.00	24.500	0.00
0.600	0.00	6.600	19.44	12.600	0.76	18.600	0.00	24.600	0.00
0.700	0.00	6.700	16.94	12.700	0.65	18.700	0.00	24.700	0.00
0.800	0.00	6.800	14.77	12.800	0.56	18.800	0.00	24.800	0.00
0.900	0.00	6.900	13.03	12.900	0.49	18.900	0.00	24.900	0.00
1.000	0.00	7.000	11.65	13.000	0.44	19.000	0.00	25.000	0.00
1.100	0.00	7.100	10.55	13.100	0.40	19.100	0.00	25.100	0.00
1.200	0.00	7.200	9.69	13.200	0.36	19.200	0.00	25.200	0.00
1.300	0.00	7.300	9.06	13.300	0.33	19.300	0.00	25.300	0.00
1.400	0.00	7.400	8.56	13.400	0.31	19.400	0.00	25.400	0.00
1.500	0.00	7.500	8.15	13.500	0.28	19.500	0.00	25.500	0.00
1.600	0.00	7.600	7.82	13.600	0.26	19.600	0.00	25.600	0.00
1.700	0.00	7.700	7.56	13.700	0.24	19.700	0.00	25.700	0.00
1.800	0.00	7.800	7.36	13.800	0.22	19.800	0.00	25.800	0.00
1.900	0.00	7.900	7.18	13.900	0.20	19.900	0.00	25.900	0.00
2.000	0.00	8.000	6.94	14.000	0.19	20.000	0.00	26.000	0.00
2.100	0.00	8.100	6.64	14.100	0.17	20.100	0.00	26.100	0.00
2.200	0.00	8.200	6.30	14.200	0.16	20.200	0.00	26.200	0.00
2.300	0.00	8.300	5.97	14.300	0.15	20.300	0.00	26.300	0.00
2.400	0.00	8.400	5.68	14.400	0.14	20.400	0.00	26.400	0.00
2.500	0.00	8.500	5.43	14.500	0.13	20.500	0.00	26.500	0.00
2.600	0.01	8.600	5.23	14.600	0.12	20.600	0.00	26.600	0.00
2.700	0.01	8.700	5.05	14.700	0.11	20.700	0.00	26.700	0.00
2.800	0.03	8.800	4.91	14.800	0.10	20.800	0.00	26.800	0.00
2.900	0.05	8.900	4.78	14.900	0.09	20.900	0.00	26.900	0.00
3.000	0.07	9.000	4.68	15.000	0.08	21.000	0.00	27.000	0.00
3.100	0.10	9.100	4.59	15.100	0.08	21.100	0.00	27.100	0.00
3.200	0.13	9.200	4.51	15.200	0.07	21.200	0.00	27.200	0.00

3.300	0.16	9.300	4.44	15.300	0.07	21.300	0.00	27.300	0.00
3.400	0.19	9.400	4.38	15.400	0.06	21.400	0.00	27.400	0.00
3.500	0.22	9.500	4.24	15.500	0.06	21.500	0.00	27.500	0.00
3.600	0.25	9.600	4.01	15.600	0.05	21.600	0.00	27.600	0.00
3.700	0.29	9.700	3.74	15.700	0.05	21.700	0.00	27.700	0.00
3.800	0.32	9.800	3.47	15.800	0.04	21.800	0.00	27.800	0.00
3.900	0.35	9.900	3.24	15.900	0.04	21.900	0.00	27.900	0.00
4.000	0.40	10.000	3.04	16.000	0.04	22.000	0.00	28.000	0.00
4.100	0.47	10.100	2.88	16.100	0.03	22.100	0.00	28.100	0.00
4.200	0.55	10.200	2.75	16.200	0.03	22.200	0.00	28.200	0.00
4.300	0.63	10.300	2.64	16.300	0.03	22.300	0.00	28.300	0.00
4.400	0.71	10.400	2.56	16.400	0.03	22.400	0.00	28.400	0.00
4.500	0.82	10.500	2.48	16.500	0.02	22.500	0.00	28.500	0.00
4.600	0.94	10.600	2.42	16.600	0.02	22.600	0.00	28.600	0.00
4.700	1.08	10.700	2.37	16.700	0.02	22.700	0.00	28.700	0.00
4.800	1.23	10.800	2.33	16.800	0.02	22.800	0.00	28.800	0.00
4.900	1.37	10.900	2.29	16.900	0.02	22.900	0.00	28.900	0.00
5.000	1.56	11.000	2.26	17.000	0.02	23.000	0.00	29.000	0.00
5.100	1.82	11.100	2.22	17.100	0.02	23.100	0.00	29.100	0.00
5.200	2.11	11.200	2.19	17.200	0.01	23.200	0.00	29.200	0.00
5.300	2.42	11.300	2.17	17.300	0.01	23.300	0.00	29.300	0.00
5.400	2.72	11.400	2.14	17.400	0.01	23.400	0.00	29.400	0.00
5.500	4.57	11.500	2.12	17.500	0.01	23.500	0.00	29.500	0.00
5.600	8.77	11.600	2.10	17.600	0.01	23.600	0.00	29.600	0.00
5.700	14.71	11.700	2.08	17.700	0.01	23.700	0.00	29.700	0.00
5.800	21.56	11.800	2.06	17.800	0.01	23.800	0.00	29.800	0.00
5.900	28.59	11.900	2.04	17.900	0.01	23.900	0.00	29.900	0.00

RUNOFF VOLUME = 1.510 INCHES
PEAK DISCHARGE RATE = 33.04 CFS

ADD HYD ID=5 HYD NO=540 ID I=4 ID II=3
PEAK FLOW = 120.04 CFS RUNOFF VOLUME = 1.560 INCHES
ADD HYD ID=5 HYD NO=540 ID I=4 ID II=3
PRINT HYD ID=5

HYDROGRAPH FROM AREA 540

TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS	TIME HRS	FLOW CFS
0.000	0.00	6.000	120.04	12.000	5.42	18.000	0.01	24.000	0.00
0.100	0.00	6.100	107.71	12.100	4.50	18.100	0.01	24.100	0.00
0.200	0.00	6.200	93.94	12.200	3.61	18.200	0.01	24.200	0.00
0.300	0.00	6.300	80.38	12.300	2.88	18.300	0.01	24.300	0.00
0.400	0.00	6.400	71.01	12.400	2.32	18.400	0.01	24.400	0.00
0.500	0.00	6.500	61.55	12.500	1.90	18.500	0.01	24.500	0.00
0.600	0.00	6.600	52.75	12.600	1.59	18.600	0.00	24.600	0.00
0.700	0.00	6.700	45.60	12.700	1.35	18.700	0.00	24.700	0.00
0.800	0.00	6.800	40.20	12.800	1.17	18.800	0.00	24.800	0.00
0.900	0.00	6.900	36.28	12.900	1.03	18.900	0.00	24.900	0.00
1.000	0.00	7.000	32.96	13.000	0.91	19.000	0.00	25.000	0.00
1.100	0.00	7.100	30.08	13.100	0.82	19.100	0.00	25.100	0.00
1.200	0.00	7.200	27.79	13.200	0.73	19.200	0.00	25.200	0.00
1.300	0.00	7.300	26.04	13.300	0.67	19.300	0.00	25.300	0.00

1.400	0.00	7.400	24.69	13.400	0.60	19.400	0.00	25.400	0.00
1.500	0.00	7.500	23.62	13.500	0.55	19.500	0.00	25.500	0.00
1.600	0.00	7.600	22.75	13.600	0.50	19.600	0.00	25.600	0.00
1.700	0.00	7.700	22.04	13.700	0.45	19.700	0.00	25.700	0.00
1.800	0.00	7.800	21.45	13.800	0.41	19.800	0.00	25.800	0.00
1.900	0.00	7.900	20.95	13.900	0.37	19.900	0.00	25.900	0.00
2.000	0.00	8.000	19.95	14.000	0.34	20.000	0.00	26.000	0.00
2.100	0.00	8.100	18.70	14.100	0.31	20.100	0.00	26.100	0.00
2.200	0.00	8.200	17.63	14.200	0.28	20.200	0.00	26.200	0.00
2.300	0.00	8.300	16.65	14.300	0.25	20.300	0.00	26.300	0.00
2.400	0.00	8.400	15.76	14.400	0.23	20.400	0.00	26.400	0.00
2.500	0.01	8.500	15.14	14.500	0.21	20.500	0.00	26.500	0.00
2.600	0.05	8.600	14.63	14.600	0.19	20.600	0.00	26.600	0.00
2.700	0.10	8.700	14.23	14.700	0.17	20.700	0.00	26.700	0.00
2.800	0.18	8.800	13.89	14.800	0.16	20.800	0.00	26.800	0.00
2.900	0.27	8.900	13.61	14.900	0.14	20.900	0.00	26.900	0.00
3.000	0.37	9.000	13.37	15.000	0.13	21.000	0.00	27.000	0.00
3.100	0.48	9.100	13.17	15.100	0.12	21.100	0.00	27.100	0.00
3.200	0.59	9.200	12.99	15.200	0.11	21.200	0.00	27.200	0.00
3.300	0.71	9.300	12.83	15.300	0.10	21.300	0.00	27.300	0.00
3.400	0.83	9.400	12.69	15.400	0.09	21.400	0.00	27.400	0.00
3.500	0.94	9.500	11.98	15.500	0.08	21.500	0.00	27.500	0.00
3.600	1.06	9.600	10.96	15.600	0.08	21.600	0.00	27.600	0.00
3.700	1.18	9.700	10.02	15.700	0.07	21.700	0.00	27.700	0.00
3.800	1.30	9.800	9.23	15.800	0.06	21.800	0.00	27.800	0.00
3.900	1.41	9.900	8.62	15.900	0.06	21.900	0.00	27.900	0.00
4.000	1.53	10.000	8.15	16.000	0.05	22.000	0.00	28.000	0.00
4.100	1.97	10.100	7.78	16.100	0.05	22.100	0.00	28.100	0.00
4.200	2.29	10.200	7.50	16.200	0.04	22.200	0.00	28.200	0.00
4.300	2.60	10.300	7.28	16.300	0.04	22.300	0.00	28.300	0.00
4.400	2.92	10.400	7.10	16.400	0.04	22.400	0.00	28.400	0.00
4.500	3.23	10.500	6.95	16.500	0.03	22.500	0.00	28.500	0.00
4.600	3.86	10.600	6.82	16.600	0.03	22.600	0.00	28.600	0.00
4.700	4.39	10.700	6.71	16.700	0.03	22.700	0.00	28.700	0.00
4.800	4.88	10.800	6.62	16.800	0.03	22.800	0.00	28.800	0.00
4.900	5.35	10.900	6.53	16.900	0.02	22.900	0.00	28.900	0.00
5.000	6.24	11.000	6.46	17.000	0.02	23.000	0.00	29.000	0.00
5.100	7.36	11.100	6.39	17.100	0.02	23.100	0.00	29.100	0.00
5.200	8.49	11.200	6.33	17.200	0.02	23.200	0.00	29.200	0.00
5.300	9.54	11.300	6.27	17.300	0.02	23.300	0.00	29.300	0.00
5.400	10.50	11.400	6.22	17.400	0.02	23.400	0.00	29.400	0.00
5.500	24.00	11.500	6.18	17.500	0.01	23.500	0.00	29.500	0.00
5.600	46.48	11.600	6.13	17.600	0.01	23.600	0.00	29.600	0.00
5.700	71.71	11.700	6.10	17.700	0.01	23.700	0.00	29.700	0.00
5.800	96.33	11.800	6.07	17.800	0.01	23.800	0.00	29.800	0.00
5.900	118.96	11.900	6.04	17.900	0.01	23.900	0.00	29.900	0.00

RUNOFF VOLUME = 1.550 INCHES
PEAK DISCHARGE RATE = 120.04 CFS

FINISH

Eagleson Road

Township Of Nepean

Township Of Goulbourn

Landal Holdings
5.56 Ac.

Admiral
Leaseholds
5.66Ac.

J-Don-L Enterprises Ltd.
14.43Ac

J-Don-L Enterprises Ltd
6.03Ac.

20' Service
Easement

Road 'C'

Road 'A'

BRANCH

J-Don-L Enterprises
2.75 Ac.

1.66Ac

No. 2

Rothsay

Canadian

Pacific

Existing
Watermain

Existing
Sewer

Drive

20' Service
Easement

Glen Cairn

Beach Foundry
16.03 Ac.

J-Don-L Enterprises Ltd
7.21 Ac.

BRANCH No. 1

Forcemain

Easement

Existing

Road 'B'

Drain

Easement

Pump Station

Forcemain

Future Connection To
South Glen Cairn
Trunk Sewer

Drainage

Drainage
Easement

O.H.E.P.C.

Railway

Glamorgan Drive

Monahan

Lot 31 Con. X

Lot 30 Con. X

Drainage Area

Future Drainage Pattern

Existing 100 Year Flood Elev. 313.0

New 100 Year Flood Elev. 313.0

Existing Drains

Sewer

Water Distribution System

Alternate Watermain Connections

Limit Of Phase I Development

TOWNSHIP OF GOULBOURN
MONAHAN CREEK DRAINAGE STUDY

0 200 400 600
feet

MAR 20 1975

Plate 7

Hydroworks Sizing Summary

Private Development-OGS 1

Kanata, Ontario

06-04-2023

Recommended Size: HydroDome HD 5

A HydroDome HD 5 is recommended to provide 80 % annual TSS removal based on a drainage area of 1.61 (ha) with an imperviousness of 94.3 % and Ottawa CDA, Ontario rainfall for the 20 um to 2000 um particle size distribution.

The recommended HydroDome HD 5 treats 99 % of the annual runoff and provides 80 % annual TSS removal for the Ottawa CDA rainfall records and 20 um to 2000 um particle size distribution.

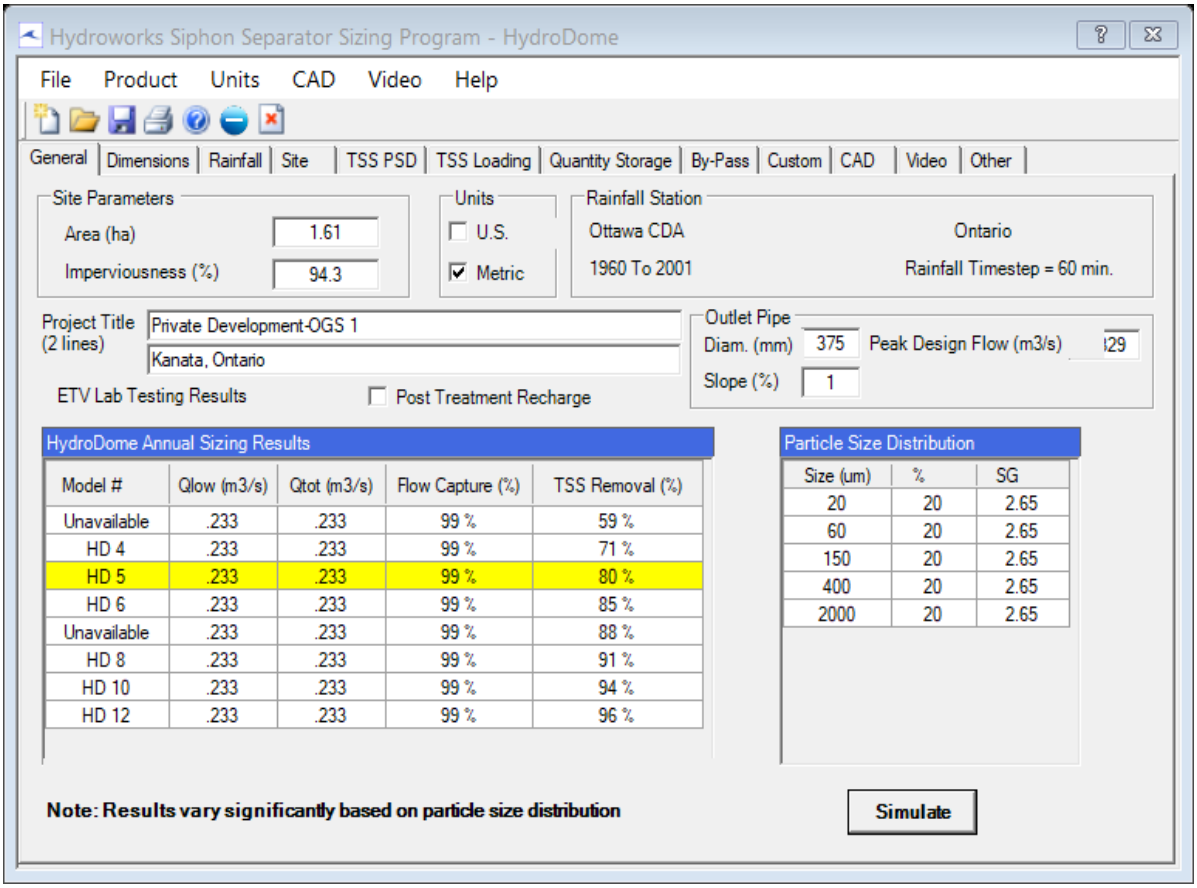
The HydroDome has a siphon which creates a discontinuity in headloss. The given peak flow of .23 (m3/s) is greater than the full pipe flow of .18 (m3/s) indicating the pipe will be surcharged during the peak flow. Full pipe flow was assumed for the headloss calculations. The pressure head in the pipe was not evaluated since this would require a hydraulic gradeline analysis. The headloss was calculated to be 399 (mm) above the crown of the 375 (mm) outlet pipe.

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

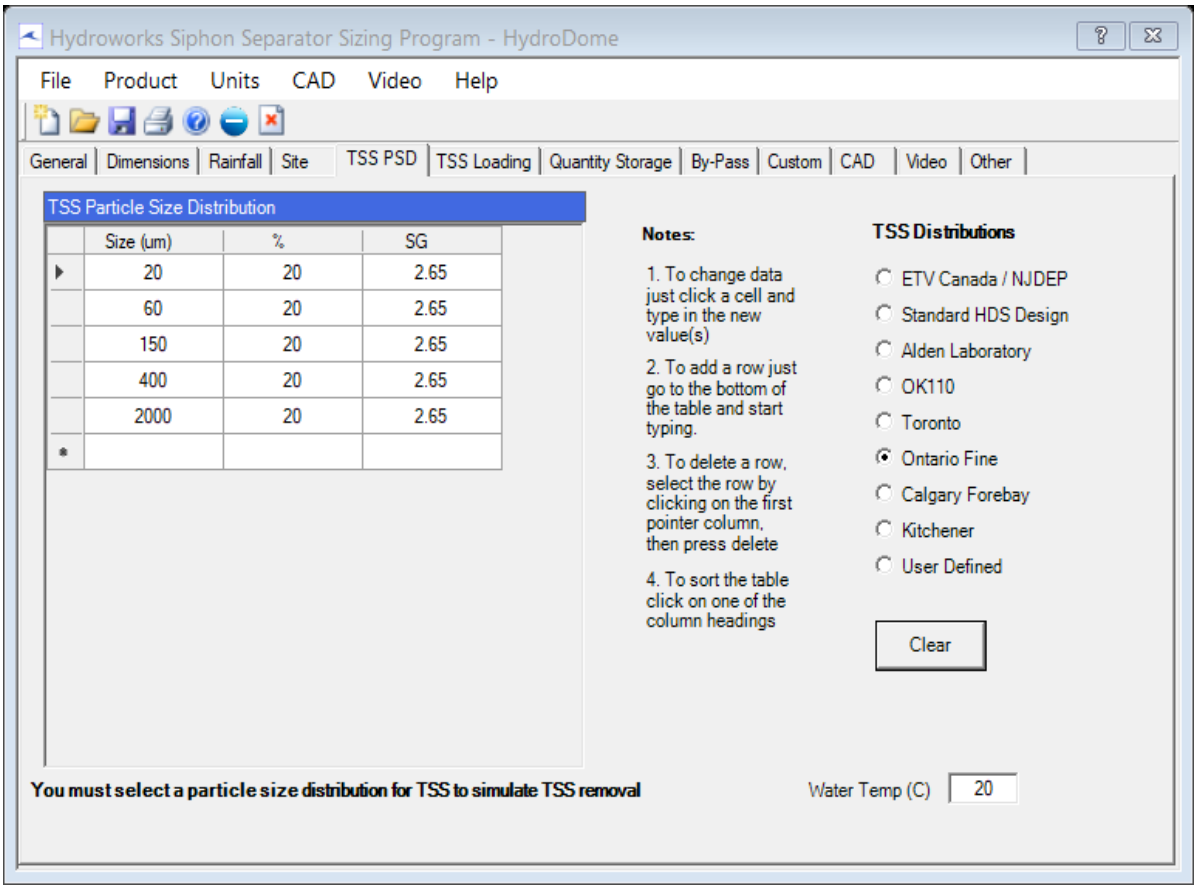
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroDome .

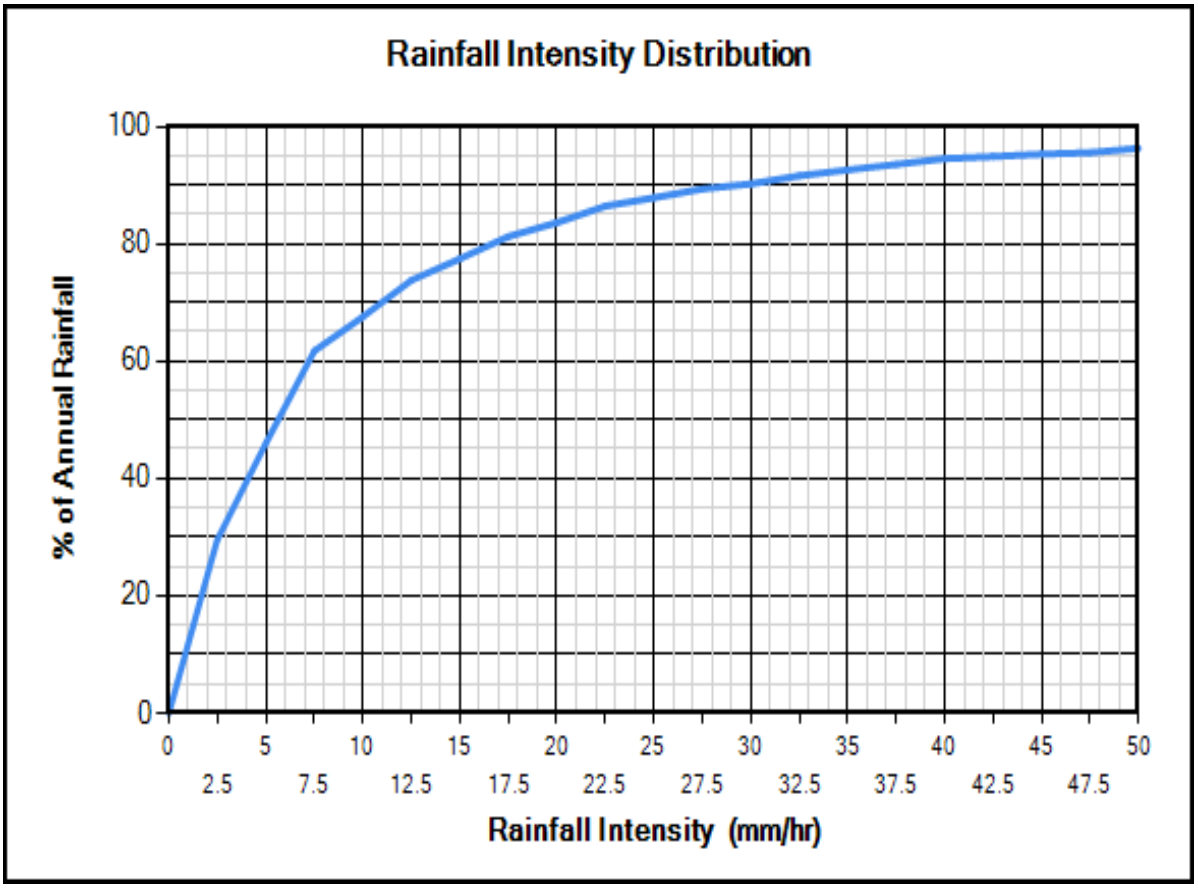
TSS Removal Sizing Summary



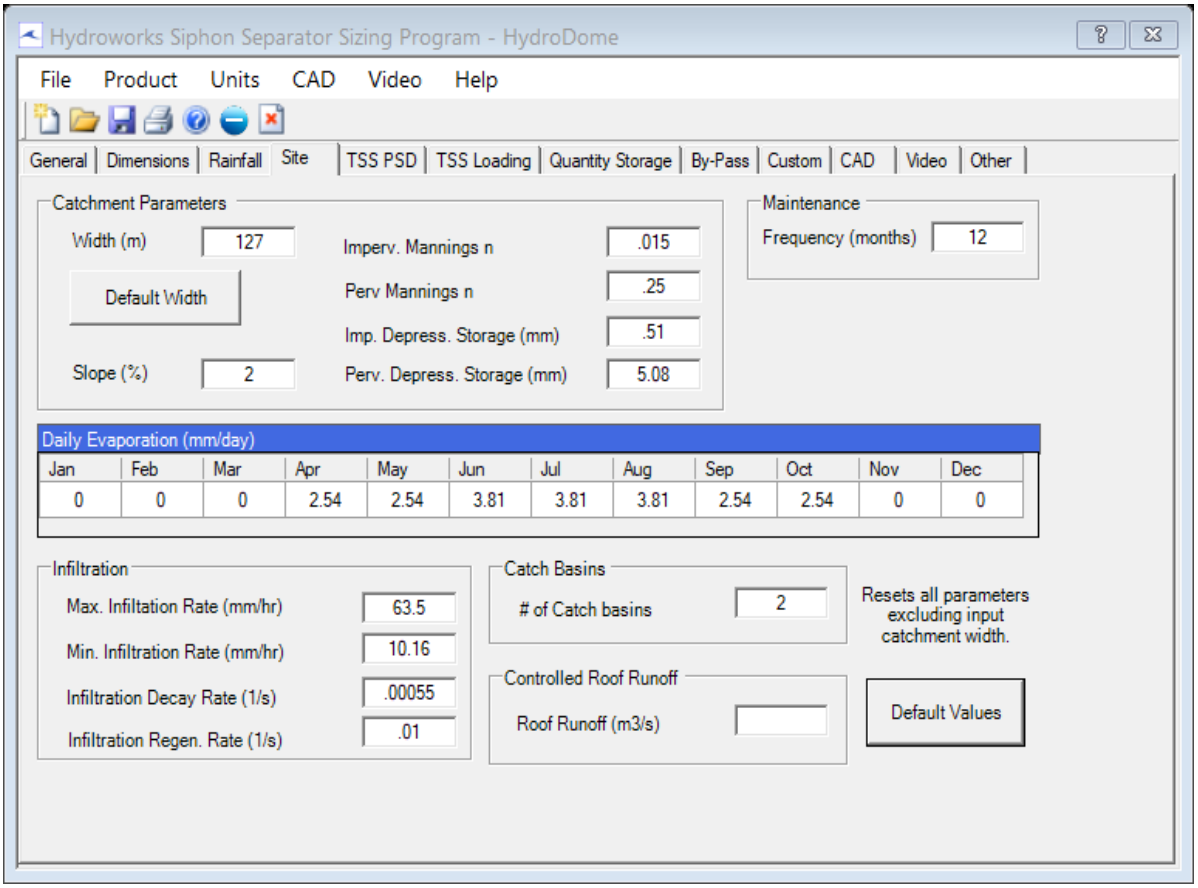
TSS Particle Size Distribution



Rainfall Station - Ottawa CDA, Ontario(1960 To 2001)



Site Physical Characteristics



Dimensions And Capacities

Hydroworks Siphon Separator Sizing Program - HydroDome

File Product Units CAD Video Help

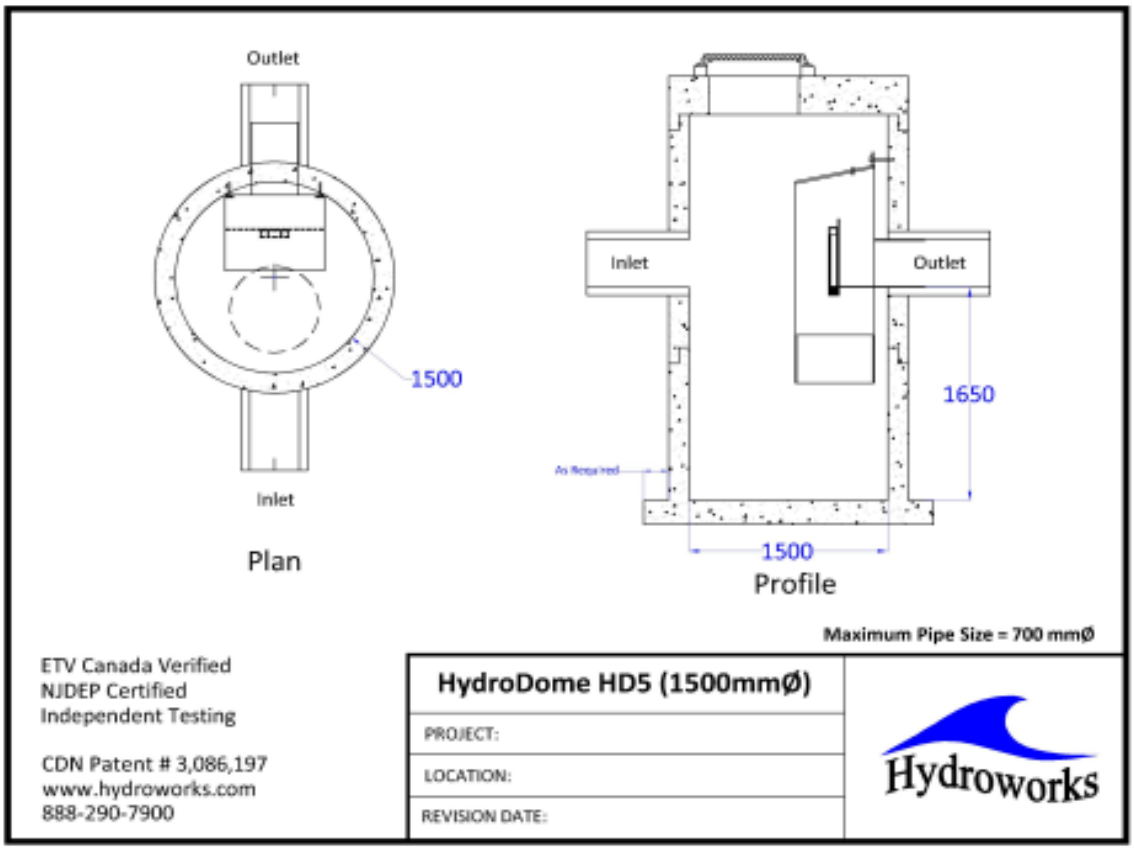
General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

Dimensions and Capacities

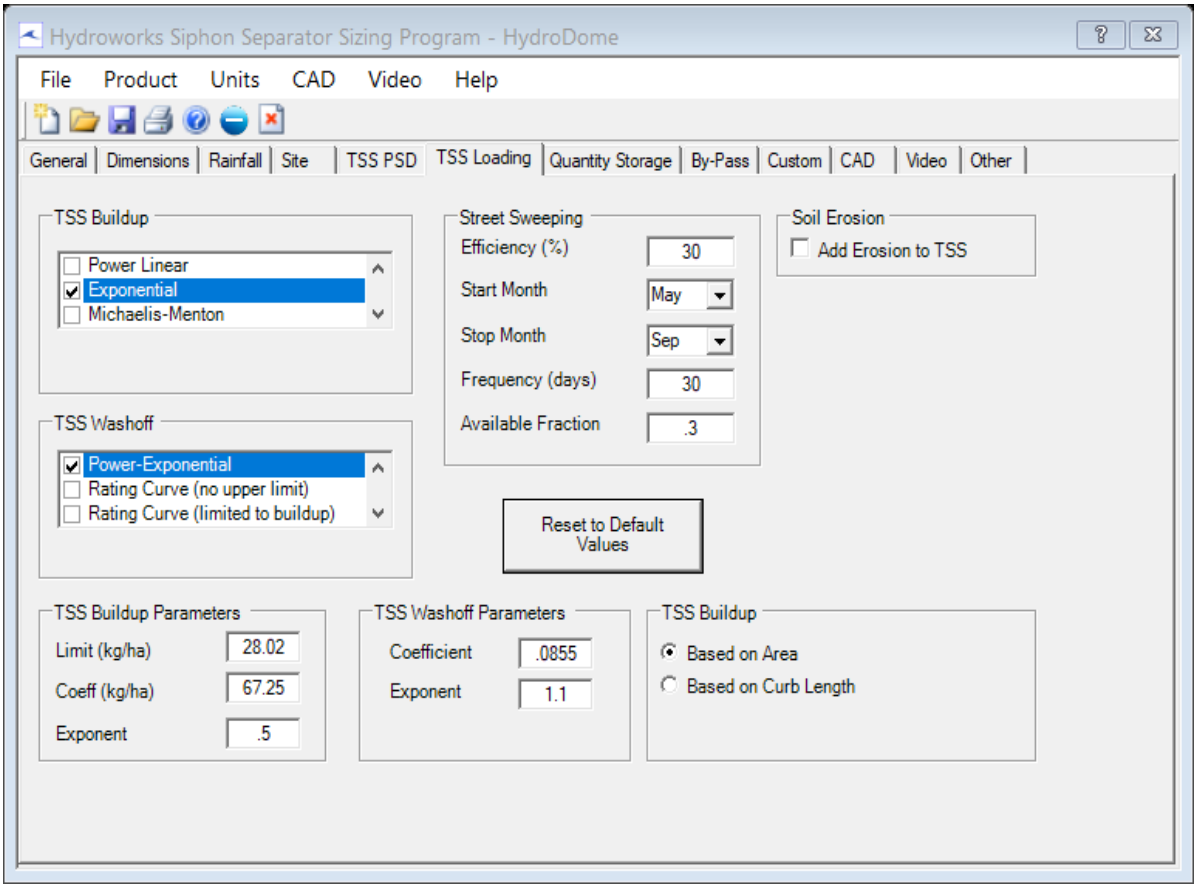
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HD 3	0.91	1.22	123	0.5	0.8
HD 4	1.22	1.37	266	0.9	1.6
HD 5	1.52	1.68	483	1.7	3.1
HD 6	1.83	1.98	803	2.9	5.2
HD 7	2.13	2.29	1226	4.6	8.2
HD 8	2.44	2.59	1863	6.8	12.1
HD 10	3.05	3.2	3617	13	23.3
HD 12	3.66	3.81	6224	22.2	40

Depth = Depth from outlet invert to inside bottom of tank

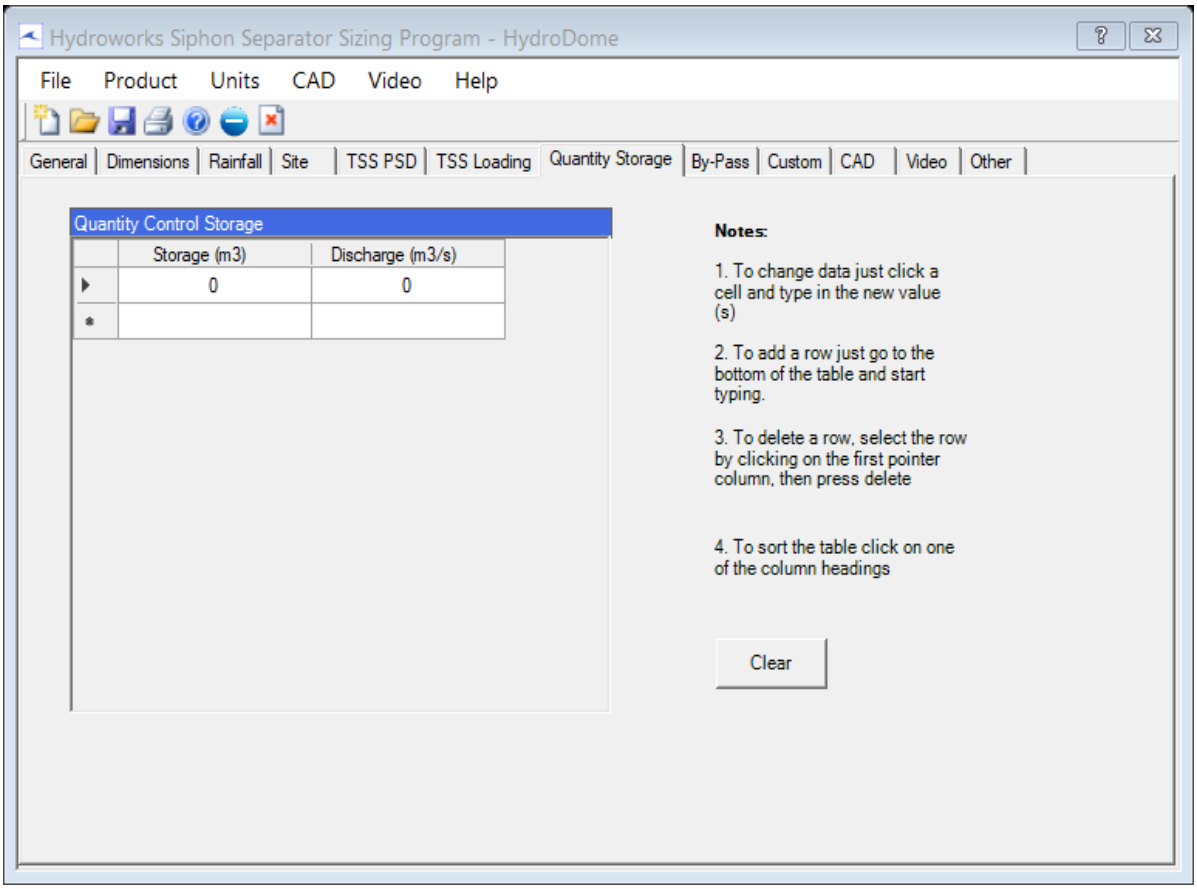
Generic HD 5 CAD Drawing



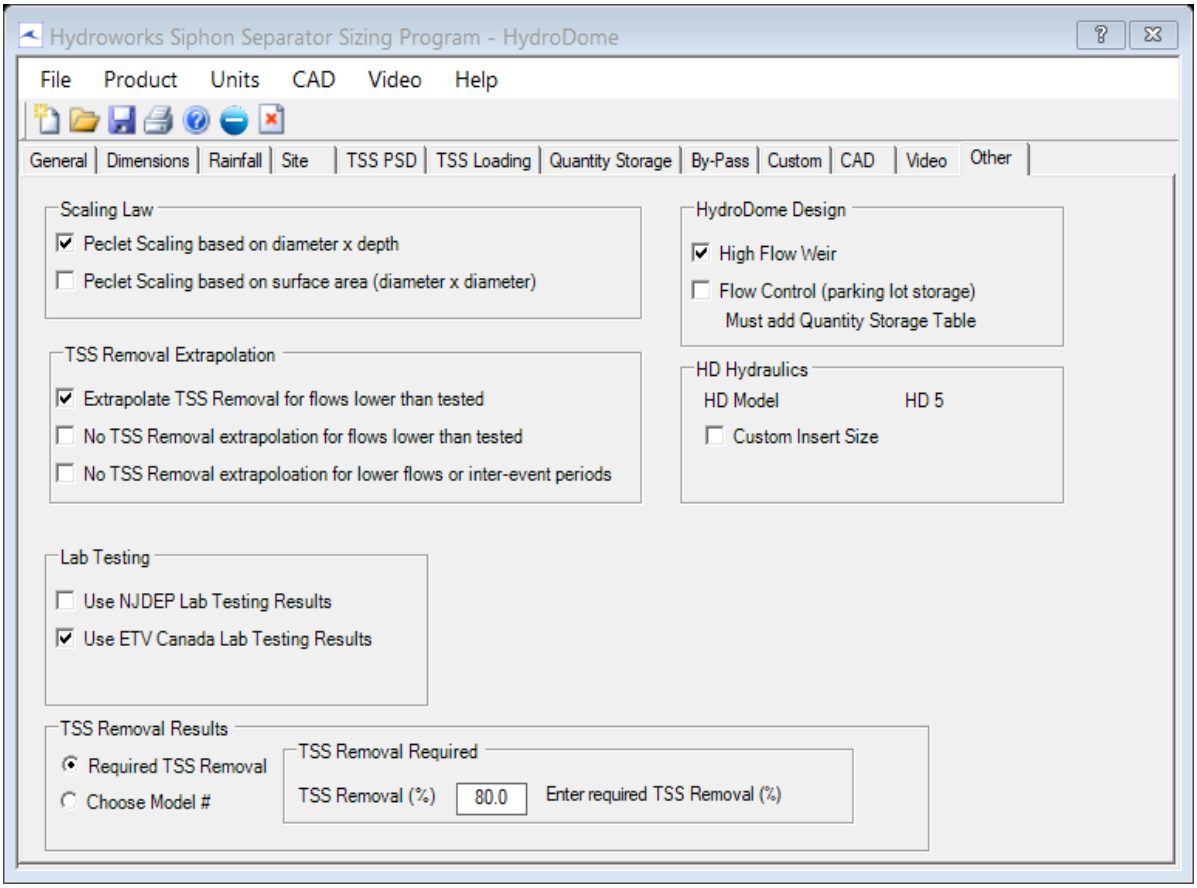
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Flagged Issues

If there is underground detention storage upstream of the HydroDome please contact Hydroworks to ensure it has been modeled correctly.

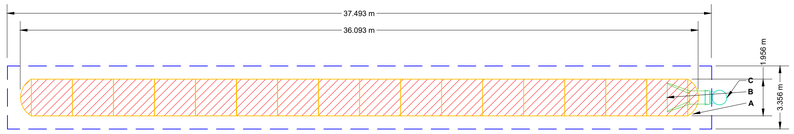
Hydroworks Sizing Program - Version 5.7

1-800-290-7900
www.hydroworks.com

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:	
16	STORMTECH MC-3500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	3.810
2	STORMTECH MC-3500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	1.981
450	STONE ABOVE (mm)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	1.829
229	STONE BELOW (mm)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	1.829
30	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	1.829
104.5	INSTALLED SYSTEM VOLUME (m³) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	1.829
		TOP OF MC-3500 CHAMBER:	1.372
		600 mm ISOLATOR ROW PLUS INVERT:	0.281
		BOTTOM OF MC-3500 CHAMBER:	0.229
125.8	SYSTEM AREA (m²)	BOTTOM OF STONE:	0.000
81.7	SYSTEM PERIMETER (m)		

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	600 mm BOTTOM CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	52 mm	
	B	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: MCFLAMP		
NYLOPLAST (INLET W/ ISO PLUS ROW)	C	750 mm DIAMETER (610 mm SUMP MIN)		



ISOLATOR ROW PLUS (SEE DETAIL)

NO WOVEN GEOTEXTILE

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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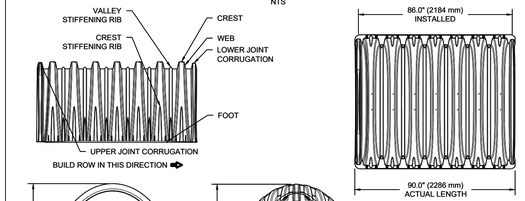
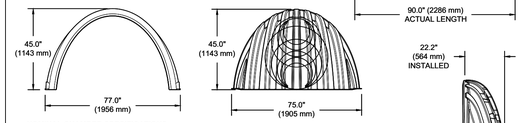
MC-3500 TECHNICAL SPECIFICATION

NTS





NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

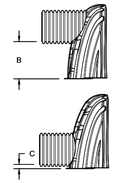
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

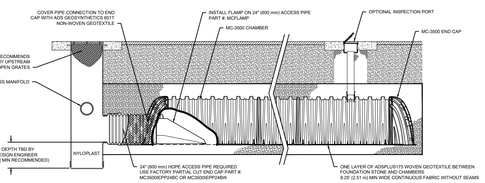
PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

2 MC-3500 TECHNICAL SPECIFICATION



MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

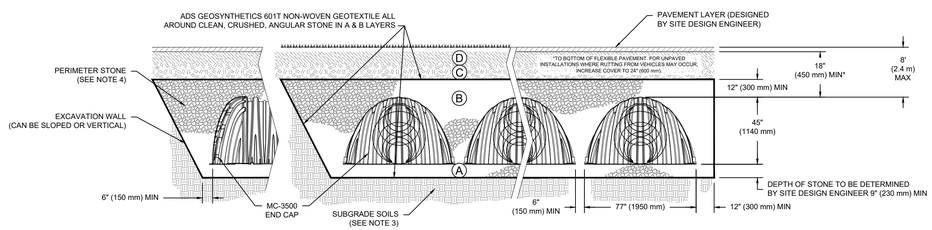
1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

3 MC-3500 ISOLATOR ROW PLUS DETAIL

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%, THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

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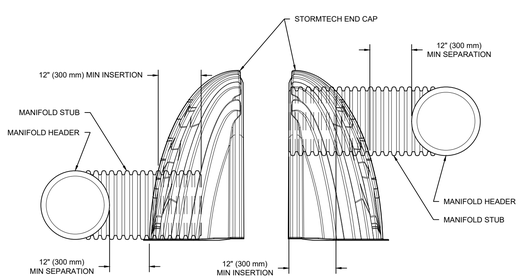
MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

4 MC-SERIES END CAP INSERTION DETAIL

1 MC-3500 CROSS SECTION DETAIL

DRAWN: AZ | DATE:
CHECKED: N/A | PROJECT #:
REV: | NOT TO SCALE

75 MICHAEL CROWPLAND - CHAMBER 1
OTTAWA, AK, USA

StormTech® Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
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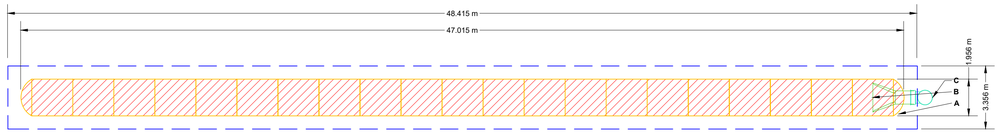
ADS.

SHEET
1 OF 1

PROPOSED LAYOUT		CONCEPTUAL ELEVATIONS:	
21	STORMTECH MC-3500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	3.810
2	STORMTECH MC-3500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	1.981
450	STONE ABOVE (mm)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	1.829
229	STONE BELOW (mm)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	1.829
30	STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	1.829
135.5	INSTALLED SYSTEM VOLUME (m^3) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	1.829
		TOP OF MC-3500 CHAMBER:	1.372
		600 mm ISOLATOR ROW PLUS INVERT:	0.281
		BOTTOM OF MC-3500 CHAMBER:	0.229
162.5	SYSTEM AREA (m^2)	BOTTOM OF STONE:	0.000
103.5	SYSTEM PERIMETER (m)		

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	600 mm BOTTOM CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 600 mm BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	52 mm	
	B	INSTALL FLAMP ON 600 mm ACCESS PIPE / PART#: MCFLAMP		
NYLOPLAST (INLET W/ ISO PLUS ROW)	C	750 mm DIAMETER (610 mm SUMP MIN)		



ISOLATOR ROW PLUS (SEE DETAIL)

NO WOVEN GEOTEXTILE

BED LIMITS

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3 MC-3500 ISOLATOR ROW PLUS DETAIL

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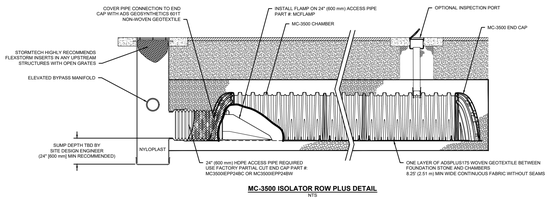

MC-3500 ISOLATOR ROW PLUS DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

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- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

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2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

4 MC-SERIES END CAP INSERTION DETAIL

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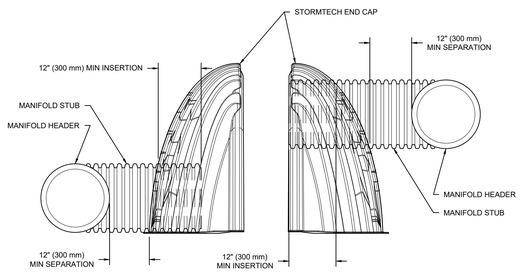
MC-SERIES END CAP INSERTION DETAIL
NTS



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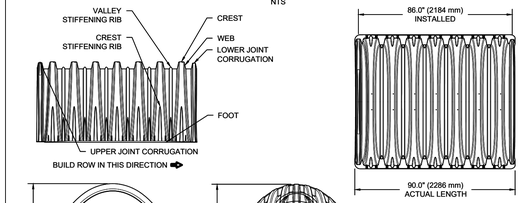
MC-3500 TECHNICAL SPECIFICATION
NTS



NOMINAL CHAMBER SPECIFICATIONS

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MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m^3)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m^3)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m^3)
WEIGHT	49 lbs.	(22.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
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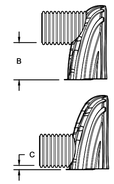
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



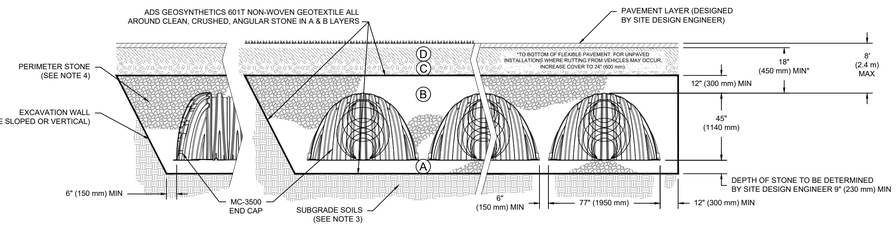
CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

2 MC-3500 TECHNICAL SPECIFICATION

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[4] A-1, A-2-4, A-3 OR AASHTO M43[4] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[3] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[3] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/% THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

1 MC-3500 CROSS SECTION DETAIL

DRAWN: AZ | CHECKED: N/A | DATE: | PROJECT #: | REV: | NOT TO SCALE

75 MICHAEL COWPLAND - CHAMBER 2
OTTAWA, AK, USA

StormTech® Chamber System
888-892-2694 | WWW.STORMTECH.COM

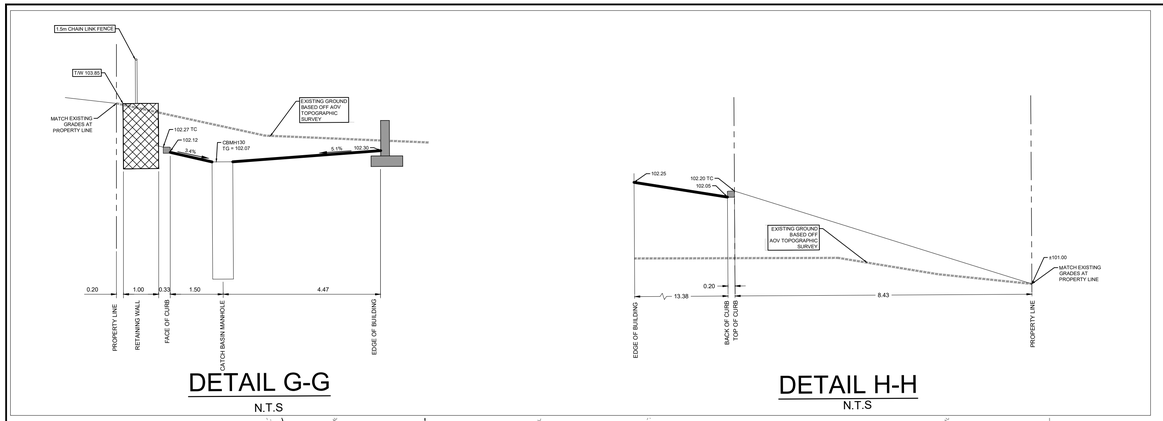
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

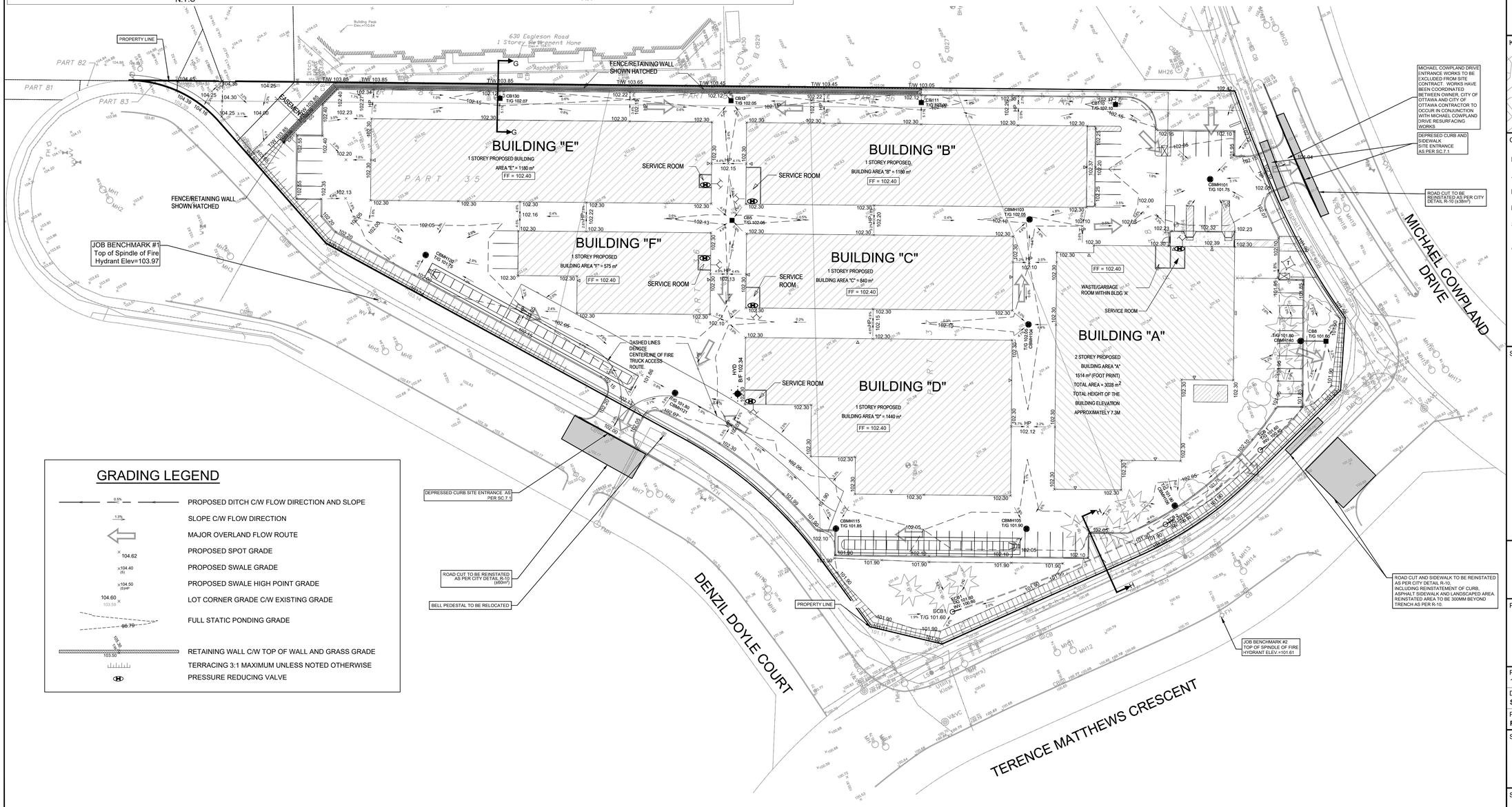
ADS.

SHEET 1 OF 1

APPENDIX E

- Grading Plan Drawing C-200
- Erosion and Sedimentation Control Plan Drawing C-900





GRADING LEGEND

- PROPOSED DITCH C/W FLOW DIRECTION AND SLOPE (0.5%)
- SLOPE C/W FLOW DIRECTION (1.3%)
- MAJOR OVERLAND FLOW ROUTE
- PROPOSED SPOT GRADE (104.62)
- PROPOSED SWALE GRADE (104.40 (S))
- PROPOSED SWALE HIGH POINT GRADE (104.50 (SHP))
- LOT CORNER GRADE C/W EXISTING GRADE (104.60 / 103.59)
- FULL STATIC PONDING GRADE (96.79)
- RETAINING WALL C/W TOP OF WALL AND GRASS GRADE (TW 103.50)
- TERRACING 3:1 MAXIMUM UNLESS NOTED OTHERWISE
- PRESSURE REDUCING VALVE

CLIENT

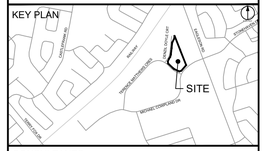
HUNTINGTON PROPERTIES

ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR CITY REVIEW	2022-12-09
2	REVISED PER CITY COMMENTS	2023-03-09
3	REVISED PER CITY COMMENTS	2023-07-07
4	REVISED PER CITY COMMENTS	2023-07-19
5	REVISED PER CITY COMMENTS	2023-09-22
6	REVISED PER CITY COMMENTS	2023-11-13

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

KEY PLAN



CONSULTANTS

Project Coordinator:
Huntington Properties
Architect:
A49 Architecture
Landscape:
Fotenn
Mechanical & Electrical:
Goodkey, Weedmark & Associates Limited
Surveyor:
Annis O'Sullivan Vollebekk Ltd.

Geotech:
Paterson Group

1:400 (0, 4, 12, 20m)

SEAL

LICENSED PROFESSIONAL ENGINEER
W. ZHUANG
100231427
2023/11/13
PROVINCE OF ONTARIO

IBI GROUP
Suite 400 – 333 Preston Street
Ottawa ON K1S 5N4 Canada
tel 613 225 1311 / 613 241 3300 fax 613 225 9868
ibigroup.com

PROJECT

PROPOSED SELF STORAGE DEVELOPMENT

75 MICHAEL COWPLAND

PROJECT NO: 135470	
DRAWN BY: **S.L. / D.D.**	CHECKED BY: **T.R.B.**
PROJECT MGR: **R.M.**	APPROVED BY: **T.R.B.**

SHEET TITLE

GRADING PLAN

SHEET NUMBER	ISSUE
C-200	6

CITY PLAN NO. 18885 CITY FILE No. D07-12-22-0174

SCALE CHECK

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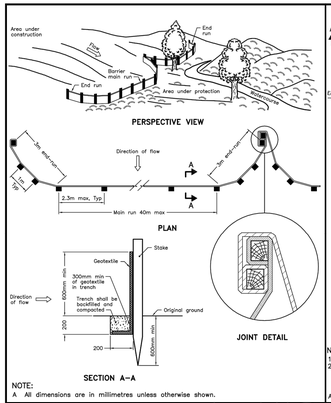
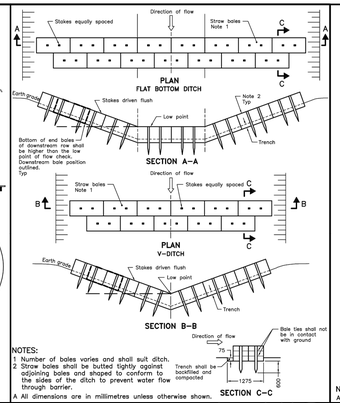
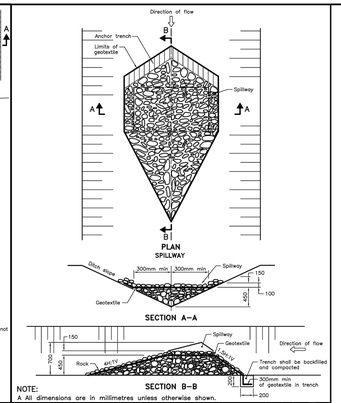


ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
LIGHT–DUTY SILT FENCE BARRIER			
OPSD 219.110			



ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
STRAW BALE FLOW CHECK DAM			
OPSD 219.180			



ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
TEMPORARY ROCK FLOW CHECK DAM V–DITCH			
OPSD 219.210			

NOTES:

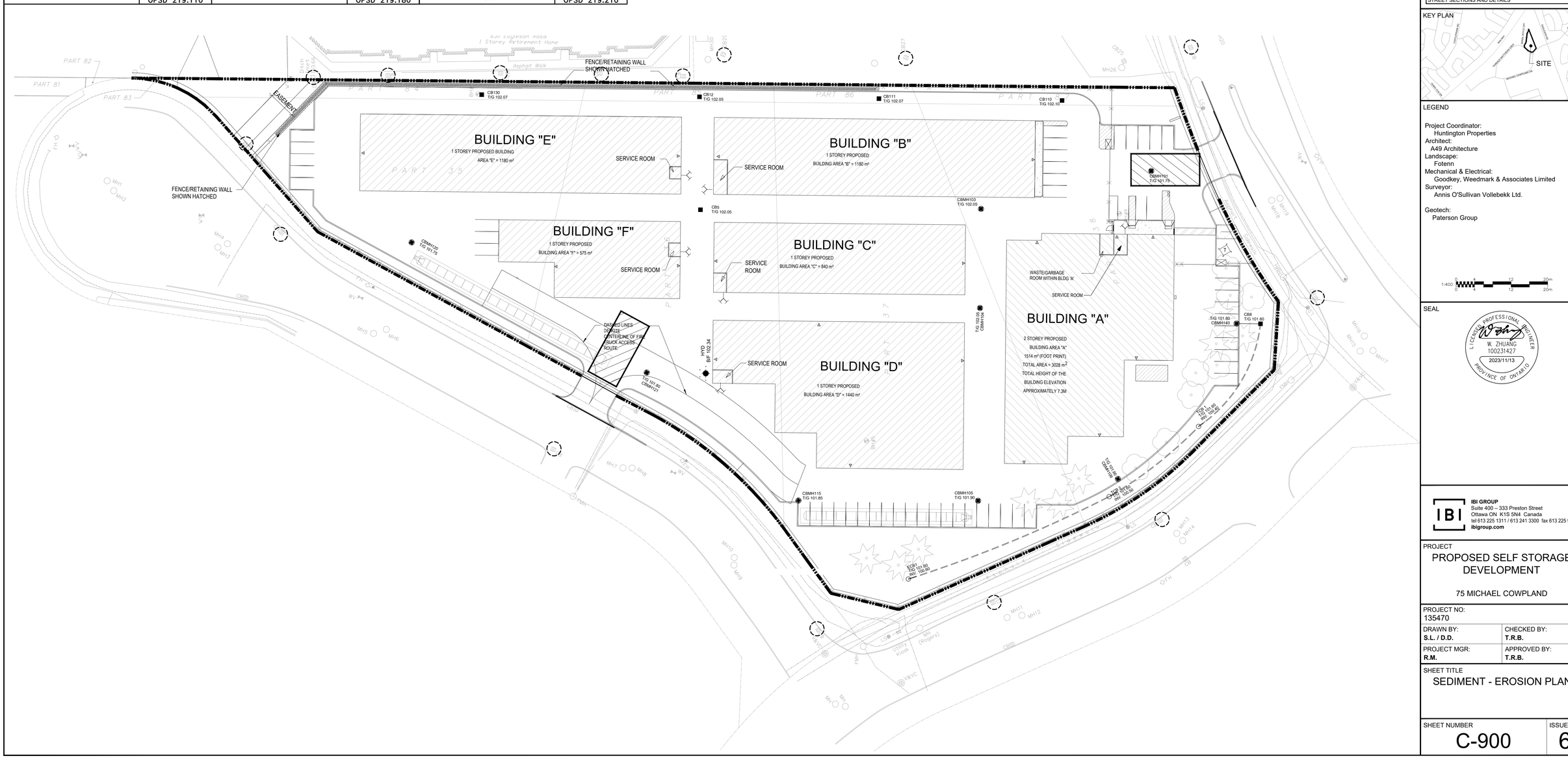
THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY,

1. SILT FENCE TO BE ERECTED PRIOR TO EARTH WORKS BEING COMMENCED. SILT FENCE TO BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED OR UNTIL START OF SUBSEQUENT PHASE.
2. STRAW BALE SEDIMENT TRAPS TO BE CONSTRUCTED IN EXISTING ROAD SIDE DITCHES. TRAPS TO REMAIN AND BE MAINTAINED UNTIL VEGETATION IS ESTABLISHED.
3. SILT SACK TO BE PLACED AND MAINTAINED UNDER COVER OF ALL CATCHBASINS. GEOTEXTILE SILT SACK IN STREET CBs TO REMAIN UNTIL ALL CURBS ARE CONSTRUCTED. GEOTEXTILE FABRIC IN RYCBs TO REMAIN UNTIL VEGETATION IS ESTABLISHED. ALL CATCHBASINS TO BE REGULARLY INSPECTED AND CLEANED, AS NECESSARY, UNTIL SOD AND CURBS ARE CONSTRUCTED.
4. CONTRACTOR TO PROVIDE DETAILS ON LOCATION(S) AND DESIGN OF DEWATERING TRAP(S) PRIOR TO COMMENCING WORK. CONTRACTOR ALSO RESPONSIBLE FOR MAINTAINING TRAP(S) AND ADJUSTING SIZE(S) IF DEEMED REQUIRED BY THE ENGINEER DURING CONSTRUCTION.
5. CONTRACTOR TO PROTECT EXISTING CATCHBASINS WITH FILTER CLOTH UNDER THE COVERS TO TRAP SEDIMENTATION. REFER TO IDENTIFIED STRUCTURES.
6. WORKS NOTED ABOVE ARE TO BE INSTALLED, INSPECTED, MAINTAINED AND ULTIMATELY REMOVED BY SERVICING CONTRACTOR.
7. THIS IS A "LIVING DOCUMENT" AND MAY BE MODIFIED IN THE EVENT THE PROPOSED CONTROL MEASURES ARE INSUFFICIENT

LEGEND :

- LIGHT DUTY SILT FENCE AS PER OPSD-219.110
- SNOW FENCE
- STRAW BALE CHECK DAM AS PER OPSD-219.180
- ROCK CHECK DAM AS PER OPSD-219.210
- SILT SACK PLACED UNDER EXISTING CB COVER
- TEMPORARY MUD MAT 0.15m THICK 50mm CLEAR STONE ON NON WOVEN FILTER CLOTH (7.0 x 15.0)

North



CLIENT

HUNTINGTON PROPERTIES

Huntington PROPERTIES

IBI Group Professional Services (Canada) Inc.
is a member of the IBI Group of companies

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

KEY PLAN

LEGEND

Project Coordinator:
Huntington Properties
Architect:
A49 Architecture
Landscape:
Fotenn
Mechanical & Electrical:
Goodkey, Weedmark & Associates Limited
Surveyor:
Annis O'Sullivan Vollebekk Ltd.

Geotech:
Paterson Group

1:400 0 4 12 20m

SEAL

LICENCED PROFESSIONAL ENGINEER
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2023/11/13
PROVINCE OF ONTARIO

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tel 613 225 1311 / 613 241 3300 fax 613 225 9868
ibigroup.com

PROJECT

PROPOSED SELF STORAGE DEVELOPMENT

75 MICHAEL COWPLAND

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SHEET TITLE

SEDIMENT - EROSION PLAN

SHEET NUMBER	ISSUE
C-900	6

CITY PLAN NO. 18885

CITY FILE No. D07-12-22-0174

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