SITE SERVICING AND STORMWATER MANAGEMENT BRIEF
IN SUPPORT OF SITE PLAN APPROVAL

Dr. John M. Denison Child Care Centre
900 Mulock Drive/ 605 Fernbank Road
Newmarket, ON

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File Number: 19055

Prepared For:
Larkin Land Use Planners

2	Issued for Site Plan Application – 2nd Submission	March 5th, 2020
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No.	**Revision**	**Date**

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1.0 INTRODUCTION

This Site Servicing and Stormwater Management Brief has been prepared in support of a Site Plan Approval for the proposed Dr. John M. Denison Child Care Centre development. The proposed development is located at 900 Mulock Drive/ 605 Fernbank Road in Newmarket, Ontario. The purpose of this report is to demonstrate that the proposed servicing strategy will function within the existing infrastructure and achieves both the Town of Newmarket, Lake Simcoe Conservation Authority ('LSRCA') and York Region design criteria.

1.1 Background

The subject site is located along the south side of Mulock Drive between Fernbank Road and Leslie Street. The site is bounded by Town owned property to the east, west and south. This includes a community garden, soccer fields, and an existing parking lot.

The existing 0.86 ha site consists of a heritage structure, a showroom centre and associated parking spots for the community facilities bordering the property. This development intends to demolish the existing show room and construct a childcare facility. The existing heritage building will remain undisturbed and the existing parking facilities in the adjacent property to the south will be upgraded to suit the proposed use.

The following background and reference documents were used to develop the proposed functional servicing brief.

- "Town of Newmarket Engineering Design Standards and Criteria", dated August 2019.
- "LSRCA Technical Guidelines for Stormwater Management Submissions", dated September 2016.
- "MECP Stormwater Management Planning and Design Manual", dated March 2003.
- "Geotechnical Investigation Proposed Building 900 Mulock Drive", prepared by DS Consultants Ltd., dated October 29, 2019.
- "Preliminary Hydrogeological Investigation", prepared by DS Consultants Ltd., dated February 19th, 2020.

1.2 Proposed Development

The new development will consist of a single storey 500 m^2 childcare facility, playgrounds, pavement areas for parking and drop off, and landscaped areas. There is no proposed basement for the facility. The proposed building will work seamlessly with the existing heritage building located on-site by maintaining an accessible travel route to each building. Refer to **Figure 1 – Site Location Plan** below and **Drawing C1 – Site Grading and Erosion and Sediment Control Plan** for the development limit boundary.

The proposed work will impact a total of 1.07 ha area. As such, this area has been carried in all calculations.

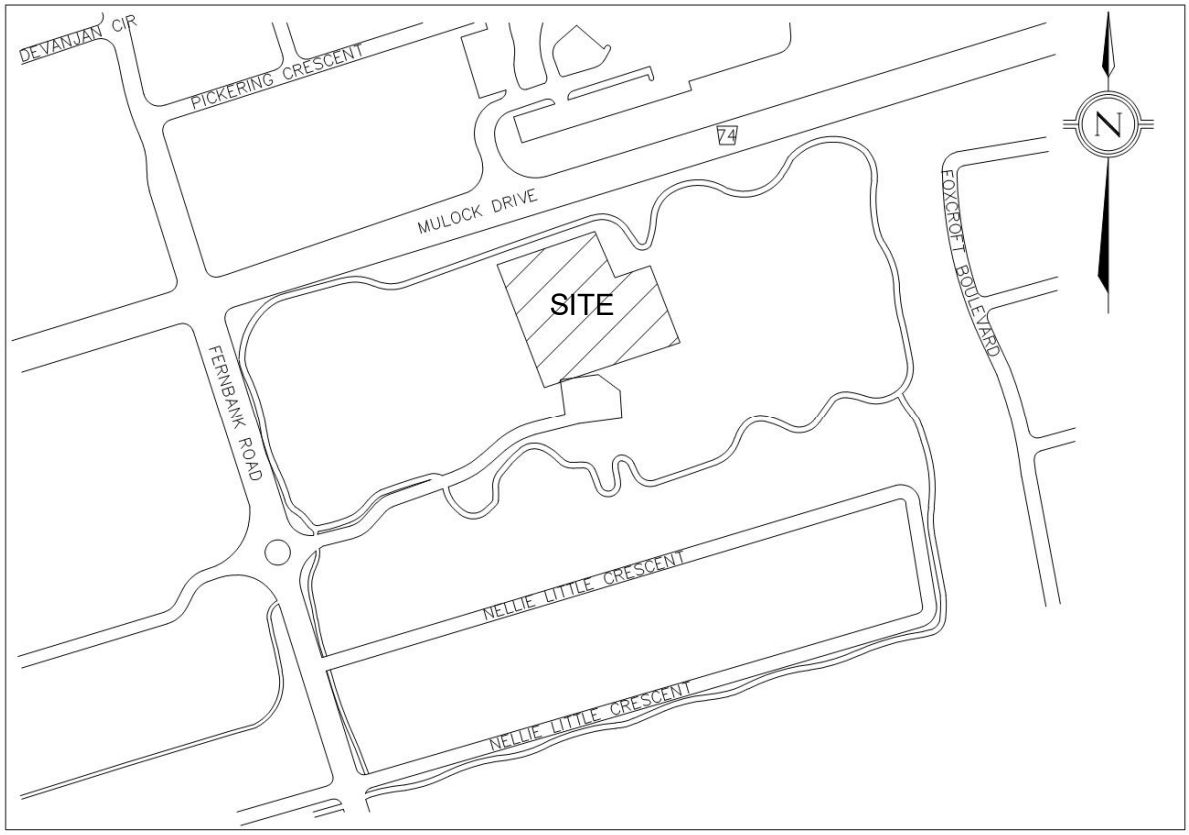

Figure 1 – Site Location Plan

2.0 STORMWATER MANAGEMENT

2.1 Existing Conditions

The existing site has no controls and has limited existing storm infrastructure. A ditch exists along the adjacent west development which captures most of the site's flows. There is no designated storm outlet or municipal connection for the subject site.

It has been assumed throughout the stormwater strategy that all existing drainage patterns are to be maintained. As per the LSRCA reviewing agencies, the existing show room and associated parking lot on-site cannot be included in the pre-development calculations and should instead be taken as pervious, landscaped areas. Therefore, the pre-development impervious area is taken as 21% for all stormwater management calculations.

Refer to **Appendix A** for **Figure 2 - Pre-Development Drainage and Imperviousness Plan**.

2.2 Proposed Conditions

The proposed development is expected to increase the site impervious by 7%, equating to a decrease of 700 m^2 of pervious or grassed surface. The loss of pervious surface results in the minor increase of storm runoff as well as the minor decrease in natural infiltration. To offset this impact, low impact development ('LID') features are proposed. This is in lieu of traditional storm outlet restrictions based on the unavailability of a municipal storm sewer connection. Refer to **Appendix A** for **Figure 3 - Post-Development Drainage and Imperviousness Plan**.

The proposed childcare building will have downspouts that will collect roof drainage and discharge it to grade. The majority of the drainage from the roof and new hard surfaces will be directed into one of two proposed soak-away pits. Drainage collected in the reconfigured parking lot, as well as the fire route and existing building will be directed to permeable pavement. Theses LID measures provide water balance and stormwater quality/quantity controls.

Refer to the **Drawing C2– Site Servicing and Utility Plan** for the servicing layout.

2.3 Stormwater Management Criteria

The stormwater management criteria for this development is dictated by the Town of Newmarket Engineering Department and the Lake Simcoe Conservation Authority (LSRCA) standards.

As per the LSRCA, the subject site can be classified as a "major development", as it is proposing a new building with a gross floor area of equal or greater than 500 m^2. However, since the increase of net impervious area is only 700 m^2 the stormwater management requirements are taken as follows:

Water Balance
Every feasible effort must be made to maintain pre-development infiltration volumes and recharge quality to predevelopment levels on an annual basis.

Water Quantity
As per the LSRCA Criteria, the post-development flows are to be restricted to equal or less than the pre-development release rates. The Conservation Authority requirements further dictate that a development that creates 0.50 ha or more of new or reconstructed impervious surfaces must also retain and or treat the runoff from a 25 mm rainfall event over such surfaces. As this development does not create 0.50 ha of new/reconstructed impervious surfaces (impervious of only 700m^2) it is anticipated that the requirement will be limited to a best efforts approach where most of the impervious area of the site is captured and retained.

As the existing site has limited storm infrastructure, conventional storage methods cannot be utilized to decrease stormwater runoff. As such, infiltration will be the primary tool to reduce the stormwater runoff quantity on-site.

Water Quality
As per the LSRCA, all new developments are required to achieve MECP Enhanced Protection Level 1. This corresponds to the long-term average removal of 80% of total suspended solids.

In addition, the LSRCA targets a net zero phosphorus control for all new developments, with a cash in lieu requirement if this target is not achieved.

2.3.1 Water Balance

The hydrogeological assessment prepared by DS Consultants Ltd. prepared a preliminary water balance assessment for this development. This has been revised to suit an updated site plan and now excludes the existing show room in all calculations. The analysis utilizes the Thornthwaite model.

The water budget requirement for this site, given a net increase of only 700 m^2, is to match post-development to pre-development. However best efforts have been made to infiltrate the 10 mm event from all impervious surfaces entering the LID features. This goes beyond the requirements for water balance as per the Lake Simcoe Conversation Authority criteria.

Existing Conditions

In pre-existing conditions, the following parameters were used, as per the hydrogeological assessment.

Parameter	**Pervious Area**	**Impervious Area**
Total Precipitation – P (mm/year)	858	858
Evapotranspiration – ET (mm/year)	580	129
Precipitation Surplus – PS (mm/year)	278	729
Infiltration – I (mm/year)	153	0
Runoff- P-ET (mm/year)	125	729

Based on the pervious and impervious areas, the total precipitation, evapotranspiration, runoff and infiltration targets are calculated.

Parameter	**Pervious Area**	**Impervious Area**	**Total**
Area (m^2)	8 420	2 300	10 720
Total Precipitation, P(m^3)	7 224	1 973	9 198
Evapotranspiration, ET (m^3)	4 884	296 *	5 180
Runoff, P-ET(m^3)	1 053	1 677	2 730
Infiltration, I (m^3)	1 288	0	1 288

*Assumed 15% of P

Proposed Conditions

As per the proposed site plan, the following parameters were calculated with an increase of impervious area of 700 m^2.

Parameter	Pervious Area	Impervious Area	Total
Area (m^2)	7 720	3 000	10 720
Total Precipitation, P(m^3)	6 624	2 574	9 198
Evapotranspiration, ET (m^3)	4 478	386	4 864
Runoff, P-ET(m^3)	965	2 188	3 153
Infiltration, I (m^3)	1 181	0	1 181

Under proposed conditions, the site is expected to increase total runoff by 15.5% and decrease infiltration volumes by 8.3% annually. To compensate for this difference, two types of LID measures are proposed on-site. Permeable pavement is proposed in the parking lot as well as two soak-away pits within the site.

The separate LID measures have been sized to infiltrate the 10 mm storm event over the impervious area directed to the feature. Refer to **Figure 3- Post Development Drainage Plan** for the drainage areas directed to each of the proposed LID features.

As per the hydrogeological report prepared by DS Consultants Ltd., an infiltration rate of 12 mm/hr can be taken for the purpose of sizing the LID features. This is an average between two test pits, and as per the report can be used to estimate the infiltration rate throughout the site. Safety factors have been applied to the measured infiltration rates for the soils to address heterogeneity of the soils. As per the hydrogeological report, a safety factor of 2.5 and has been used in all calculations to yield the design infiltration rate of 12 mm/hr.

Area 201, which consists of the entire proposed roof area is directed to two soak-away pits. Based on the infiltration rates received from the hydrogeological engineer, the soak-away pits have been sized to infiltrate 16 m^3 collectively. This is equivalent to the 10 mm event over the impervious area directed to the LID and corresponds to 70% of annual precipitation surplus.

Area 203, which consists of the proposed parking lot, is directed to permeable pavement. Based on the infiltration rates received from the hydrogeological engineer, the permeable pavement has been sized to infiltrate 16 m^3. This is equivalent to the 10 mm event over the impervious area directed to the LID and corresponds to 70% of annual precipitation surplus.

Using these two LID methods, the following parameters are calculated:

Parameter	Total
Area (m^2)	10 720
Total Precipitation, P(m^3)	9 198
Evapotranspiration, ET (m^3)	4 334
Runoff, P-ET(m^3)	1 663
Infiltration, I (m^3)	2 671

The proposed LIDs not only compensate for the additional impervious areas, they improve on existing conditions by increasing infiltration by over 100% and decreasing storm runoff by 39%. Refer to the water balance calculations attached to this letter.

2.3.2 Water Quantity

Based on the water balance assessment above, the LID features proposed on-site are expected to decrease total runoff by 39%. Since the 700 m^3 of increase to impervious surface results in the increase of total runoff of 15.5%, the water balance controls are expected to fully compensate for this. As such, no additional stormwater quantity methods are proposed or required on-site. It is assumed that all storm rainfall events, up to and including the 100-year event will be equal or less than the pre-development release rates based on the generous infiltration volume proposed on-site.

The development does not propose any storm infrastructure and has no designated municipal storm outlet. Therefore, conventional stormwater quantity measures such as orifice controls and storage tanks are not proposed.

2.3.3 Water Quality

As per the Lake Simcoe Region Conservation Authority Stormwater Management manual, 80% of total suspended solids removal is required on-site. This is to be achieved with the utilization of the soak-away pits and permeable pavement as mentioned above. As per Table 3.2 of the manual, the storage volume required for treating 80% of Total Suspended Solids is calculated to be 32 m^3 based on the entire developable limits. The site proposes a total of 32 m^3 of infiltration storage, thus providing the required infiltration volume. Therefore, it is expected that 80% of Total Suspended Solids is achieved on-site.

As per the Conservation Authority requirements, pre-treatment is required for all drainage directed to the soak-away pits. It is noted that the drainage directed to these LID features is mainly runoff from pervious

area and do not experience any vehicular traffic. Additionally, prior to entering the soak away pits, the drainage from pedestrian areas is filtered through grass swales, providing a first level flush of any contaminants and sediments in the runoff.

The permeable pavement and the soak-away pits will require consistent maintenance. Refer to **Appendix C** for the operation and maintenance manual for the permeable pavement as per manufacturer's specifications.

The soak-away pits will not experience vehicular or heavy pedestrian access, and therefore are expected to have low maintenance requirements. It is the responsibility of the owner to ensure that the landscaped area is kept free from debris and that general maintenance of the landscaped area (mowing, prevention of overgrowth) is provided. The owner and contractor are to avoid compaction of the soils in this area.

2.3.4 Phosphorous Removal

As per the Lake Simcoe "*Phosphorous Offsetting Policy, September 2017",* the LSRCA requires that all new developments target control 100% of the phosphorous from leaving the property and every effort must be made to reduce the net phosphorus to zero in post-development conditions.

Based on existing site conditions, the subject site can be classified as a low intensity development. The land is used as a show room facility and experiences light vehicular and pedestrian traffic. This results in a net phosphorus load of 0.14 kg/year for the entire 1.07 ha developable limits.

In post-development conditions, the show room is to be removed and replaced with the childcare facility. The vehicular access is contained to the south parking lot only and the entire land can still be considered low intensity. As such, the net increase of phosphorus loading is zero.

The proposed LID features- the soak-away pits as well as the permeable pavement, have been sized to infiltrate the 10mm event from drainage area 201 and 203. This equates to 70% of annual rainfall events, and therefore when calculating the efficiency rates of both systems at reducing phosphorous, the systems will only be able to provide 70% of the maximum efficiency rates. The maximum efficiency rate is calculated based on the 25 mm rainfall event. As such, the efficiency rates of each system are calculated as follows:

Permeable Pavers Phosphorous Removal:
70% of Removal Rating for a 25 mm Storm
70% * 87% Removal Efficiency = 61%

Soak-Away Pits Phosphorous Removal:
70% of Removal Rating for a 25 mm Storm
70% * 60% Removal Efficiency = 42%

The incorporation of the LIDs is expected to reduce the phosphorus loading by 48%, resulting in a net phosphorous loading of 0.07 kg/year.

As per the Phosphorus Offsetting Policy, offset costs are to be applied in order to achieve net zero phosphorous loading. This results in the proposed offset cost of:

0.07 kg/year x 2.5 offset ratio x $35,000/kg = $6,125

3.0 SANITARY SERVICING

3.1 Existing Conditions

The existing heritage building on site is serviced with a 150 mm sanitary connection along the west building face. The existing sanitary sewer runs west towards Fernbank Road and is tributary to a 250 mm lead running west.

A CCTV inspection was preformed to verify the existing condition of the sanitary sewer. No major deficiencies were recorded, and the inverts were verified on-site. There are no anticipated concerns with connecting into the existing sewer. Refer to **Appendix D** for the detailed CCTV inspection report.

3.2 Proposed Conditions

To facilitate the new retaining wall required between the existing heritage structure and the new childcare building, a drop structure is required at the perimeter of the heritage structure. Therefore, approximately 30 m of sanitary sewer will need to be removed and replaced to accommodate the lower sewer depth. The works will include a new manhole installed east of the existing heritage building to connect to the existing sanitary line exiting the building. Proposed grades around this manhole will be kept relatively flat in order to allow for access.

The sanitary demands generated by the proposed building are calculated based on the Town of Newmarket design criteria. The site will utilize school sewage flows of 1.6 L/s/ha, resulting in a net increase of sanitary flows of 0.14 L/s. Refer to **Appendix D** for calculations.

A new 200 mm sanitary connection is required to service the proposed childcare facility. This connection will be made into the existing line located to the south. The connection to the existing heritage building is to be replaced to facilitate the new retaining wall structure.

4.0 WATER SERVICING

4.1 Existing Conditions

The existing heritage structure is serviced with a water connection along the south perimeter of the building face. As per obtained utility locate information, the existing watermain is 150 mm in diameter. The existing water supply runs west towards Fernbank Road.

4.2 Proposed Conditions

To service the new childcare building and provide adequate fire protection to both buildings as per Building Code, an extension to the existing watermain line is required. A fire hydrant is proposed within 45 m of the primary building entrance.

As per discussion with the architect, no building mechanical consultants have been retained at this time. Water meters within the building will be coordinated with mechanical consultants once engaged. The building will be sprinklered.

As per the Town of Newmarket Engineering Design Criteria, institutional flows of 18 m^3/day/ha were used to determine the domestic flows. The maximum day demand of 2.2 L/min is calculated. Refer to **Appendix E** for calculations.

Based on the Fire Underwriters Survey, the base fire flow for an ordinary constructed building of this size is to be taken as 6,571 L/min. However, with the reductions of a sprinklered building with a standard water supply and the separation charge based on the building next door, the resultant fire flow is 5,000 L/min. Therefore, the total watermain demand (fire flow plus domestic) is 5,002 L/min.

Pressure testing will be completed in the spring to determine the capacity in the existing watermain. As there is no hydrant in the vicinity of the area, the Municipality's input or modelling information is required to complete this analysis.

5.0 EROSION & SEDIMENT CONTROL

The following erosion and sediment control measures will be implemented during construction to minimize sediment transport downstream of the site. The following is in conformance with the Town of Newmarket design notes and details.

- A sediment control fence shall be erected around the perimeter of the site wherever runoff has the potential of leaving the site;
- Temporary catchbasin sediment controls and conveyance swales will be installed as necessary;
- The contractor shall keep adjacent properties free of dust, mud and any other refuse throughout the duration of construction;
- All sediment and erosion control works shall be inspected after each rainfall and/or on a bi-weekly basis and repaired/maintained as necessary; and
- Temporary modular fencing and filter socks are to be installed around the perimeter of the infiltration galleries throughout construction to prevent vehicular traffic and sediments from entering the gallery structures.

All erosion and sediment control measures will be installed prior to commencement of site construction works and will remain in place through the duration of construction. During construction, the erosion and sediment control measures will be monitored and maintained. Refer to **Drawing C1 – Site Grading and Erosion and Sediment Control Plan** for design details, as well as associated notes and details.

CONCLUSIONS

The assessment provided above outlines the proposed servicing strategy for the childcare development.

We trust the information provided in the report meets with your requirements. Should there be any questions or comments, please feel free to contact the undersigned.

Sincerely,

Counterpoint Engineering

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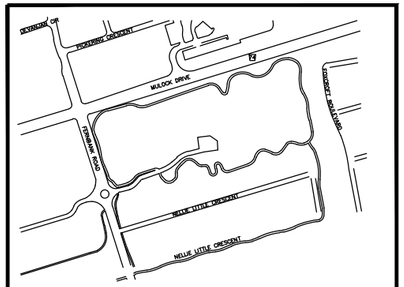
APPENDIX A

FIGURES



KEY PLAN

LEGEND

DRAINAGE BOUNDARY

101 — DRAINAGE ID
A=1.07 — AREA (HA)
C=0.35 — RUNOFF COEFFICIENT

FLOW DIRECTION

		IMPERVIOUSNESS (%)	AREA (m²)
	ROOF AREA	100%	360
	ASPHALT AREA	100%	1940
	LANDSCAPED AREA	0%	8420
	TOTAL	21%	10, 720

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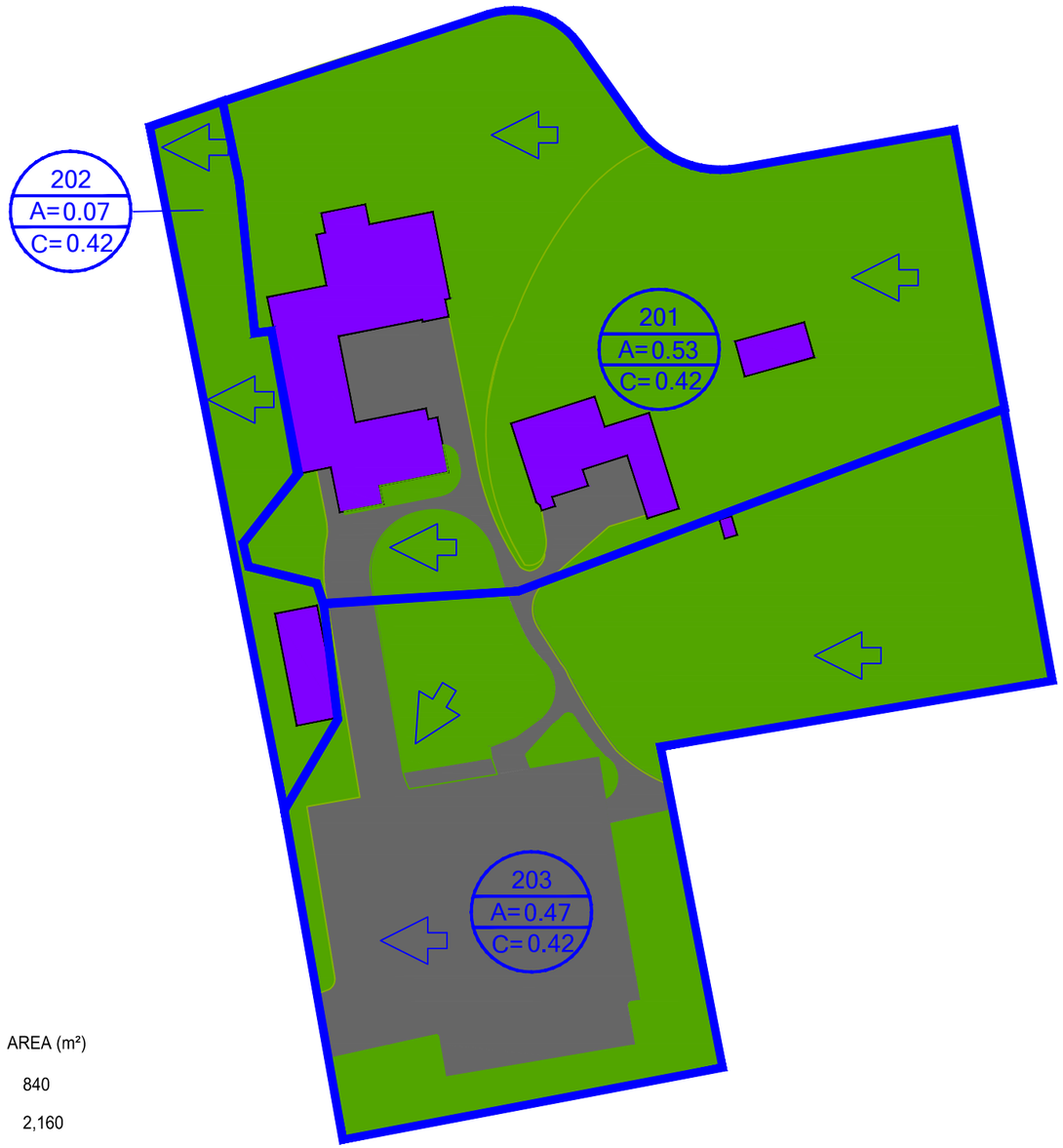
DENISON CHILD CARE CENTRE
605 FERNBANK (900 MULOCK DRIVE)
NEWMARKET, ONTARIO

PRE-DEVELOPMENT DRAINAGE AND IMPERVIOUSNESS PLAN

DESIGNED BY: ES	DATE: MAR 2020
CHECKED BY: CB	PROJECT No. 19055
DRAWING BY: ES	
CHECKED BY: CB	FIGURE No. 1
SCALE: 1: 750	

MULOCK DRIVE



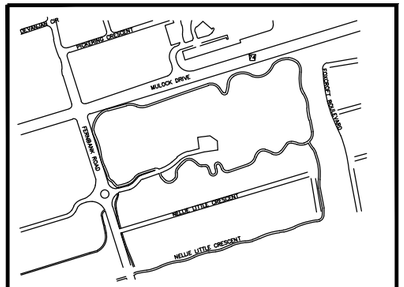
LEGEND

DRAINAGE BOUNDARY

201 / A=1.07 / C=0.42 — DRAINAGE ID; AREA (HA); RUNOFF COEFFICIENT

FLOW DIRECTION

		IMPERVIOUSNESS (%)	AREA (m²)
	ROOF AREA	100%	840
	ASPHALT AREA	100%	2,160
	LANDSCAPED AREA	0%	7,720
	TOTAL	28%	10,720



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DENISON CHILD CARE CENTRE
605 FERNBANK (900 MULOCK DRIVE)
NEWMARKET, ONTARIO

PRE-DEVELOPMENT DRAINAGE AND IMPERVIOUSNESS PLAN

DESIGNED BY: ES	DATE: FEB 2020
CHECKED BY: CB	PROJECT No. 19055
DRAWING BY: ES	
CHECKED BY: CB	FIGURE No. 2
SCALE: 1: 750	

APPENDIX B

Annual Water Balance Calculations

Quality Control Calculations

Phosphorous Control Calculations

Project No.: 19055

SWM DESIGN CALCULATIONS
Water Balance/ Water Budget Assessment

Project Name: Denison Day Care
Municipality: Town of Newmarket
Project No.: 19055
Date: 5-Mar-20

Prepared by: E.S
Last Revised: 5-Mar-20

Catchment Designation	Site				
	Pre-Development	Post-Development	Change (Pre- to Post-)	Post- Development with Mitigation	Change (Pre- to Post- with Mitigation)
Inputs (Volumes)					
Precipitation (m^3/yr)	9,198	9,198	0.0%	9,198	0.0%
Run-on (m^3/yr)	0	0	0.0%	0	0.0%
Other Inputs (m^3/yr)	0	0	0.0%	0	0.0%
Total Inputs (m^3/yr)	**9,198**	**9,198**	**0.0%**	**9,198**	**0.0%**
Outputs (Volumes)					
Precipitation Surplus (m^3/yr)	4,018	4,334	7.9%	4,334	7.9%
Evapotranspiration (m^3/yr)	5,180	4,864	-6.1%	4,864	-6.1%
Infiltration (m^3/yr)	1,288	1,181	-8.3%	1,181	-8.3%
Infiltration Measures (m^3/yr)	0	0	0.0%	1,490	N/A
Total Infiltration (m^3/yr)	1,288	1,181	-8.3%	2,671	107.3%
Runoff Pervious Areas (m^3/yr)	1,053	965	-8.3%	965	-8.3%
Runoff Impervious Areas (m^3/yr)	1,677	2,188	N/A	698	N/A
Total Runoff (m^3/yr)	2,730	3,153	15.5%	1,663	-39.1%
Total Outputs (m^3/yr)	**9,198**	**9,198**	**0.0%**	**9,198**	**0.0%**

SWM DESIGN CALCULATIONS
Water Budget - Pre-Development

Project Name: Denison Day Care
Municipality: Town of Newmarket
Project No.: 19055
Date: 5-Mar-20

Prepared by: E.S
Last Revised: 5-Mar-20

Catchment Designation	Site Area		
	Pervious	Impervious	Total
Area (m^2)	8,420	2,300	**10,720**
Pervious Area (m^2)	8,420	0	**8,420**
Impervious Area (m^2)	0	2,300	**2,300**
Inputs (per Unit Area)			
Precipitation (mm/yr)	858	858	**858**
Run-on (mm/yr)	0	0	**0**
Other Inputs (mm/yr)	0	0	**0**
Outputs (per Unit Area)			
Precipitation Surplus (mm/yr)	278	729	**375**
Evapotranspiration (mm/yr)	580	129	**483**
Infiltration (mm/yr)	153	0	**120**
Infiltration Measures (mm/yr)	0	0	**0**
Total Infiltration (mm/yr)	153	0	**120**
Runoff Pervious Areas (mm/yr)	125	0	**98**
Runoff Impervious Areas (mm/yr)	0	729	**156**
Total Runoff (mm/yr)	125	729	**255**
Total Outputs (mm/yr)	**858**	**858**	**858**
Difference (Inputs-Outputs)	**0**	0	**0**
Inputs (Volumes)			
Precipitation (m^3/yr)	7,224	1,973	**9,198**
Run-on (m^3/yr)	0	0	**0**
Other Inputs (m^3/yr)	0	0	**0**
Total Inputs (m3/yr)	**7,224**	**1,973**	9,198
Outputs (Volumes)			
Precipitation Surplus (m^3/yr)	2,341	1,677	**4,018**
Net Surplus (m^3/yr)	2,341	1,677	**4,018**
Evapotranspiration (m^3/yr)	4,884	296	**5,180**
Infiltration (m^3/yr)	1,288	0	**1,288**
Infiltration Measures (m^3/yr)	0	0	**0**
Total Infiltration (m^3/yr)	1,288	0	**1,288**
Runoff Pervious Areas (m^3/yr)	1,053	0	**1,053**
Runoff Impervious Areas (m^3/yr)	0	1,677	**1,677**
Total Runoff (m^3/yr)	1,053	1,677	**2,730**
Total Outputs (m^3/yr)	**7,224**	**1,973**	9,198
Difference (Inputs-Outputs)			**0**

SWM DESIGN CALCULATIONS
Water Budget - Post-Development (No Mitigation)

Project Name: Denison Day Care
Municipality: Town of Newmarket
Project No.: 19055
Date: 5-Mar-20

Prepared by: E.S
Last Revised: 5-Mar-20

Catchment Designation	Site Area		
	Pervious	Impervious	Total
Area (m^2)	7,720	3,000	**10,720**
Pervious Area (m^2)	7,720	0	**7,720**
Impervious Area (m^2)	0	3,000	**3,000**
Infiltration Factors			
MOE Infiltration Factor	0.39	0	
Run-off from Impervious Surfaces	0	0.8	
Inputs (per Unit Area)			
Precipitation (mm/yr)	858	858	**858**
Run-on (mm/yr)	0	0	**0**
Other Inputs (mm/yr)	0	0	**0**
Outputs (per Unit Area)			
Precipitation Surplus (mm/yr)	278	729	**404**
Evapotranspiration (mm/yr)	580	129	**454**
Infiltration (mm/yr)	153	0	**110**
Infiltration Measures (mm/yr)	0	0	**0**
Total Infiltration (mm/yr)	153	0	**110**
Runoff Pervious Areas (mm/yr)	125	0	**90**
Runoff Impervious Areas (mm/yr)	0	729	**204**
Total Runoff (mm/yr)	125	729	**294**
Total Outputs (mm/yr)	**858**	**858**	**858**
Difference (Inputs-Outputs)	**0**	0	**0**
Inputs (Volumes)			
Precipitation (m^3/yr)	6,624	2,574	**9,198**
Run-on (m^3/yr)	0	0	**0**
Other Inputs (m^3/yr)	0	0	**0**
Total Inputs (m3/yr)	**6,624**	**2,574**	9,198
Outputs (Volumes)			
Precipitation Surplus (m^3/yr)	2,146	2,188	**4,334**
Net Surplus (m^3/yr)	2,146	2,188	**4,334**
Evapotranspiration (m^3/yr)	4,478	386	**4,864**
Infiltration (m^3/yr)	1,181	0	**1,181**
Infiltration Measures (m^3/yr)	0	0	**0**
Total Infiltration (m^3/yr)	1,181	0	**1,181**
Runoff Pervious Areas (m^3/yr)	965	0	**965**
Runoff Impervious Areas (m^3/yr)	0	2,188	**2,188**
Total Runoff (m^3/yr)	965	2,188	**3,153**
Total Outputs (m^3/yr)	**6,624**	**2,574**	9,198
Difference (Inputs-Outputs)			**0**

Note:
- Evaporation from impervious area assumed to be 15% of precipitation

SWM DESIGN CALCULATIONS
Water Budget - Post-Development (With Mitigation)

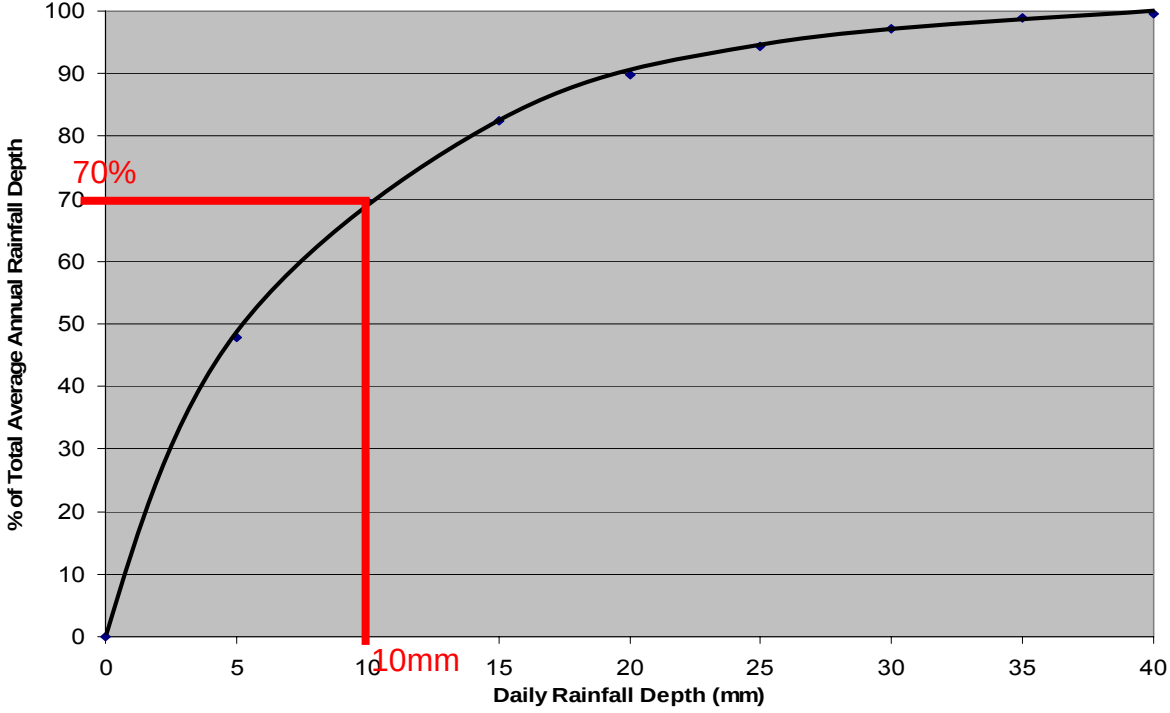
Project Name: Denison Day Care
Municipality: Town of Newmarket
Project No.: 19055
Date: 5-Mar-20

Prepared by: E.S
Last Revised: 5-Mar-20

Catchment Designation	Area Towards Permeable Pavement (Area 203)			Area towards Soakaway Pits (Area 201)			Remainder of Site (Area 202)			Totals
	Pervious	Impervious	Sub Total	Pervious	Impervious	Sub Total	Pervious	Impervious	Sub Total	Site
Area (m^2)	3,192	1,518	4,710	3,860	1,400	5,260	668	82	750	10,720
Pervious Area (m^2)	3,192	0	3,192	3,860	0	3,860	668	0	668	7,720
Impervious Area (m^2)	0	1,518	1,518	0	1,400	1,400	0	82	82	3,000
Inputs (per Unit Area)										
Precipitation (mm/yr)	858	858	**858**	**858**	**858**	**858**	858	858	**858**	**858**
Run-on (mm/yr)	0	0	**0**	**0**	**0**	**0**	0	0	**0**	**0**
Other Inputs (mm/yr)	0	0	**0**	**0**	**0**	**0**	0	0	**0**	**0**
Outputs (per Unit Area)										
Precipitation Surplus (mm/yr)	278	729	**423**	**278**	**729**	**398**	278	729	**327**	**209**
Evapotranspiration (mm/yr)	580	129	**435**	**580**	**129**	**460**	580	129	**531**	**228**
Infiltration (mm/yr)	153	0	**104**	**153**	**0**	**112**	153	0	**136**	**55**
Infiltration Measures (mm/yr)		511	**165**	**0**	**511**	**136**	0	0	**0**	**72**
Total Infiltration (mm/yr)	153	511	**268**	**153**	**511**	**248**	153	0	**136**	**127**
Runoff Pervious Areas (mm/yr)	125	0	**85**	**125**	**0**	**92**	125	0	**111**	**45**
Runoff Impervious Areas (mm/yr)	0	219	**71**	**0**	**219**	**58**	0	729	**80**	**37**
Total Runoff (mm/yr)	125	219	**155**	**125**	**219**	**150**	125	729	**191**	**82**
Total Outputs (mm/yr)	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**858**	**437**
Difference (Inputs-Outputs)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	**0**	**0**
Inputs (Volumes)										
Precipitation (m^3/yr)	2,739	1,302	**4,041**	3,312	1,201	**4,513**	573	70	**644**	**9,198**
Run-on (m^3/yr)	0	0	**0**	0	0	**0**	0	0	**0**	**0**
Other Inputs (m^3/yr)	0	0	**0**	0	0	**0**	0	0	**0**	**0**
Total Inputs (m3/yr)	**2,739**	**1,302**	**4,041**	**3,312**	**1,201**	**4,513**	**573**	**70**	**644**	**9,198**
Outputs (Volumes)										
Precipitation Surplus (m^3/yr)	887	1,107	**1,994**	1,073	1,021	**2,094**	186	60	**246**	**4,334**
Net Surplus (m^3/yr)	887	1,107	**1,994**	1,073	1,021	**2,094**	186	60	**246**	**4,334**
Evapotranspiration (m^3/yr)	1,851	195	**2,047**	2,239	180	**2,419**	387	11	**398**	**4,864**
Infiltration (m^3/yr)	488	0	**488**	591	0	**591**	102	0	**102**	**1,181**
Infiltration Measures (m^3/yr)	0	775	**775**	0	715	**715**	0	0	**0**	**1,490**
Total Infiltration (m^3/yr)	488	775	**1,263**	591	715	**1,305**	102	0	**102**	**2,671**
Runoff Pervious Areas (m^3/yr)	399	0	**399**	483	0	**483**	84	0	**84**	**965**
Runoff Impervious Areas (m^3/yr)	0	332	**332**	0	306	**306**	0	60	**60**	**698**
Total Runoff (m^3/yr)	399	332	**731**	483	306	**789**	84	60	**143**	**1,663**
Total Outputs (m^3/yr)	**2,739**	**1,302**	**4,041**	**3,312**	**1,201**	**4,513**	**573**	**70**	**644**	**9,198**
Difference (Inputs-Outputs)			**0**			**0**			**0**	**0**

Note:
- Evaporation from impervious area assumed to be 15% of precipitation

Figure 1a- % of Total Annual Average Rainfall Depth Vs. Daily Rainfall Amounts
(Based on 1991 Toronto Rainfall Data from 16 Rain Gauge Stations)



SWM DESIGN CALCULATIONS
Water Balance Calculations- Soak Away Pits

Project Name: Newmarket Daycare
Municipality: Newmarket
Project No.: 19055
Date: 5-Mar-20

Prepared by: CB
Checked by: ES
Last Revised: 5-Mar-20

Total Contributing Area	5,260 m^2	
Contibuting Pervious Area	3860 m^2	
Contributing Impervious Area	1400 m^2	
10mm Retention Target	**14** m^3	

**Impervious area only*

Assumed Infiltration Rate	12	mm/hr	From hydrogeological report
Drawdown Time	48	hours	
Max. Drawdown Depth	1.44	m	
Drawdown Design Depth	0.5	m	
Area of Soakway Pit 1	55	m^2	
Area of Soakway Pit 2	25	m^2	
Porosity	0.4		
Total Infiltration Volume	**16**	m^3	Equates to 70% of rainfall

SWM DESIGN CALCULATIONS
Water Balance Calculations-Permeable Pavement

Project Name: Newmarket Daycare
Municipality: Newmarket
Project No.: 19055
Date: 5-Mar-20

Prepared by: CB
Checked by: ES
Last Revised: 5-Mar-20

Total Contributing Area	4,710	m^2
Contibuting Pervious Area	3192	m^2
Contributing Impervious Area	1518	m^2

10mm Retention Target	**15**	m^3

**Impervious area only*

Assumed Infiltration Rate	12	mm/hr	From hydrogeological report
Drawdown Time	48	hours	
Max. Drawdown Depth	1.44	m	
Drawdown Design Depth	0.65	m	
Area of Permeable Pavement	60	m^2	
Porosity	0.4		
Total Infiltration Volume	**16**	m^3	Equates to 70% of rainfall

Counterpoint Engineering
Quality Control from LID Measures

Soakaway Pits and Pemeable Pavement

Table 3.2 Water Quality Storage Requirements based on Receiving Waters[1, 2]

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	25	30	35	40
	Wetlands	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
Normal 70% long-term S.S. removal	Infiltration	20	20	25	30
	Wetlands	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
Basic 60% long-term S.S. removal	Infiltration	20	20	20	20
	Wetlands	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240

Contributing Area	1.070	ha
Contributing Area Imperviousness	55	%
Trench Volume Provided	**32**	m^3
Trench Volume Required for 60% Removal	21	m^3
Trench Volume Required for 70% Removal	21	m^3
Trench Volume Required for 80% Removal	**32**	m^3

Total TSS Removal as per MECP Table 3.2 >80 %

Ontario
MINISTRY OF THE ENVIRONMENT

Database Version: V 2.0 Release Update
Update Date: 30-Mar-12

Project DEVELOPMENT Summary

DEVELOPMENT: Dennison Child Care Facility
Subwatershed: East Holland

Total Pre-Development Area (ha):	1.0700	Total Pre-Development Phosphorus Load (kg/yr):	0.14

Pre-Development Land Use	Area (ha)	P coeff. (kg/ha)	P Load (kg/yr)
Low Intensity Development	1.07	0.13	0.14

POST-DEVELOPMENT LOAD

Post-Development Land Use	Area (ha)	P coeff. (kg/ha)	Best Management Practice applied with P Removal Efficiency		P Load (kg/yr)
Low Intensity Development	0.07	0.13	NONE	0%	0.01
Low Intensity Development	0.53	0.13	Soakaways - Infiltration trenches	**42%**	0.04

Efficieny is based off of 70% of the typical removal efficieny of soakaway pits (60%)

NOTE: BMP efficiency has been adjusted from the reference provided value by -18% (from 60% to 42%)

Low Intensity Development	0.47	0.13	Permeable Pavement	**61%**	0.02

Efficieny is based off of 70% of the typical removal efficieny of permeable pavers (87%)

NOTE: BMP efficiency has been adjusted from the reference provided value by -26% (from 87% to 61%)

Post-Development Area Altered:	**1.07**
Total Pre-Development Area:	**1.07**
Unaffected Area:	**0**

	P Load (kg/yr)
Pre-Development:	**0.14**
Post-Development:	**0.14**
Change (Pre - Post):	**0.00**
0% Net Reduction in Load	
Post-Development (with BMPs):	**0.07**
Change (Pre - Post):	**0.07**
48% Net Reduction in Load	

DEVELOPMENT: **Dennison Child Care Facility**
Subwatershed: **East Holland**

CONSTRUCTION PHASE LOAD

SUMMARY WITH IMPLEMENTATION OF BMPs	**P Load (kg/yr)**
Pre-Development:	**0.14**
Construction Phase Amortized Over 8 Years :	to be determined
Post-Development:	**0.07**
Post-Development + Amortized Construction:	**to be determined**
Pre-Development Load - Post-Development Load:	**0.07**
Conclusion:	**48% Reduction in Load**
Pre-Development Load - (Post-Development + Amortized Construction Load):	**to be determined**
Conclusion:	**to be determined**

Based on a comparison of Pre-Development and Post-Development loads, and in consideration of Construction Phase loads, the Ministry would encourage the Municipality to:

APPENDIX C

Maintenance Manuals

Project No.: 19055

PERMEABLE PAVER
MAINTENANCE GUIDE

UNILOCK®

DESIGNED TO CONNECT

This guide is specific to Unilock® permeable pavers as a maintainable system for storm water runoff and does not cover cleaning concrete pavers themselves. Please see the Unilock Product Care and Maintenance Guide (available for download at www.unilock.com) for information on cleaning concrete pavers. The maintenance information in this guide is intended for Unilock permeable paver systems only and not for other types of permeable pavers or pervious systems.

Maintenance is necessary for any type of permeable pavement system, much like any impervious pavement with catch basins and underground infrastructure. Over the lifetime of the permeable paver system there will be a need to clean any sediment, soil, dirt and debris from the joint aggregate material to maintain a sufficient infiltration rate. Every project will vary in performance needs, as well as to the frequency in which the joint material must be cleaned. The surface infiltration rate must be greater than the regional 100 year rainfall intensity to adequately ensure no runoff is generated, which is only one goal for using permeable pavers. Unilock® suggests establishing a maintenance plan using the techniques in this document to prevent clogging.

PRECEDING MAINTENANCE

Before providing maintenance on permeable paver systems, proper installation and protection during construction is required. Here are a few conditions to observe, require and prevent for establishing a successful system:

1. Verify correct installation and materials:
- Hire contractors with knowledgeable experience installing permeable pavers.
- Review and approve all sub-base, base and joint aggregate materials.
- Do not allow sand and dense-graded aggregates.

2. Prevent construction damage:
- Limit subgrade soil compaction when infiltration is necessary.
- Restrict vehicles with muddy tires from driving over newly placed pavers.
- Do not mix aggregate materials.

3. Refill joint material:
- Once, between 3 and 6 months after initial installation.
- Repeat as needed - approximately every 5-10 years.

4. Avoid stockpiling of materials such as:
- Topsoil.
- Mulch.

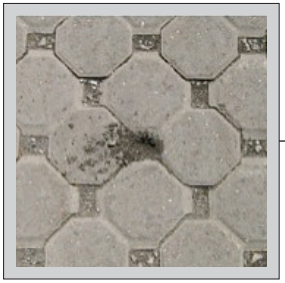
The proper materials and installation execution can be found in the Unilock specifications for permeable pavers. Both residential and commercial projects will utilize the same base, setting bed and joint aggregates. Some projects many not require sub-base materials, underdrainage or geotextile. It is not necessary to separate the setting bed from the base aggregates with a geotextile.

EXAMPLES OF COMMON MAINTENANCE ISSUES

Below are several warning signs and visual clues of common maintenance issues which must be prevented and addressed or remediated to ensure continued surface infiltration.

1. Slow Draining/Runoff:
- Verify with simple infiltration testing or observe after rain storms.
- Surface should drain immediately.

2. Ponding and Bird Baths:
- Rule of thumb: if more than a nickel deep one minute after a rainfall event, maintenance is necessary.
- Verify correct materials were installed.
- Exceptions at bottom of slopes.



3. Surface Crusting:
- Identify if there is a problem such as run on sediments.
- Increase cleaning frequency in troubled areas.
- Remove debris immediately.

4. Weeds:
- Weeds will not germinate unless there is a collection of soil or moisture.
- Remove weeds immediately.
- Clean sediment from joint material.
- Chemical treatment may be required prior to maintenance removal.

5. Covered Joint Material:
- Identify problem and correct.
- Remove immediately.
- Joint material should appear as photo on right.

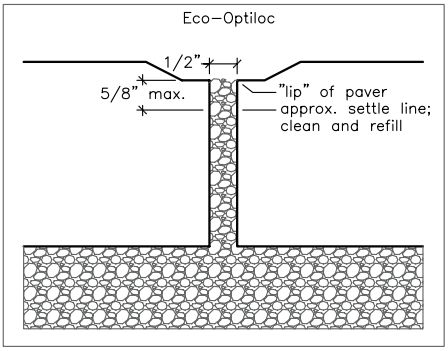
These common problems can often be easily remedied by maintaining the proper joint aggregate level.

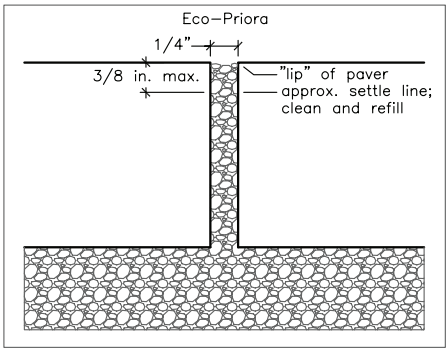
MAINTENANCE TYPES

There are two service types for maintaining the integrity of a permeable paver system.

1. **Preventative** – removes most miscellaneous debris before being trapped in the joint aggregate material causing clogging. This usually does not require removal of any joint material to restore infiltration.

2. **Restorative** – requires some removal or complete removal of the joint material to renew infiltration. Occurs after miscellaneous debris has been captured and lodged in the joint aggregate.





**Note:* *Both maintenance types will be most effective when the joint aggregate material is filled to the "lip" of the paver. If the joint material has settled more than the joint width, plus 1/8 inch below the paver lip, the maintenance equipment is significantly less effective and potentially more expensive.*

MAINTENANCE EQUIPMENT

Maintenance equipment requirements will vary according to project size, age, and product type.

Project Type 1: For smaller pedestrian type areas such as sidewalks, driveways, plazas, patios or similar:

Preventative:

1. Hand-Held Bristle Broom

- Available at any hardware store.
- Sweep as needed to keep the surface clear of debris.
- Approximate cost: $15.

2. Leaf Blower

- Electric or gas powered.
- Minimum air speed of 120 mph.
- Joint aggregate material will remain in place while removing debris from paver surface.
- Approximate cost: $50 to $300.

3. Rotary Brush
- Poly bristles only.
- Flips debris from joint.
- Will require slight refilling of the joint aggregate material.
- Approximate cost: varies depending on attachment vehicle.

Restorative:

1. Wet/Dry Shop Vacuum
- Minimum 4 HP (peak) motor with 130 cubic feet per minute suction.
- Will remove some joint aggregate material.
- Replenish removed joint aggregate material to "lip" of paver.
- Approximate cost: $50 to $150.

2. Riding Litter Vacuum
- Tennant ATLV 4300.
- 48 inch wide vacuum head.
- 110 gallon capacity.
- Can also be used as a preventative technique.
- Will evacuate most debris from joint except for aggregate material.
- Approximate cost: approx. $25K new.

3. Powerwasher
- Capable of spraying 1,400 to 1,800 psi.
- Spray at a 30 degree angle approximately 18 to 24 inches from the surface.
- Will evacuate joint material.
- Replenish removed joint aggregate material to "lip" of paver.
- Approximate cost: $125 to $500.

Project Type 2: For larger vehicular areas such as roads, parking lots, alleys, plazas or similar that can support vehicles:

Preventative:

1. Rotary Brush
- Poly bristles only.
- Flips debris from joint.
- Will require slight refilling of the joint aggregate material.
- Approximate cost: Varies depending on attachment vehicle.

2. Broom Sweepers

- Typical "street sweeper" type.
- Rotating curb brushes with center pickup.
- Poly bristles only.
- Do not utilize water to clean the surface as this can have detrimental effects on the cleaning.
- Best for seasonal cleaning.
- Approximate cost: $100 to $120 per hour from a service company.

3. Regenerative Air Sweepers

- Light duty suction cleaning.
- Utilizes stream of air blowing horizontally across surface and vacuuming.
- No rotating brushes.
- Approximate cost: $45 to $65 per hour from a service company.

Restorative:

1. Vacuum Sweepers

- Vacall Dynamic Multi-Purpose Vacuum. *(top photo)*
- Elgin Whirlwind. *(bottom photo)*
- Heavy duty cleaning.
- Minimum suction of 14,000 cubic feet per minute.
- Complete evacuation of joint aggregate material.
- Replenish removed joint aggregate material to "lip" of paver.
- Approximate cost: $2.50 to $4.50 per parking space.

2. Powerwashers

- Capable of spraying 1,400 to 1,800 psi.
- Spray at a 30 degree angle approximately 18 to 24 inches from the surface.
- Will evacuate joint aggregate material.
- Replenish removed joint aggregate material to "lip" of paver.

STRATEGIC PROCEDURES FOR MAINTAINING INFILTRATION

Observe and implement the following habitual procedures to ensure longevity of the system.

1. Weekly – prevent contamination from routine landscape maintenance such as grass clippings from mowing, hedge trimming, mulching plant beds, etc. by implementing the following joint opening cleaning procedures immediately after contamination occurs:

- Hand broom debris from the paver surface.
- Blow debris from the paver surface with backpack blower type device, collect and dispose.
- Mechanically sweep paver surface.

2. Monthly – observe any collection areas of debris, dirt, topsoil, mulch, etc. after season events such as snowfall, rain storms, leaf litter, etc. and investigate if clogging is occurring. Immediately restore infiltration using the following cleaning options:
- Break up any crust covering the joint aggregate material with hand broom for smaller areas or mechanically with a rotary sweeper for larger areas. Remove debris material.
- When necessary, restore infiltration using wet/dry shop vacuum for small areas or vacuum truck for larger areas by removing debris from joint aggregate material.
- Replenish joint aggregate material to "lip" of paver.

3. Yearly – establish a seasonal maintenance schedule that includes the following:
- Sweep entire permeable paving surface with appropriate preventative sweeping devices.
- Replenish joint aggregate material to "lip" of paver.

4.Ten years plus – plan long term maintenance to rejuvenate infiltration rates:
- Complete restoration of the joint aggregate material.
- Replenish joint with cleaned or new aggregate material to "lip" of paver.

RECOMMENDED SEASONAL MAINTENANCE SCHEDULE

Unilock suggests establishing a best practices maintenance program to ensure longevity of the systems before restorative action is required. Biannual preventative maintenance is suggested as shown in the schedule below. This includes sweeping once in the early spring and once again in the late fall. Below is a preventative maintenance timeline that includes four maintenance suggestions:

1. After the snow melt – March 1 through April 15
- Broom, blow, rotary brush or sweep entire surface.
- Clean debris from paver surface in location of snow stockpile area.
- Replenish joint aggregate material after cleaning.
- Every fifth year, vacuum or power wash problem areas and refill joint material.

2. Late Spring – April 1 through May 15
- Broom, blow, rotary brush or sweep flowers from trees and shrubs.
- Collect any additional debris from areas mulched or planted with annual flowers.
- Replenish joint aggregate material as necessary.

3. Late Summer – July 15 through August 30
- Broom, blow, rotary brush or sweep lawn and shrub clippings or tree fruits.
- Collect any additional debris from summer activities such as charcoal coals inadvertently dumped on the permeable surface, beach sand, etc.
- Replenish joint aggregate material as necessary.

4. Late Fall – October 15 through November 30
- Broom, blow, rotary brush or sweep plant leaves.
- Replenish joint aggregate material as necessary.

Various factors will affect each project's preventative maintenance timeline and must be reviewed individually.

See the Recommended Seasonal Maintenance Schedule chart on next page.

Recommended Maintenance Schedule		Seasonal BMP			
		After Snow Melt	Late Spring	Late Summer	Late Fall
Techniques	**Project Type 1: Preventative - choose one**		1x per season	optional	1x per season
	Bristle Broom	**	*	*/**	*
	Leaf Blower	**	*	*/**	*
	Rotary Brush		*	*/**	*
	Project Type 1: Restorative		**		**
	Wet-Dry Vacuum	**	**	**	**
	Riding Litter Vacuum		*	**1x every 5 yrs.	*
	Powerwasher	**	**	**	**
	Project Type 2: Preventative - choose one		1x per season	optional	1x per season
	Rotary Brush		*	*	*
	Broom Sweepers		*		*
	Regenerative Air Sweepers		*		*
	Project Type 2: Restorative				
	Vacuum Sweepers			** 1x every 10 yrs.	
	Powerwasher	**	**	**	**

* recommended

** as needed per Strategic Procedures

WINTER MAINTENANCE AND DE-ICING

Durability is one benefit that Unilock paving stones are known for. Almost all Unilock paving stones have a slight bevel around the edge of the stone. This helps protect the edges from potential chipping by snow clearing equipment. Always use a plastic snow shovel for paving stones. Also fit snow blowers with plastic shoes on the adjustable gliders and on the scoop edge.

When using commercial snow removal companies, confirm in writing they have protective edges on the snowplow equipment to avoid scratching the surface. Although the metal on snow clearing equipment will not adversely affect Unilock paving stones structurally, the contact of any steel on concrete can potentially leave tiny particles of metal in the paver surface which will rust and leave unsightly brown streaks. (A good example of this can be seen on the municipal curbs at the street). To reduce aesthetic damage to the paver surface, only use a polymer or rubber cutting edge on the plow.

De-icing substances, when used in proper amounts, will not damage good-quality concrete. They will, however, speed up the surface wear on some styles of pavers. Many of the exposed aggregate products and tumbled products are unaffected by virtue of their style.

There are three primary types of de-icing salts:

- Sodium chloride (common rock salt) is the most popular de-icing salt. It is widely available and it will melt snow and ice at temperatures down to approximately 16° F. Below 16° F, rock salt stops melting snow and ice. Sodium chloride can damage adjacent grass, plants and metal. Apply with caution and use as sparingly as possible.

- Calcium chloride is another de-icing salt. It generally looks like small, white, round, pellets. It will melt snow down to about 0° F. It can irritate skin. Studies indicate that depending on the concentration, calcium chloride is less damaging to grass than sodium chloride is. Heavy concentrations of calcium chloride can chemically attack concrete.

- Potassium chloride is a de-icing salt available in some markets. It will not hurt skin or damage plants. However, it melts ice only when the air temperature is above 15° F, but it can be combined with sand to improve effectiveness.

Note: *Do not use magnesium chloride.*

Note: *Do not use sand for anti-skid with permeable pavers as it will clog the joint material.*

Note: *Fertilizers that contain ammonium nitrate and ammonium sulfate should not be used for de-icing since these substances attack the integrity of concrete. Always read the manufacturer's recommendations for use and heed all warnings and cautions.*

NOTES

When we take care of the earth,
it will ultimately take care of us.

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Aurora, IL 60505
Tel: (630) 892-9191
Fax: (630) 892-9215

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Rittman, OH 44270
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APPENDIX D

Sanitary Calculations

Project No.: 19055

CCTV review report

project:	Denison Child Care Facility
location:	Newmarket, ON
contractor:	

date:	March 03, 2020	**pages:**	2
re:	CCTV Review Report	**file #:**	19055

Please find below our review of the site servicing CCTV inspection reports and videos prepared by T2UE dated January 27th, 2020 and delivered to our office February 27th, 2020. Included with this report is the CCTV inspection reports and videos for your records.

1. Sanitary Sewers:

1. SAN MH1 to MH: West Lead (250mm PVC.) – Clear debris from 0.2m to 1.1m. Clear debris @ 5.3m.

Figures:

Figure 1

Figure 2

It is recommended that once all debris is removed that all lines and laterals are re-flushed prior to certification.

Review Completed By:

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Contract Administrator
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Field Services Manager
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Counterpoint Engineering Inc.
Sanitary Flow Generation

Project:	Denison Child Care Facility
Project No:	19055
Location:	Newmarket, Ontario
Date:	Mar-20

Town of Nemarket Design Criteria

Institutional Average Flow	1.6 L/s/ha

Town of Newmarket Guidelines: Peak Flow

Peaking Factor	n/a - included in average flow
Extraneuous Flows	n/a - included in average flow

Site Stats

Proposed GFA	**892.07**	m^2

Sanitary Site Flow Rates

Sanitary Peak Design Flow=	**0.14**	**L/s**

APPENDIX E

Watermain Calculations

Project No.: 19055

Project No:	61001705	Cross Street:	
Client:	CPE		Mulock Dr and Fernbank Rd
		City:	Newmarket
Project Name.:	Denison Child Care Facility	Province:	Ontario

TEST HOLE DATA SUMMARY

Utility Type

GAS	Gas Main/Pipeline	GS	Gas Service
WM	Watermain	WS	Water Service
SAN	Sanitary Sewer	BT	Buried Telecom
STM	Storm Sewer	TV	Cable TV
COMB	Combined Sewer	FOC	Fibre Optic Cable
BE	Buried Electric	EXP	Exploratory
BE-SL	Street Light	UNK	Unknown
BE-TL	Traffic Light		

Utility Material

CD	Concrete Duct	DBC	Direct Buried Cable
CLAY	Clay Pipe	PL	Plastic (e.g. PVC, PE, HDPE)
CONC	Concrete	MET	Metallic (e.g. Iron, Steel, Coated)
CSP	Corrugated Steel Pipe	UNK	Unknown
CU	Copper Pipe		

Surface Type

A	Asphalt	I	Interlock Brick
C	Concrete	NG	Natural Ground

ID'd By

RC Rod & Cap ND Nail & Disk S Sleeve W Wooden Stake L Lathe X Cut X PK PK Nail

TH No.	Client Ref. No.	TH Date (m/d/yy)	Utility Type	Utility Material	Utility Width (Field)	Utility Elevation		Depth of Utility From Grade		Reference Marker			Depth Excavation from Grade	Utility Direction
						Top	Bottom	Top	Bottom	Elev.	ID'd	Surface		
					mm	m	m	m	m	m	By	Type	m	
TH1	TH1	2/13/20	WM	PL	165	263.37	-	1.43	-	264.80	Cut X	A	1.52	E-W

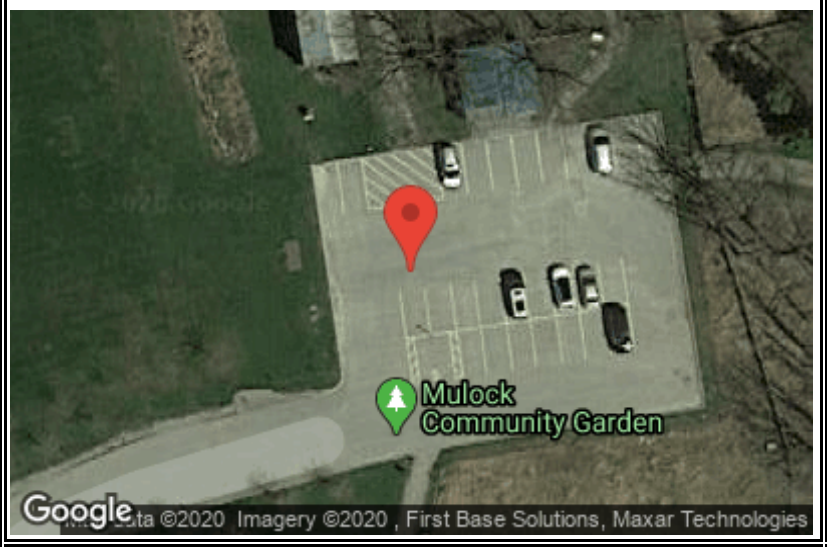
Project No:	61001705
Client:	CPE
Project Name.:	Denison Child Care Facility

TEST HOLE DATA SHEET

TEST HOLE No.:

TH1

MAP

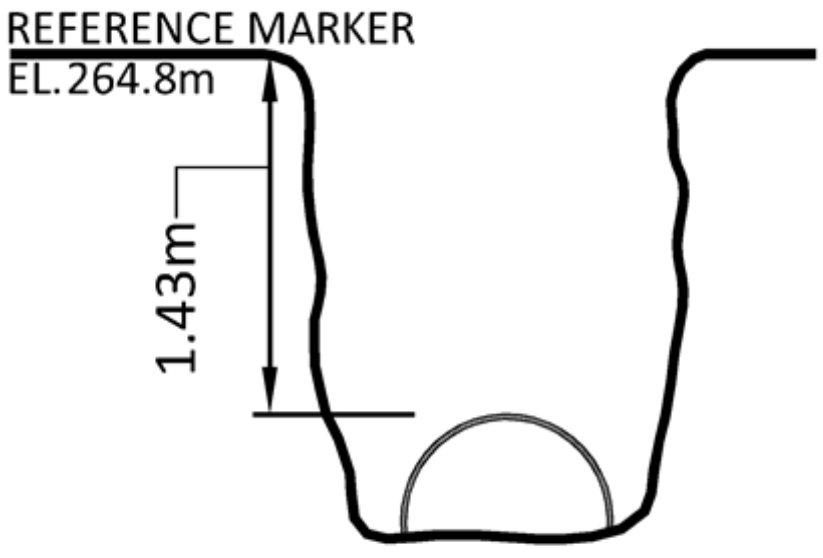


SITE PHOTO

TH Date (m/d/yy)	2/13/20	
Utility Description		
Utility Type	WM	
Utility Material	PL	
Utility Width (Field)	165	mm
Utility Width (Record)	-	mm
Utility Direction	E-W	
Elevation of Utility		
Top of Utility	263.37	m
Bottom of Utility	-	m
Depth From Grade		
Top of Utility	1.43	m
Bottom of Utility	-	m
Depth of Excavation	1.52	m
Reference Marker		
Easting	625409.06	
Northing	4878010.36	
Reference Elevation	264.80	m
Location	Center of Utility	
ID'd By	Cut X	
Surface Type	A	

TEST HOLE PHOTO

TEST HOLE CROSS SECTION



Notes:
FIELD VERFIED APPROX. 165mm WATERMAIN. FIELD OBSERVATIONS INDICATE WATERMAIN IS WRAPPED IN BLACK PLASTIC WRAPPING.

Revision Notes:

Revision Date: M/d/yy | Reviewed Date: 2/25/20 | Reviewed By: MT

Counterpoint Engineering Inc.
Domestic Water Demand

Project:	Denison Child Care Facility
Project No:	19055
Location:	Newmarket, Ontario
Date:	Mar-20

Town of Newmarket Guidelines		
Institutional	18 m3/day/ha	
Maximum Day Peaking Factor	2	
Peak Hour Factor	3	

Site Stats		
Proposed GFA	892.07	m^2

Watermain Domestic Demand		
Maximum Day Demand=	2.2	L/min

Counterpoint Engineering Inc.

REQUIRED FIRE FLOW WORKSHEET - PROPOSED DEVELOPMENT
Fire Underwriters Survey

Project : **Denison Child Care Centre**
Project No: **19055**
Client: **Town of Newmarket**
Location: **Town of Newmarket**

Guide for Determination of Required Flow Copyright I.S.O

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

where
F = the required fire flow in litres per minute.
C = coefficient related to the type of construction.
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).
= 0.6 for fire-resistive construction (fully protected frame, floors, roof).
A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

Type of Construction		Class Factor
WF	Wood Frame	1.5
OC	Ordinary Construction	1.0
NC	Non-Combustible	0.8
FC	Fire-Resistive	0.6

Contents		% Reduction
NC	Non-Combustible	25
LC	Limited Combustible	15
C	Combustible	0
FB	Free Burning	15
RB	Rapid Burning	25

Area Notes for Fire Resistive Buildings (from FUS manual, 1999):

If Vertical Openings are inadequately protected (less than 1-hour fire rating): Area is the total of the two largest adjoining floors (above ground level) plus 50% of the area of each of the next 8 adjoining floors above that.

If Vertical Openings are adequately protected (at least 1-hour fire rating): Area is the total of the largest floor (above ground level) plus 25% of the area of each of the next 2 immediately adjoining floors above that.

1) Fire Flow

Type of Construction:	OC	
C=	1	
A*=	892	m^2
F=	6,571	**L/min**

Note: Exterior walls are proposed brick and/or stone with wood frame.

2) Occupancy Reduction/Surcharge

Contents Factor:		C				
Reduction/Surcharge of		0%		=	0	L/min
F=	6571L/min	0	L/min	=	6,571	**L/min**

3) System Type Reduction

NFPA 13 Sprinkler:	yes	30%
Standard Water Supply:	yes	10%
Fully Supervised:	no	0%
Total		40%

Reduction of		40%	L/min	=	2,628	L/min
F=	6571L/min -	2,628	L/min	=	3,943	**L/min**

4) Separation Charge

Building Face	Dist(m)	Charge
North	50	0%
East	9	20%
South	50	0%
West	50	0%
Total		20%

of 6570.859 **L/min** = 1,314 **L/min**
(max exposure charge can be 75%)

Separation	Charge	Separation	Charge
0 to 3m	25%	20.1 to 30 m	10%
3.1 to 10m	20%	30.1 to 45m	5%
10.1 to 20m	15%		

F= 3943L/min + 1314L/min = 5,257 **L/min** (2,000L/min<F<45,000L/min)

F=	5,000	**L/min**
F=	83	**L/s**
F=	1,321	**gpm**

(round to the nearest 1,000L/min)