Stormwater Management Report

Wildfire Golf Club – Building Addition
Township of Douro – Dummer
Engage Project No. 21013

Engage Engineering Ltd.

September 2021

REVISION SUMMARY

Revision No.	Revision Title	Date	Revision Summary
1	Issued for 1st Submission	April 16th, 2021	
2	Issued for 2nd Submission	September 17th, 2021	

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1.0 Introduction

1.1 Purpose

Engage Engineering Limited (Engage) has been retained by KMD Community Planning and Consulting Inc. on behalf of the landowner to prepare a Stormwater Management Report (SWM) in support of the proposed cart storage building addition at Wildfire Golf Club in the Township of Douro-Dummer (Town), in the County of Peterborough. The development will include the construction on one cart storage building, asphalt walkway and a variety of landscape features. The purpose of this report is to support the site plan application by quantifying the impact that the proposed development will have from a stormwater management perspective and recommend any stormwater management measures required to maintain post-development flows to pre-development levels, while providing the appropriate quantity controls.

Recommendations made in this report will be in accordance with the County of Peterborough and Otonabee Region Conservation Authority (ORCA) requirements, in addition to current stormwater management best practices and the Credit Valley Conservation Low Impact Development Stormwater Management Planning and Design Guide.

1.2 Site Description

The subject land is a portion of the Wildfire Golf Club in the Township of Douro-Dummer. The portion of site under investigation is a 0.650ha section of the subject site, bounded by the existing parking lot to the south, grassed areas to the north and east and an asphalt pathway to the west. The location of the subject building addition is identified on the **Location Plan** included as **Figure 1**.

Figure 1 - Location Plan

2.0 Hydrologic Analysis

2.1 Existing Conditions

The existing site is a 0.650ha parcel of land within the Wildfire Golf Club on Wildfire Road in the County of Peterborough. The site generally slopes from north to south with approximately 3.5 m of relief from the high point in the north to the low point in the south. The topography is shown on the **Topographic Survey** prepared by Elliot and Parr Ltd. which is included as **Figure 2**. The location of the proposed building is included on the **Site Plan** prepared by FAD Architects and is included as **Figure 3**. The site has a vegetated cover consisting mainly of grass and wooded areas. Based on a review of the topography, runoff from the proposed building addition will flow via sheet flow from north to south to an existing swale which will convey flows to the small existing pond to the south. Flows will outlet from the pond into the roadside ditch within the County Road 6 right-of-way (ROW) and will ultimately contribute to Gilchrist Bay. No Geotechnical Investigation has been completed for the site as it was confirmed as not necessary at the pre-consultation meeting due to the minor nature of the development.

Three existing catchment areas have been identified under the pre-development conditions as shown on the **Pre-Development Drainage Area Plan** included as **Figure 4**. The respective catchment areas can be identified based on the following properties.

- **EX1**: Existing catchment area EX1 is 0.199ha and consists of woodlot and grassed areas. Flows from this catchment area travel from north to south via overland flow into the existing drainage swale along the parking lot and ultimately contribute to the roadside ditch along County Road 6.

- **EX2**: Existing catchment area EX2 is 0.451ha and consists of grassed, woodlot and impervious areas. Flows from this catchment enter the existing drainage swale along the parking lot via overland flow and ultimately contribute to the roadside ditch along County Road 6.

- **EX3**: Existing catchment area EX3 is 0.814ha and consists of grassed and impervious areas. Flows from this catchment travel via overland flow and the existing on-site storm sewer network to the north and ultimately contribute to the existing pond north of the club house. This catchment area will only be used to determine sediment removal requirements for the existing pond to the north as requested by the Township peer review Engineer during the pre-consultation meeting.

The existing characteristics of the drainage areas are summarized in **Table 1** below.

Table 1 - Existing Catchment Areas (ha)

Catchment	Grass	Woodlot	Impervious	Total
EX1	0.040	0.159	0.000	0.199
EX2	0.022	0.275	0.154	0.451
EX3	0.509	0.000	0.305	0.814

2.2 Proposed Conditions

Under proposed conditions, the topography will change to accommodate the grading for the proposed cart storage building. The proposed catchment areas are identified on the **Post-Development Drainage Area Plan** included as **Figure 5**.

The respective catchment areas can be identified based on the following properties:

- **PR1**: Proposed catchment area PR1 is 0.199ha and consists of the proposed building addition, asphalt walkways, and a variety of landscape features. Flows from this catchment will enter the proposed conveyance swale system through overland flow and contribute to the proposed enhanced grass swale facility. Controlled flows will outlet to the existing drainage ditch south of the building addition. Ultimately flows will contribute to the roadside ditch within the County Road 6 ROW as in existing conditions.

- **PR2**: Proposed catchment are PR2 is 0.451ha consists of grassed, woodlot and impervious areas. This catchment area will remain unchanged from existing conditions. Flows from this catchment enter the existing drainage swale along the parking lot via overland flow and ultimately contribute to the roadside ditch along County Road 6.

The characteristics of the proposed catchment areas are summarized in **Table 2** below:

Table 2 - Proposed Catchment Areas (ha)

Catchment	Grass	Woodlot	Impervious	Total
PR1	0.040	0.100	0.059	0.199
PR2	0.022	0.275	0.154	0.451

2.3 Hydrologic Parameters

The hydrologic parameters for the site under existing and proposed conditions were developed based on the site conditions and topography. The parameters are summarized in **Table** 3 below. Detailed spreadsheets are included in Appendix A.

Table 3 - Existing and Proposed Hydrologic Parameters

Catchment ID	Area (ha)	% Impervious (%)	Runoff Coefficient	Tc (Calc.)	Tc (Min.)
EX1	0.199	0.00	0.23	13.8	10.0
EX2	0.451	34.15	0.46	6.2	10.0
PR1	0.199	29.47	0.42	3.1	10.0
PR2	0.451	34.15	0.46	6.2	10.0

The peak runoff for the existing and proposed conditions were calculated for the 2-year through 100-year return periods using the Rational Method and the hydrologic parameters identified in the previous section. Spreadsheets with the Rational Method calculations are included in **Appendix A** and the calculations are summarized in **Table** 4 below.

Table 4 - Pre and Post Development Peak Flows

Catchment ID	Peak Flows (m^3/s)					
	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
EX1	0.008	0.010	0.012	0.015	0.018	0.021
EX2	0.040	0.053	0.061	0.079	0.095	0.108
PR1	0.016	0.021	0.025	0.031	0.038	0.043
PR2	0.040	0.053	0.061	0.079	0.095	0.108

The results indicate that in the absence of any quantity controls, the proposed peak flows from area PR2 will remain the same when compared to area EX2 and no quantity control is required. However, the proposed peak flows from PR1 will increase when compared to EX1, and some form of quantity control is required.

3.0 Stormwater Management

3.1 Quantity Control

To address quantity control for the site, an enhanced grassed swale facility (SWM facility) has been proposed. The SWM facility is proposed to promote infiltration and reduce runoff from peak flows on the site. An onsite swale conveyance system will convey flows to the proposed SWM facility as shown on the **Site Servicing and Grading Plan** included in **Appendix E**.

Flows are proposed to be restricted through a raised culvert outlet which will connect the proposed SWM facility to the existing drainage swale south of the proposed building addition. Controlled flows will ultimately outlet to the roadside ditch within the County Road 6 ROW.

Runoff for minor and major storm events from catchment areas PR1 will be conveyed to the SWM facility via overland flow and the onsite conveyance swale system. The facility will be 0.55m deep and will provide **82.38m^3** of storage below the top of basin elevation.

Discharge rates used to calculate the storage requirements were calculated as shown in **Table** 4 above.

The Modified Rational Method was used to calculate the storage volume required to limit post-development flows to the pre-development level. Supporting calculations are included in **Appendix A** and summarized in **Table 5** below.

Table 5 - Storage Requirements for PR1

Design Storm (years)	Catchment Area (ha)	Runoff Coefficient	Discharge Rate (m^3/sec)	Total Storage Required (m^3)
2	0.199	0.42	0.007	5.5
5	0.199	0.42	0.009	7.7
10	0.199	0.42	0.009	10.7
25	0.199	0.46	0.010	15.6
50	0.199	0.51	0.012	19.9
100	0.199	0.53	0.012	25.1

A single-stage orifice has been designed to control the peak flows and consists of a 100mm outlet culvert connecting to the existing swale. An emergency overflow weir is also included within the design to convey any flows above the 100-year ponding elevation, or in the event the outlet becomes blocked, from the SWM facility towards the existing swale. The weir is set at an elevation of 239.95 and has a bottom width of 1.0m.

An abbreviated stage storage discharge (SSD) relationship for the proposed detention basin is shown in Table 6 below. The complete SSD table and calculations, along with the weir sizing calculations, are included in **Appendix B**.

Table 6 - Stage Storage Discharge

Description	Stage (m)	Discharge (m^3/s)	Storage (m^3)
Bottom of Storage	239.50	0.000	0.0
2 – Year Ponding	239.70	0.007	7.59
5 – Year Ponding	239.75	0.009	11.16
10 – Year Ponding	239.75	0.009	11.16
25 – Year Ponding	239.80	0.010	18.88
50 – Year Ponding	239.85	0.012	27.93
100 – Year Ponding	239.85	0.012	27.93
Emergency Weir	239.95	-	50.84
Top of Storage	240.05	-	82.38

The proposed outlet structure and storage configuration provides more storage volume for each storm event than is required to limit post-development flows to pre-development levels. The total controlled post-development release rates are at or below the pre-development release rate for each of the storm durations.

As illustrated in **Table 6** there is 0.20m of freeboard between the 100-year ponding elevation and the top of the facility. There is 0.10m of freeboard between the 100-year ponding elevation and the bottom of the weir. It is noted that the SWM facility is an open bottom system with a raised outlet that will allow for the potential for infiltration.

Table 7 below demonstrates that proposed discharge rates for the SWM facility are at or below pre-development release rates.

Table 7- Allowable vs. Proposed Release Rates

Design Storm (years)	Allowable Discharge Rate (EX1+EX2) (m^3/sec)	Proposed Discharge Rate (PR2+PR1 Routed) (m^3/sec)
2	0.048	0.047
5	0.063	0.062
10	0.073	0.070
25	0.094	0.089
50	0.113	0.107
100	0.129	0.120

3.2 Quality Control

Quality control is not required for the site as the proposed building addition will only contribute clean rooftop water, and no significant increase in contaminants is expected from the proposed pathways. The enhanced grass swale facility proposed for quantity control will provide some quality control for the development. A treatment train approach consisting of a conveyance swale system and an enhanced grass swale facility is proposed and will be complete with a raised outlet and minimum grades to enhance removal rates.

In addition, as per the CVC LIDSWMPDG the velocity in the enhanced grassed swale should be 0.5m/s or less for the 4-hour 25mm Chicago Storm to maximize quality control and promote infiltration. The proposed swale has a longitudinal slope of 0.5% and will limit velocities to 0.15m/s which is below the requirement. This is identified in the Channel Design Sheet included in **Appendix C**.

3.3 Stormwater Conveyance

Runoff from the site will be conveyed through surface drainage systems including overland flow and a conveyance swale system. All storm events, up to and including the100-year storm, will be conveyed in swales along the building footprint. Calculations demonstrating the sizing and capacity of the proposed swales are included in **Appendix C** and summarized in **Table 8** below.

Two cross sections of the existing downstream conveyance swale were analyzed with the 100-year controlled flow rate to confirm existing capacity. The cross-section locations are shown on the **Post-Development Drainage Area Plan** included as **Figure 5** and calculations demonstrating the sizing and capacity of the existing swales are included in **Appendix C** and summarized in **Table 8** below.

Table 8 – Swale Capacity

Swale ID	Characteristics	Cross Sectional Area (m^2)	Maximum Flow Rate (m^3/s)	Percent Capacity 100-Year Flow	Velocity (m/s)
Conveyance Swale	Triangular; 3:1 side slope, 0.5% long (lowest) slope; 0.20m deep (at shallowest)	0.20	0.043	36%	0.45
Existing Swale (XS-1)	Triangular; 3:1 side slope 1.5% long (lowest) slope; 0.30m deep	0.27	0.119	40%	0.88
Existing Swale (XS-2)	Triangular; 3:1 side slope 1.0% long (lowest) slope; 0.50m deep	0.75	0.119	12%	0.76
Enhanced Grassed Swale	Trapezoidal, 2m bottom width, 3:1 side slope, 0.5% long (lowest) slope, 0.5m deep	1.75	0.013	1%	0.15

3.4 Culvert Sizing

A culvert will convey stormwater runoff from the conveyance swale on the west side of the proposed building addition to the SWM facility. The 100-year uncontrolled flow rate for the respective drainage area, as identified on the **Post Development Drainage Area Plan** included as **Figure 5**, was used to size the proposed culvert. A 150mm diameter HDPE culvert has been specified, which can convey the 100-year uncontrolled flows.

Calculations demonstrating the sizing and capacity and are included in **Appendix E** and are summarized in **Table 9** below.

Table 9 – Culvert Capacity

Culvert ID	Design Storm	Flow Rate Through Culvert (m^3/s)	High Water Elev. (m)	Outlet Velocity (m/s)
Conveyance Culvert	100-Year (uncontrolled)	0.004	239.86	0.307

4.0 Operation and Maintenance

4.1 Proposed Facilities

Proper operation and maintenance has an important impact on the long-term performance of all SWM features and facilities. The following list identifies the required inspection and maintenance activities that should be undertaken for the enhanced grassed swale, in order to ensure it is operating effectively:

1. Facility Inspection
2. Grass Cutting
3. Trash/Debris Removal
4. Removal of Accumulated Sediment

Facility Inspection

Inspections of the enhanced grassed swale are conducted to confirm the facility performance as well as to identify the type and frequency of additional maintenance activities. During the first two years of operation, inspections should be made after each significant rainfall event to ensure proper functioning of the system; this will average between 3 to 6 inspections per year. After this initial period, inspection frequency can be reduced to a single annual inspection.

Below is a checklist of items that should be inspected/reviewed during the facility inspection:

Infiltration/Enhanced Grassed Swale Facility

1. Observe water level in basin – standing water could indicate blockage of outlet. If standing water is observed, inspect the swale for built up sediment.
2. Observe and measure sediment levels in the bottom of the facility and around the rock check dams. If significant sediment is observed (greater than 0.15m depth) it should be removed.

Grass Cutting

It is preferable to maintain the facility in as natural a state as possible; longer grass and natural vegetation tend to enhance water quality and SWM performance. Grass cutting around the top perimeter of the basin can be completed on an as-required basis for aesthetic reasons but the vegetation within the swale/basin should be left in a natural state. If the grass in the basin needs to be cut due to aesthetic concerns, it should be cut as infrequently as possible to maintain an acceptable aesthetic standard.

Trash/Debris Removal

Trash/debris removal will be required for the swale/basin in the spring of each year, to remove debris that has accumulated over the winter season. Apart from "spring cleaning", trash removal should be completed on a periodic basis throughout the year, in conjunction with other routine maintenance activities such as grass cutting.

Sediment Removal

Sediment will need to be removed periodically from the swale/facility in order to maintain SWM performance. The rate of accumulation of sediment is dependent on several factors including:

- Characteristics of upstream areas (level of imperviousness)
- Upstream land use and activities, especially during the construction phase of the development prior to sodding
- Winter control practices (e.g. level of sand used)

In general, sediment should be removed from the basin when the accumulated depth reaches 0.15m. Semi-annual inspections during the first two years and annual inspections thereafter should be used to confirm the rate of accumulation of sediment and when it will need to be removed. The most effective means of removing sediment is with a vacuum excavation truck.

4.2 Existing Pond Sediment Removal

It was requested by the Peer Review Engineer for the Township during the pre-consultation meeting that sediment loading calculations be performed for the existing pond southwest of the proposed building.

Sediment will need to be removed periodically from the pond to maintain SWM performance. As noted above, the rate of accumulation of sediment is dependent of serval factors. In general, sediment should be removed from the facility when the accumulated sediment depth reaches 0.3m, which is a conservative value. The contributing area to the existing pond is shown on the Existing Pond Contributing Area Plan included as **Figure 6**. Sediment loading calculations were performed and are included in **Appendix D**. Based on the conservative calculations, it is estimated that the pond will require cleanout every 484 years. Sediment levels in the pond should be measured on an annual basis to confirm these calculations and ensure that the sediment levels do not exceed 0.3m in depth.

5.0 Erosion and Sediment Control

The development of the site, particularly the stripping of the site, will result in an area of exposed native soil, which in turn has the potential to erode and contribute sediment to downstream receivers. To mitigate these effects, an erosion and sediment control strategy was developed for the site. Elements of the strategy incorporate best practices as outlined in the *Erosion and Sediment Control Guidelines for Urban Construction, GGHCA*.

The erosion and sediment control plan has been established to best protect downstream receivers during the construction period. A silt fence barrier will first be erected downgrade of the construction area.

Silt Fence

Silt fence will be utilized as a perimeter control and will be installed as shown on the **Erosion & Sediment Control Plan** included in **Appendix E**. Silt fence will be installed in accordance with OPSD 219.110 and may require periodic maintenance during the construction period.

Straw Bale Check Dams

Straw bales have been included in the existing downstream swale as a means of reducing velocities and sediment build up in the swales from construction activity. They will be installed in accordance with OPSD 219.180 and the contractor shall maintain the check dams during construction.

6.0 Summary

The proposed cart storage building addition at the Wildfire Golf Club includes the addition of hardscape surfaces which will increase site imperviousness and increase post-development runoff rates. To mitigate these effects, a stormwater management strategy is proposed that incorporates an enhanced grassed swale to provide quality and quantity control. The facility will provide 82.38m^3 of storage for the 100-year storm even which exceeds the storage requirement. The facility will have a raised single-stage outlet consisting of a 100mm HDPE culvert. Quality control is not required for the site as the proposed building addition will contribute clean rooftop water, however some form of quality control will be provided in the enhanced grassed swale system. The raised outlet and minimum grades will provide an opportunity for any sediment to settle out prior to release.

The use of the above noted facilities will provide the required quality and quantity control. The proposed SWM strategy will ensure that the proposed building addition does not have a negative impact on downstream receivers.

Prepared by:

Brooke Sanders,
EIT

Reviewed by:

Brad Parsons, P.Eng.
Water Resources Engineer

Figure 2 –Topographic Survey

ILLUSTRATION OF

LOT 30
CONCESSION 7

GEOGRAPHIC TOWNSHIP OF DOURO

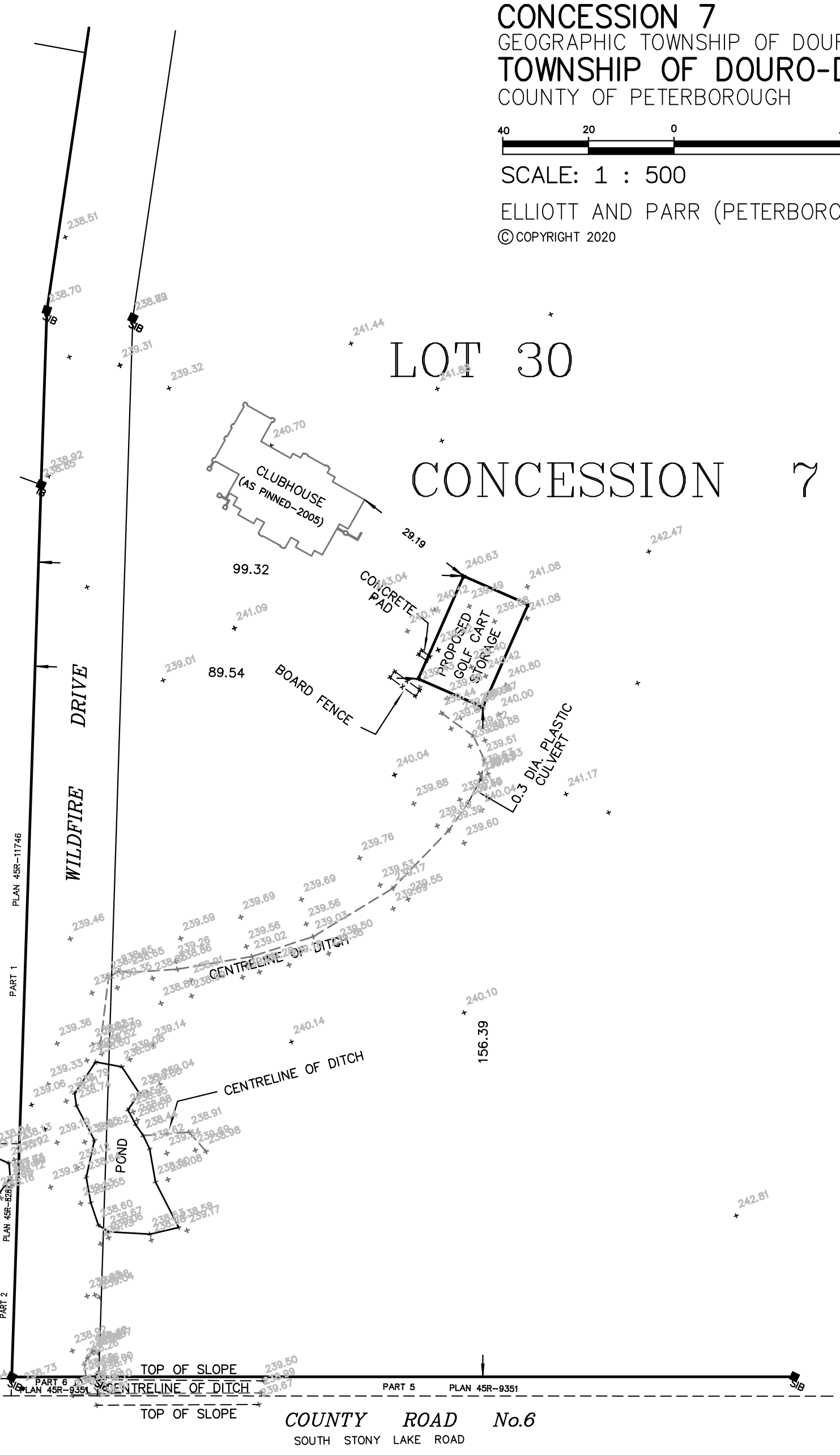
TOWNSHIP OF DOURO-DUMMER

COUNTY OF PETERBOROUGH

40 20 0 40 80 metres

SCALE: 1 : 500

ELLIOTT AND PARR (PETERBOROUGH) LTD.



METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NOTES

BEARINGS ARE UTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK (RTN) OBSERVATIONS, UTM ZONE 17, NAD83 (CSRS) (2010.0)

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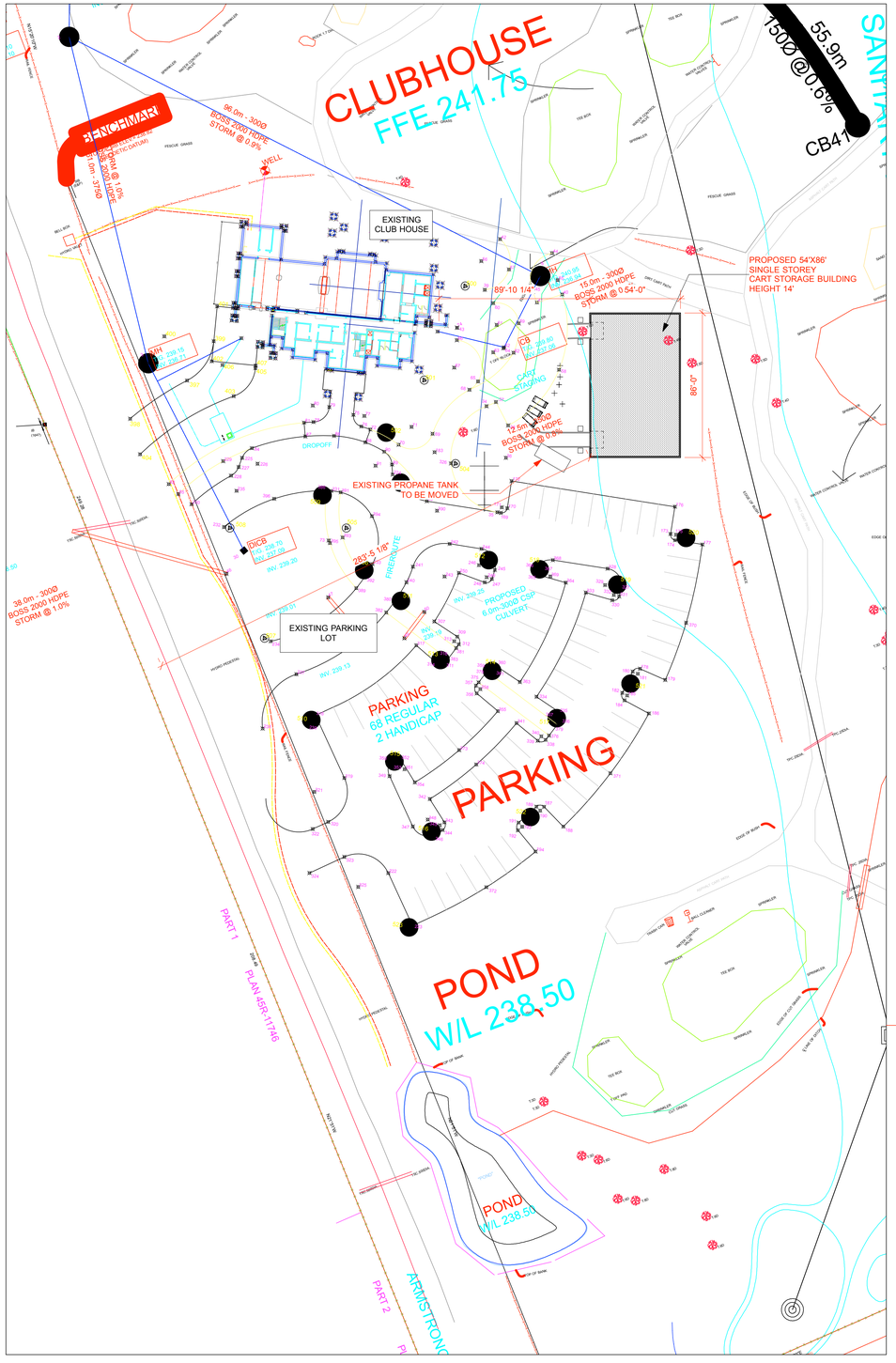
JK	SMO	20-19-358-00
FILE: E&P DU'R 7-30		DATED: 02/18/2021

Figure 3 - Site Plan



1 SITE PLAN
Scale: 1:480

2 KEY SITE PLAN
NTS

FAD architects
67 james st.
parry sound ont
P2A 1T6
t. 705.746.5272
info @ fad . ca

Project Title

WILDFIRE GOLF CLUB
CART STORAGE

2215 WILDFIRE DR.
DOURO-DRUMMER

Consultant

REV.	DATE	DESCRIPTION

NO.	DATE	ISSUE NOTE

Project Manager	Drawn By
T. MCCONNELL	MR
Date	**Reviewed By**
NOV 2020	MR

Project ID
200X

Sheet Title
SITE PLAN

Sheet No.
A1.1

Figure 4 - Pre-Development Storm Area Drainage Plan

NORTH

EX2
0.46 | 0.451

EX1
0.23 | 0.199

LEGEND

CATCHMENT BOUNDARY

EX1 — CATCHMENT NAME
RUNOFF COEFFICIENT — 0.26 | 0.45 — AREA (ha)

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WILDFIRE GOLF CLUB - BUILDING ADDITION

FIGURE 4 - PRE-DEVELOPMENT DRAINAGE AREAS

DRAWN:	APPROVED:	SCALE:	DATE:	PROJECT No.:
B.SANDERS	B.PARSONS	1:400	21-04-16	21013

Figure 5 - Post-Development Storm Area Drainage Plan

NORTH

PR2
0.451 | 0.46

PR1
0.42 | 0.199

CUL
0.44 | 0.018

XS-1

XS-1

XS-1

XS-1

LEGEND

OVERLAND FLOW ROUTE

CATCHMENT BOUNDARY

CULVERT SIZING BOUNDARY

PR1 — CATCHMENT NAME
RUNOFF COEFFICIENT — 0.26 | 0.45 — AREA (ha)

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WILDFIRE GOLF CLUB - BUILDING ADDITION

FIGURE 5 - POST-DEVELOPMENT DRAINAGE AREAS

DRAWN:	APPROVED:	SCALE:	DATE:	PROJECT No.:
B.SANDERS	B.PARSONS	1:500	21-09-17	21013

Figure 6 – Sediment Loading Catchment Area

NORTH

SL
8.1 | 2.59

EXISTING CONVEYANCE SWALE

EXISTING SWM POND

LEGEND:

APPROXIMATE CATCHMENT BOUNDARY

SL — CATCHMENT NAME
12 — PERCENT IMPERVIOUS (%)
1.68 — AREA (ha)

NOTES:

DRAINAGE AREA ESTIMATED BASED ON BACKGROUND STUDIES, HIGH LEVEL TOPOGRAPHY, SITE VISITS, AND SATELLITE IMAGERY. PERCENT IMPERVIOUS IS ACCURATE.

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WILDFIRE GOLF CLUB - BUILDING ADDITION

FIGURE 6 - EXISTING POND CONTRIBUTING AREA

DRAWN:	APPROVED:	SCALE:	DATE:	PROJECT No.:
B.SANDERS	B.PARSONS	1:1000	21-09-17	21013

Appendix A: Hydrologic Parameters

Rational Method Calculations

Project Name: Wildfire Building Addition
Project No: 21013
Rain Gauge: Peterborough

Designed By: BS
Date: 2021-09-17

Catchment Name and Description		Land Use and Areas (Ha)								Catchment Characteristics								Runoff Coefficient														Peak Flows (m^3/s)						
Name	Description	CN = 50 Wetland	CN = 61 Grass	CN = 85 Gravel	CN = 74 Crop & other improved land	CN = 65 Pasture & other unimproved land	CN = 58 Woodlots and forests	CN = 98 Impervious	Total	CN Weighted	% Impervious	Soils Group	Length (m)	Average Slope (%)	Calculated Time of Concentration (min)	Minimum Time of Concentration (min)	Time to Peak (min)	Time to Peak (hr)	Wetland	Grass	Gravel	Crop & other improved land	Pasture & other unimproved land	Woodlots and forests	Impervious	Composite Runnoff Coefficient	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	25mm	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
EX1	North		0.040				0.159	0.000	**0.199**	58.61	0.00%	B	61.0	4.2	13.8	10.0	9.2	0.15	0.05	0.15	0.60	0.00	0.00	0.25	0.90	0.23	0.23	0.23	0.23	0.25	0.28	0.29	0.006	0.008	0.010	0.012	0.015	0.018	0.021
EX2	South		0.022				0.275	0.154	**0.451**	71.80	34.15%	B	104.0	1.2	6.2	10.0	6.7	0.11	0.05	0.10	0.60	0.00	0.00	0.25	0.90	0.46	0.46	0.46	0.46	0.51	0.56	0.58	0.034	0.040	0.053	0.061	0.079	0.095	0.108
EX1+EX2	Allowable Discharge																																**0.048**	**0.063**	**0.073**	**0.094**	**0.113**	**0.129**
PR1	North		0.040				0.100	0.059	**0.199**	70.39	29.47%	B	61.0	4.2	3.1	10.0	6.7	0.11	0.05	0.15	0.60	0.00	0.00	0.25	0.90	0.42	0.42	0.42	0.42	0.46	0.51	0.53	0.013	0.016	0.021	0.025	0.031	0.038	0.043
PR2	South		0.022				0.275	0.154	**0.451**	71.82	34.15%	B	104.0	1.2	6.2	10.0	6.7	0.11	0.05	0.10	0.60	0.00	0.00	0.25	0.90	0.46	0.46	0.46	0.46	0.51	0.56	0.58	0.034	0.040	0.053	0.061	0.079	0.095	0.108
	PR1(routed)																																0.007	0.009	0.009	0.010	0.012	0.012
	PR1(routed) + PR2																																**0.047**	**0.062**	**0.070**	**0.089**	**0.107**	**0.120**
SL	For Sediment Loading		2.380					0.210	**2.590**	64.00	8.11%																											
CUL	Culvert Sizing		0.011				0.000	0.007	**0.018**	75.39	38.89%	B	10.0	5.0	0.6	10.0	6.7	0.11	0.05	0.15	0.60	0.35	0.30	0.00	0.90	0.44	0.44	0.44	0.44	0.49	0.53	0.55	0.001	0.002	0.002	0.002	0.003	0.004	0.004

Notes:

Runoff Coefficients

1. Runoff coefficients for Land Uses taken from MTO Drainage Manual Design Chart 1.07.
2. Runoff coefficients have been adjusted for storms exceeding the 10-year return period as follows: 25 Year - 1.10; 50-Year: 1.20; 100-Year: 1.25

Time of Concentration

1.Tc calculcated using Airport equation for C<0.4 and Bransby Willisams for C>0.4
2. Tp calculated as 0.67Tc.

Modified Rational Method Storage

Project Name: Wildfire Building Addition
Project No: 21013
Designed By: BS
Date: 2021-09-17

Rainfall Data				
Design Storm:	2 Year	IDF Parameters:	A =	662
Rain Station:	Peterborough		B =	7.5
			C =	0.79

Catchment Area Parameters			
Catchment ID:	PR1	Discharge Rate (m^3/s):	0.007
Drainage Area (ha):	0.199		
Runoff Coefficient:	0.42		

Modified Rational Method Calculations

Time (minutes)	Intensity (mm/hr)	Peak Runoff (m^3/s)	Volume (m^3)		
			Inflow	Released	Storage
0	134.76	0.031	0.0	0.0	0.0
5	90.01	0.021	6.3	2.1	4.2
10	69.00	0.016	9.6	4.2	5.4
15	56.58	0.013	11.8	6.3	**5.5**
20	48.28	0.011	13.5	8.4	5.1
25	42.31	0.010	14.7	10.5	4.2
30	37.79	0.009	15.8	12.6	3.2
35	34.23	0.008	16.7	14.7	2.0
40	31.35	0.007	17.5	16.8	0.7
45	28.97	0.007	18.2	18.9	0.0
50	26.96	0.006	18.8	21.0	0.0
55	25.24	0.006	19.4	23.1	0.0
60	23.75	0.006	19.9	25.2	0.0
65	22.45	0.005	20.3	27.3	0.0
70	21.30	0.005	20.8	29.4	0.0
75	20.27	0.005	21.2	31.5	0.0
80	19.35	0.004	21.6	33.6	0.0
85	18.52	0.004	21.9	35.7	0.0
90	17.76	0.004	22.3	37.8	0.0
95	17.08	0.004	22.6	39.9	0.0
100	16.45	0.004	22.9	42.0	0.0
105	15.87	0.004	23.2	44.1	0.0
110	15.33	0.004	23.5	46.2	0.0

Modified Rational Method Storage

ENGAGE ENGINEERING

Project Name: Wildfire Building Addition
Project No: 21013
Designed By: BS
Date: 2021-09-17

Rainfall Data				
Design Storm:	5 Year	IDF Parameters:	A =	1098
Rain Station:	Peterborough		B =	10.1
			C =	0.83

Catchment Area Parameters			
Catchment ID:	PR1	Discharge Rate (m^3/s):	0.009
Drainage Area (ha):	0.199		
Runoff Coefficient:	0.42		

Modified Rational Method Calculations

Time (minutes)	Intensity (mm/hr)	Peak Runoff (m^3/s)	Volume (m^3)		
			Inflow	Released	Storage
0	161.07	0.037	0.0	0.0	0.0
5	115.36	0.027	8.0	2.7	5.3
10	90.98	0.021	12.7	5.4	7.3
15	75.66	0.018	15.8	8.1	**7.7**
20	65.07	0.015	18.1	10.8	7.3
25	57.28	0.013	20.0	13.5	6.5
30	51.29	0.012	21.4	16.2	5.2
35	46.52	0.011	22.7	18.9	3.8
40	42.63	0.010	23.8	21.6	2.2
45	39.40	0.009	24.7	24.3	0.4
50	36.66	0.009	25.6	27.0	0.0
55	34.30	0.008	26.3	29.7	0.0
60	32.26	0.007	27.0	32.4	0.0
65	30.47	0.007	27.6	35.1	0.0
70	28.88	0.007	28.2	37.8	0.0
75	27.46	0.006	28.7	40.5	0.0
80	26.19	0.006	29.2	43.2	0.0
85	25.04	0.006	29.7	45.9	0.0
90	24.00	0.006	30.1	48.6	0.0
95	23.05	0.005	30.5	51.3	0.0
100	22.18	0.005	30.9	54.0	0.0
105	21.38	0.005	31.3	56.7	0.0
110	20.63	0.005	31.6	59.4	0.0

Modified Rational Method Storage

Project Name: Wildfire Building Addition
Project No: 21013
Designed By: BS
Date: 2021-09-17

Rainfall Data				
Design Storm:	10 Year	IDF Parameters:	A =	1560
Rain Station:	Peterborough		B =	13
			C =	0.86

Catchment Area Parameters			
Catchment ID:	PR1	Discharge Rate (m^3/s):	0.009
Drainage Area (ha):	0.199		
Runoff Coefficient:	0.42		

Modified Rational Method Calculations

Time (minutes)	Intensity (mm/hr)	Peak Runoff (m^3/s)	Volume (m^3)		
			Inflow	Released	Storage
0	171.84	0.040	0.0	0.0	0.0
5	129.89	0.030	9.1	2.7	6.4
10	105.21	0.024	14.7	5.4	9.3
15	88.83	0.021	18.6	8.1	10.5
20	77.13	0.018	21.5	10.8	**10.7**
25	68.31	0.016	23.8	13.5	10.3
30	61.42	0.014	25.7	16.2	9.5
35	55.88	0.013	27.3	18.9	8.4
40	51.32	0.012	28.6	21.6	7.0
45	47.49	0.011	29.8	24.3	5.5
50	44.23	0.010	30.8	27.0	3.8
55	41.42	0.010	31.8	29.7	2.1
60	38.96	0.009	32.6	32.4	0.2
65	36.81	0.009	33.4	35.1	0.0
70	34.89	0.008	34.0	37.8	0.0
75	33.18	0.008	34.7	40.5	0.0
80	31.64	0.007	35.3	43.2	0.0
85	30.25	0.007	35.8	45.9	0.0
90	28.98	0.007	36.4	48.6	0.0
95	27.82	0.006	36.8	51.3	0.0
100	26.76	0.006	37.3	54.0	0.0
105	25.78	0.006	37.7	56.7	0.0
110	24.88	0.006	38.2	59.4	0.0

Modified Rational Method Storage

ENGAGE ENGINEERING

Project Name: Wildfire Building Addition
Project No: 21013
Designed By: BS
Date: 2021-09-17

Rainfall Data				
Design Storm:	25 Year	IDF Parameters:	A =	2010
Rain Station:	Peterborough		B =	14
			C =	0.88

Catchment Area Parameters			
Catchment ID:	PRWS1	Discharge Rate (m^3/s):	0.01
Drainage Area (ha):	0.199		
Runoff Coefficient:	0.46		

Modified Rational Method Calculations

Time (minutes)	Intensity (mm/hr)	Peak Runoff (m^3/s)	Volume (m^3)		
			Inflow	Released	Storage
0	197.06	0.050	0.0	0.0	0.0
5	150.62	0.038	11.5	3.0	8.5
10	122.63	0.031	18.7	6.0	12.7
15	103.82	0.026	23.8	9.0	14.8
20	90.26	0.023	27.6	12.0	**15.6**
25	79.99	0.020	30.5	15.0	15.5
30	71.94	0.018	33.0	18.0	15.0
35	65.44	0.017	35.0	21.0	14.0
40	60.07	0.015	36.7	24.0	12.7
45	55.57	0.014	38.2	27.0	11.2
50	51.73	0.013	39.5	30.0	9.5
55	48.42	0.012	40.7	33.0	7.7
60	45.53	0.012	41.7	36.0	5.7
65	42.98	0.011	42.7	39.0	3.7
70	40.72	0.010	43.5	42.0	1.5
75	38.70	0.010	44.3	45.0	0.0
80	36.88	0.009	45.1	48.0	0.0
85	35.24	0.009	45.7	51.0	0.0
90	33.74	0.009	46.4	54.0	0.0
95	32.38	0.008	47.0	57.0	0.0
100	31.13	0.008	47.5	60.0	0.0
105	29.97	0.008	48.1	63.0	0.0
110	28.91	0.007	48.5	66.0	0.0

Modified Rational Method Storage

ENGAGE ENGINEERING

Project Name: Wildfire Building Addition
Project No: 21013
Designed By: BS
Date: 2021-09-17

Rainfall Data				
Design Storm:	50 Year	IDF Parameters:	A =	2200
Rain Station:	Peterborough		B =	14.6
			C =	0.87

Catchment Area Parameters			
Catchment ID:	PR1	Discharge Rate (m^3/s):	0.012
Drainage Area (ha):	0.199		
Runoff Coefficient:	0.51		

Modified Rational Method Calculations

Time (minutes)	Intensity (mm/hr)	Peak Runoff (m^3/s)	Volume (m^3)		
			Inflow	Released	Storage
0	213.52	0.060	0.0	0.0	0.0
5	165.26	0.047	14.0	3.6	10.4
10	135.62	0.038	23.0	7.2	15.8
15	115.45	0.033	29.3	10.8	18.5
20	100.79	0.028	34.1	14.4	19.7
25	89.62	0.025	37.9	18.0	**19.9**
30	80.82	0.023	41.0	21.6	19.4
35	73.68	0.021	43.7	25.2	18.5
40	67.77	0.019	45.9	28.8	17.1
45	62.80	0.018	47.8	32.4	15.4
50	58.55	0.017	49.6	36.0	13.6
55	54.87	0.015	51.1	39.6	11.5
60	51.66	0.015	52.5	43.2	9.3
65	48.82	0.014	53.7	46.8	6.9
70	46.30	0.013	54.9	50.4	4.5
75	44.05	0.012	55.9	54.0	1.9
80	42.01	0.012	56.9	57.6	0.0
85	40.17	0.011	57.8	61.2	0.0
90	38.50	0.011	58.7	64.8	0.0
95	36.96	0.010	59.4	68.4	0.0
100	35.56	0.010	60.2	72.0	0.0
105	34.26	0.010	60.9	75.6	0.0
110	33.06	0.009	61.6	79.2	0.0

Modified Rational Method Storage

ENGAGE ENGINEERING

Project Name: Wildfire Building Addition
Project No: 21013
Designed By: BS
Date: 2021-09-17

Rainfall Data

Design Storm:	100 Year	IDF Parameters:	A =	2507
Rain Station:	Peterborough		B =	14.8
			C =	0.88

Catchment Area Parameters

Catchment ID:	PR1	Discharge Rate (m^3/s):	0.012
Drainage Area (ha):	0.199		
Runoff Coefficient:	0.53		

Modified Rational Method Calculations

Time (minutes)	Intensity (mm/hr)	Peak Runoff (m^3/s)	Volume (m^3)		
			Inflow	Released	Storage
0	234.06	0.069	0.0	0.0	0.0
5	181.17	0.053	15.9	3.6	12.3
10	148.61	0.044	26.1	7.2	18.9
15	126.43	0.037	33.4	10.8	22.6
20	110.30	0.032	38.8	14.4	24.4
25	98.01	0.029	43.1	18.0	**25.1**
30	88.31	0.026	46.6	21.6	25.0
35	80.46	0.024	49.5	25.2	24.3
40	73.97	0.022	52.0	28.8	23.2
45	68.49	0.020	54.2	32.4	21.8
50	63.82	0.019	56.1	36.0	20.1
55	59.78	0.018	57.8	39.6	18.2
60	56.25	0.016	59.4	43.2	16.2
65	53.14	0.016	60.8	46.8	14.0
70	50.37	0.015	62.0	50.4	11.6
75	47.89	0.014	63.2	54.0	9.2
80	45.66	0.013	64.3	57.6	6.7
85	43.64	0.013	65.3	61.2	4.1
90	41.81	0.012	66.2	64.8	1.4
95	40.13	0.012	67.1	68.4	0.0
100	38.58	0.011	67.9	72.0	0.0
105	37.16	0.011	68.6	75.6	0.0
110	35.85	0.011	69.4	79.2	

Appendix B: Stage Storage Calculations

Stormwater Management Facility Outlet Sizing

Project Name: Wildfire Buidling Addition
Project No: 21013

Designed By: DR
Date: 2021-09-09

Pond Outlet Configuration		
Description	Stage 1	Stage 2
Control Type	Orifice Tube	
Orifice Diameter/Weir Height	0.10	
Invert Elevations	239.55	

Stage Storage Discharge

Description	Elevation[4] (m)	Storage (m^3)	Controlled Discharge Rate (m^3/s)		
			Orifice[1]	Weir[2]	Total
Bottom of Storage	239.50	0.00	0.000	0.000	0.000
	239.55	0.43	0.000	0.000	0.000
	239.60	1.93	0.001	0.000	0.001
	239.65	5.33	0.004	0.000	0.004
2 Year Ponding	239.70	7.59	0.007	0.000	0.007
5 & 10 Year Ponding	239.75	11.16	0.009	0.000	0.009
25 Year Ponding	239.80	18.88	0.010	0.000	0.010
50 & 100 Year Ponding	239.85	27.93	0.012	0.000	0.012
	239.90	38.55	0.013	0.000	0.013
Emergency Weir	239.95	50.84	0.014	0.000	0.014
	240.00	65.82	0.015	0.000	0.015
	240.05	82.38	0.016	0.000	0.016

1. Orifice calculations completed using Hydraflow Culvert Extension in AutoCAD Civil 3D
2. Weir discharge calculated according to Q=1.705LH1.5

Appendix C: Stormwater Conveyance :

Weir Sizing

Project Name: Wildfire Building Addition
Project No: 21013

Designed By: BS
Date: 2021-09-17

Weir Parameters					
Type:[1]	Broad Crested Rectangular		Weir Invert:	239.95	m
Peak Flow:	0.043	m^3/s	Weir Height:	0.1	m
			Width:	1	m

Stage Discharge	
Elevation (m)	Weir Flow (m^3/s)
239.95	0.000
239.98	0.007
240.00	0.019
240.03	0.035
240.05	0.054

Weir Overflow Results		
Pond Elevation at Peak Flow:	240.036	m
Freeboard:	0.014	m
Velocity:	0.500	m/s

Notes:

1. Flows over rectangular broad crested weir calculated based on weir equations in MTO Drainage Manual Chapter 8, Section Flow Over Weirs and Notches.

Rational Method Calculations

Project Name: Wildfire Building Addition - Culvert Sizing
Project No: 21013
Rain Gauge: Peterborough

Designed By: BS
Date: 2021-04-16

Catchment Name and Description		Land Use and Areas (Ha)								Catchment Characteristics								Runoff Coefficient												Peak Flows (m^3/s)					
Name	Description	CN = 50 Wetland	CN = 61 Grass	CN = 85 Gravel	CN = 74 Crop & other improved land	CN = 65 Pasture & other unimproved land	CN = 58 Woodlots and forests	CN = 98 Impervious	Total	CN Weighted	% Impervious	Soils Group	Length (m)	Average Slope (%)	Calculated Time of Concentration (min)	Minimum Time of Concentration (min)	Time to Peak (min)	Time to Peak (hr)	Wetland	Grass	Gravel	Crop & other improved land	Pasture & other unimproved land	Woodlots and forests	Impervious	Composite Runnoff Coefficient	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
PR1-A	North of path		0.011					0.007	**0.018**	75.39	38.89%	B	20.0	4.0	1.3	10.0	6.7	0.11	0.05	0.15	0.60	0.35	0.28	0.25	0.90	0.44	0.44	0.44	0.44	0.49	0.53	0.55	0.002	0.002	0.002	0.003	0.004	0.004

Notes:

Runoff Coefficients

1. Runoff coefficients for Land Uses taken from MTO Drainage Manual Design Chart 1.07.
2. Runoff coefficients have been adjusted for storms exceeding the 10-year return period as follows: 25 Year - 1.10; 50-Year: 1.20; 100-Year: 1.25

Time of Concentration

1.Tc calculcated using Airport equation for C<0.4 and Bransby Willisams for C>0.4
2. Tp calculated as 0.67Tc.

Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Apr 15 2021

21013 Culvert Sizing

Invert Elev Dn (m)	=	239.7400
Pipe Length (m)	=	6.6600
Slope (%)	=	0.6003
Invert Elev Up (m)	=	239.7800
Rise (mm)	=	150.0
Shape	=	Circular
Span (mm)	=	150.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	HDPE
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

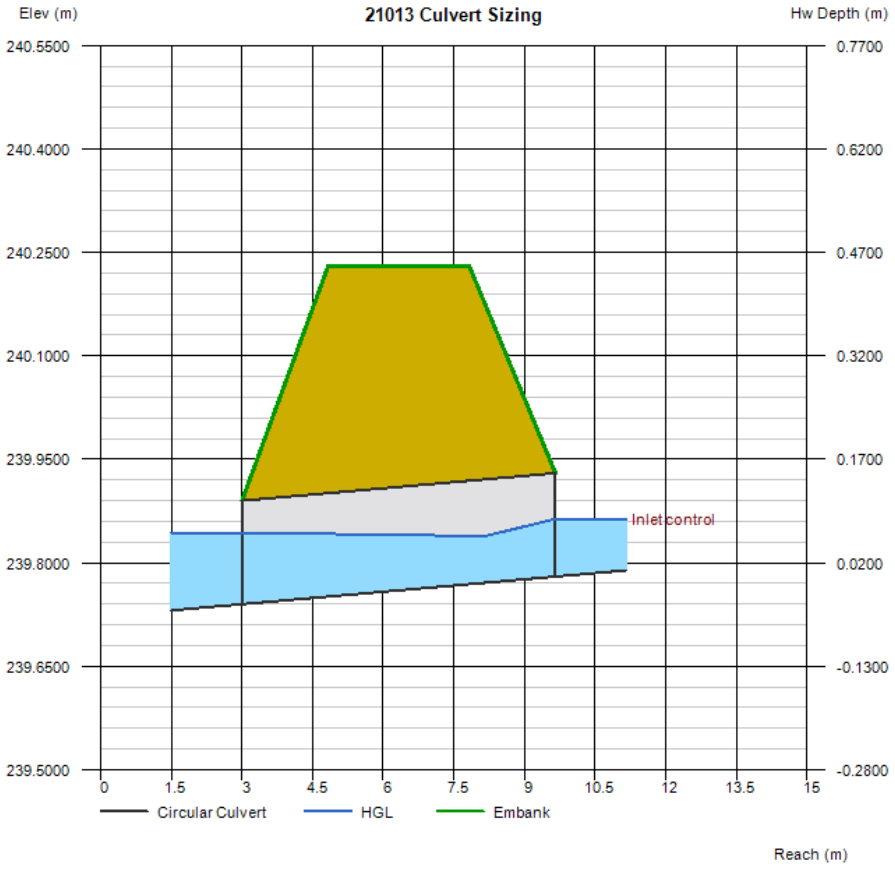
Top Elevation (m)	=	240.2300
Top Width (m)	=	3.0000
Crest Width (m)	=	10.0000

Calculations

Qmin (cms)	=	0.0040
Qmax (cms)	=	0.0040
Tailwater Elev (m)	=	(dc+D)/2

Highlighted

Qtotal (cms)	=	0.0040
Qpipe (cms)	=	0.0040
Qovertop (cms)	=	0.0000
Veloc Dn (m/s)	=	0.3073
Veloc Up (m/s)	=	0.6463
HGL Dn (m)	=	239.8436
HGL Up (m)	=	239.8372
Hw Elev (m)	=	239.8636
Hw/D (m)	=	0.5575
Flow Regime	=	Inlet Control



Channel Design Sheet

Project Name: Wildfire Building Addition
Project No: 21013

Designed By: BS
Date: 4/16/2021

Location	Contributing Area and Flow		Channel Properties						Hydraulics					
Channel Description	Description	Flow (m^3/s)	Bed Slope	Side Slope (X:1)	Bottom Width (m)	Depth (m)	Lining Material	Manning's n	Channel Capacity (m^3)	% Capacity	Cross Sectional Area (m^2)	Wetted Perimter (m)	Flow Depth (m)	Velocity (m/s)
Conveyance Swale	Convey flow from bldg to SWM facility	0.043	0.0050	3.000	0.0	0.20	Grass	0.03	0.06	73%	0.120	1.26	0.18	0.45
Existing Swale XS-1	Controlled 100-year flow rate	0.119	0.0150	3.000	0.0	0.30	Grass	0.03	0.30	40%	0.270	1.90	0.21	0.88
Existing Swale XS-2	Controlled 100-year flow rate	0.119	0.0100	3.000	0.0	0.50	Grass	0.03	0.96	12%	0.750	3.16	0.23	0.76
Enhanced Grassed Swale	25mm Storm Event	0.013	0.0050	3.000	2.0	0.50	Grass	0.03	2.01	1%	1.750	5.16	0.23	0.08

Appendix D: Sediment Loading Calculations

Sediment Removal Calculations

Project Name:	Wildfire Cart Storgae Addition	**Designed By:**	BS
Project No:	21013	**Date:**	2021-09-17

Site Data			
Area	=	2.59	ha
% Impervious	=	8.10	%
Impervious Area	=	0.21	ha
Annual Sediment Loading			
	=	0.1	m^3/ha
Annual Load	=	0.3	m^3
Final Volumes			
Area of Facility	=	543.0	m^2
Critical Depth of Sediment	=	0.3	m
Sediment Removal Volume	=	163	m^3
Sediment Removal Period	=	484	Years

Notes:

Table 6.3: Annual Sediment Loadings (MOE SWMPD Manual)

		Annual Loading (m^3/ha) for Impervious Level				
		0%	35%	55%	70%	85%
	Annual Sediment Loading (m^3/ha)	0	0.6	1.9	2.8	3.8

Appendix E: Detailed Design Drawings

WILDFIRE GOLF CLUB - BUILDING ADDITION

COUNTY OF PETERBOROUGH
ENGAGE PROJECT No: 21013
ISSUED FOR 2nd SUBMISSION

DRAWING INDEX

DRAWING	SHEET
REMOVALS AND EROSION & SEDIMENT CONTROL PLAN	01
SITE SERVICING AND GRADING	02
STANDARD NOTES & DETAILS	03

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WILDFIRE GOLF CLUB - BUILDING ADDITION
COUNTY OF PETERBOROUGH
ENGAGE PROJECT No: 21013
ISSUED FOR 2nd SUBMISSION

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SURVEY

TOPOGRAPHIC SURVEY PROVIDED
BY ELLIOT AND PARR DATED FEBRUARY
18TH, 2021

NOTES:

CONTRACTOR TO MINIMIZE THE IMPACTS ASSOCIATED WITH SEDIMENT TRANSFER BY COMPLETING THE FOLLOWING MEASURES IN THE FOLLOWING ORDER:

1. INSTALLATION OF PERIMETER LIGHT DUTY SILT FENCE AS PER OPSD 219.110.
2. TOPSOIL STRIPPING AND SITE EARTHWORKS TO BE COMPLETED WHEN ALL EROSION AND SEDIMENT CONTROL FEATURES INDICATED ON THIS PLAN ARE IN PLACE AND FUNCTIONING. IF TOPSOIL OR FILL MATERIAL IS REQUIRED TO BE STOCKPILED LIGHT DUTY SILT FENCE (OPSD 219.110) SHALL BE INSTALLED AROUND STOCKPILE LOCATIONS AS REQUIRED. ALL DISTURBED AREAS ARE TO BE SEEDED WITHIN 60 DAYS IF NO FURTHER SERVICING ACTIVITIES ARE TO OCCUR.
3. UPON COMPLETION OF SERVICING CONSTRUCTION, REMOVE SILT FENCES, AND ANY OTHER EROSION/SILTATION CONTROL MEASURES ONCE ALL CONSTRUCTION HAS BEEN COMPLETED, ALL VEGETATION HAS BEEN ESTABLISHED AND AT THE DIRECTION OF THE ENGINEER/COUNTY.

LEGEND

SILT FENCING

STRAW BALE CHECK DAM

REMOVAL

No.	REVISION	BY	DATE
2.	ISSUED FOR 2ND SUBMISSION	BS	2021-09-17
1.	ISSUED FOR 1ST SUBMISSION	BS	2021-04-16

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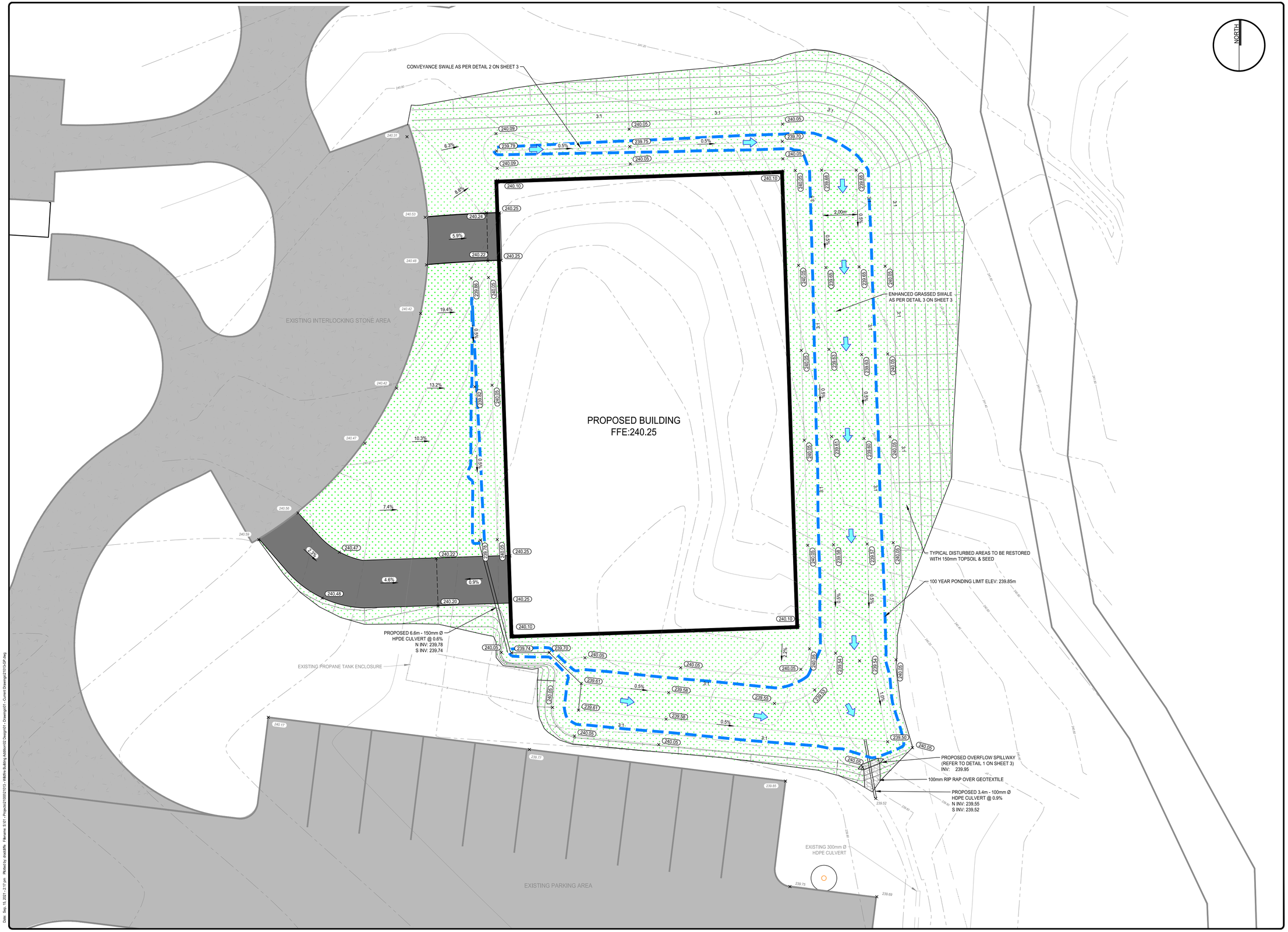
WILDFIRE BUILDING ADDITION

TOWNSHIP OF DOURO-DUMMER

REMOVALS AND EROSION & SEDIMENT CONTROL PLAN

DRAWN BY: B.SANDERS	STAMP:
DESIGNED BY: B.PARSONS	
APPROVED BY: B.PARSONS	
DATE: 2021-04-16	
SCALE: 1:100	
PROJECT NUMBER: 21013	SHEET NAME: ES1
SHEET: 1 of 3	

21013-ES
Date: Sep. 15, 2021 - 2:21 pm Plotted by: dradcliffe Filename: S:\01 - Projects\21000\21013 - Wildfire Building Addition\02 Design\01 - Drawings\01 - Current Drawings\21013-ES.dwg



21013-GP
Date: Sep. 15, 2021 - 2:17 pm Plotted by: chadcaffe File name: S:\01 - Projects\2100\21013_Wildfire Building Addition\02 Design\01 - Current Drawings\21013-GP.dwg

SURVEY

TOPOGRAPHIC SURVEY PROVIDED
BY ELLIOT AND PARR DATED FEBRUARY
18TH, 2021

NOTES:

1. ALL CONSTRUCTION AND MATERIALS TO BE IN ACCORDANCE WITH THE HIERARCHY BELOW:
   -ONTARIO PROVINCIAL STANDARD DRAWINGS & SPECIFICATIONS
   -APPLICABLE CONTRACT DOCUMENTS AND ALL SPECIFICATIONS REFERENCED HEREIN.
2. THE CONTRACTOR SHALL CONSTRUCT ALL WORK IN ACCORDANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT, HEALTH AND SAFETY REGULATIONS FOR CONSTRUCTION PROJECTS.
3. THE CONTRACTOR SHALL RESTORE OR REPLACE DAMAGED SERVICES TO EXISTING OR BETTER CONDITION.
4. THE CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS TO EXISTING OR BETTER CONDITION, OR PER THE ENGINEERING AND LANDSCAPE SPECIFICATIONS REFERENCED HEREIN.
5. THE CONTRACTOR SHALL DISPOSE OF ALL WASTE MATERIALS IN ACCORDANCE WITH THE MINISTRY OF THE ENVIRONMENT GUIDELINES AND LOCAL MUNICIPAL BYLAWS.
6. WHERE UTILITIES ARE SHOWN ON THE CONTRACT DRAWINGS, THEIR LOCATION IS APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
7. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS TO COMPLETE THE WORK INCLUDING ROAD CUT PERMITS, OCCUPANCY PERMITS, ENCROACHMENT AGREEMENTS.
8. ANY UTILITY POLES THAT MAY BE UNDERMINED BY THE CONSTRUCTION ACTIVITY ARE TO BE BRACED. THE CONTRACTOR SHALL MAKE THE NECESSARY ARRANGEMENTS TO HAVE THE POLES BRACED IN ACCORDANCE WITH THE APPROPRIATE UTILITY REQUIREMENTS.
9. ALL EROSION AND SEDIMENT CONTROL MEASURES IDENTIFIED ON THE CONTRACT DRAWINGS ARE TO BE IN PLACE PRIOR TO THE START OF CONSTRUCTION.
10. ALL PROPERTY BARS DISTURBED OR DAMAGED DURING CONSTRUCTION SHALL BE REPLACED BY THE CONTRACTOR AT THE CONCLUSION OF THE CONTRACT, AT THEIR EXPENSE.
11. ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.

No.	REVISION	BY	DATE
1.	ISSUED FOR 2ND SUBMISSION	JL	2021-09-17
1.	ISSUED FOR 1ST SUBMISSION	JL	2021-04-16

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WILDFIRE BUILDING ADDITION

TOWNSHIP OF DOURO-DUMMER

SITE SERVICING & GRADING PLAN

DRAWN BY: J.LATTA	STAMP: LICENSED PROFESSIONAL ENGINEER B.T.PARSONS 100213434 2021-09-17 PROVINCE OF ONTARIO
DESIGNED BY: B. PARSONS	
APPROVED BY: B.PARSONS	
DATE: 2021-04-16	
SCALE: 1:100	

PROJECT NUMBER:	SHEET NAME:	SHEET:
21013	GP	2 of 3

GENERAL:

1. ALL CONSTRUCTION AND MATERIALS TO BE IN ACCORDANCE WITH:

   -TOWNSHIP OF DOURO-DUMMER & COUNTY OF PETERBOROUGH DESIGN STANDARDS
   -ONTARIO PROVINCIAL STANDARD DRAWINGS & SPECIFICATIONS
   -APPLICABLE CONTRACT DOCUMENTS AND ALL SPECIFICATIONS REFERENCED HEREIN.

2. THE CONTRACTOR SHALL CONSTRUCT ALL WORK IN ACCORDANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT, HEALTH AND SAFETY REGULATIONS FOR CONSTRUCTION PROJECTS.

3. THE CONTRACTOR SHALL RESTORE OR REPLACE DAMAGED SERVICES TO EXISTING OR BETTER CONDITION.

4. THE CONTRACTOR SHALL RESTORE ALL DISTURBED AREAS TO EXISTING OR BETTER CONDITION, OR PER THE ENGINEERING AND LANDSCAPE SPECIFICATIONS REFERENCED HEREIN.

5. THE CONTRACTOR SHALL COORDINATE AND PAY FOR ALL TRAFFIC CONTROL AND SAFETY MEASURES IN ACCORDANCE WITH THE ONTARIO TRAFFIC MANUAL, BOOK 7, TEMPORARY CONDITIONS.

6. THE CONTRACTOR SHALL DISPOSE OF ALL WASTE MATERIALS IN ACCORDANCE WITH THE MINISTRY OF THE ENVIRONMENT GUIDELINES AND LOCAL MUNICIPAL BYLAWS.

7. WHERE UTILITIES ARE SHOWN ON THE CONTRACT DRAWINGS, THEIR LOCATION IS APPROXIMATE. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.

8. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS TO COMPLETE THE WORK INCLUDING ROAD CUT PERMITS, OCCUPANCY PERMITS, ENCROACHMENT AGREEMENTS.

9. ANY UTILITY POLES THAT MAY BE UNDERMINED BY THE CONSTRUCTION ACTIVITY ARE TO BE BRACED. THE CONTRACTOR SHALL MAKE THE NECESSARY ARRANGEMENTS TO HAVE THE POLES BRACED IN ACCORDANCE WITH THE APPROPRIATE UTILITY REQUIREMENTS; THE COST FOR THIS WORK IS INCLUDED IN THE UNIT PRICES FOR THE WORK ITEMS AFFECTED.

10. ALL EROSION AND SEDIMENT CONTROL MEASURES IDENTIFIED ON THE CONTRACT DRAWINGS ARE TO BE IN PLACE PRIOR TO THE START OF CONSTRUCTION.

11. ACCESS TO ALL PRIVATE PROPERTIES FRONTING THE CONSTRUCTION SHALL BE MAINTAINED AT ALL TIMES. TEMPORARY ACCESS RESTRICTIONS WILL ONLY BE PERMITTED WHERE REQUIRED TO FACILITATE UNDERGROUND SERVICING, ASPHALT AND CONCRETE PLACEMENT. THE CONTRACTOR SHALL PROVIDE 48 HOURS NOTICE TO THE COUNTY AND THE AFFECTED PROPERTY OWNERS PRIOR TO ACCESS INTERRUPTION.

12. ALL PROPERTY BARS DISTURBED OR DAMAGED DURING CONSTRUCTION SHALL BE REPLACED BY THE CONTRACTOR AT THE CONCLUSION OF THE CONTRACT, AT THEIR EXPENSE.

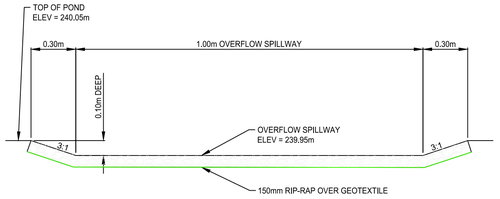
13. ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER.

SURVEY:

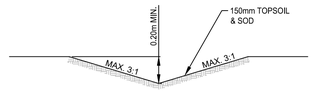
1. EXISTING UNDERGROUND SERVICES, UTILITIES, AND TOPOGRAPHIC INFORMATION IS BASED UPON:
   - TOPOGRAPHIC & LEGAL SURVEY PROVIDED BY ELLIOT & PARR SURVEYING DONE ON FEBRUARY 18TH, 2021.

2. THE CONTRACTOR SHALL PROVIDE DETAILED LAYOUT FOR THE WORK INCLUDING CALCULATIONS OF LAYOUT DIMENSIONS AND ELEVATIONS.

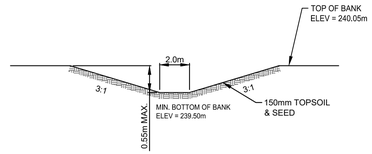
3. THE CONTRACTOR SHALL PROVIDE AN AUTOCAD AND ACCOMPANYING HARDCOPY OF THE AS CONSTRUCTED WORKS. THE DRAWINGS SHALL CONVEY ALL UNDERGROUND SERVICING AND INFRASTRUCTURE BASED ON TOPOGRAPHIC SURVEY OF THE WORKS.



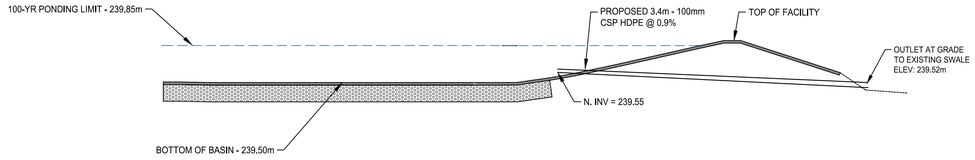
1 TYPICAL OVERFLOW SPILLWAY
SCALE: N.T.S.



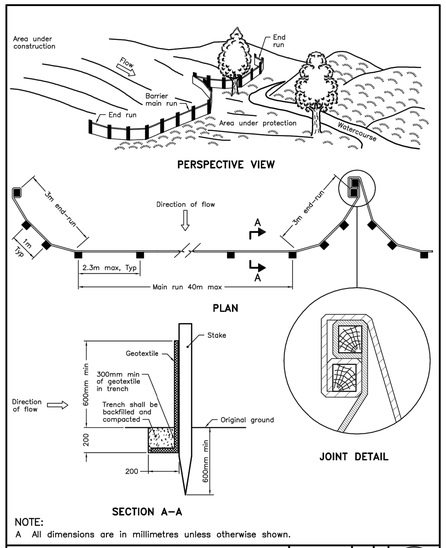
2 CONVEYANCE SWALE
SCALE: N.T.S.



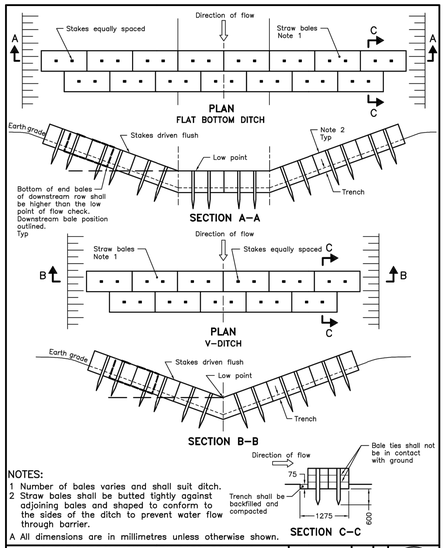
3 ENHANCED GRASSED SWALE
SCALE: N.T.S



4 ENHANCED GRASSED SWALE OUTLET CROSS-SECTION DETAIL
SCALE: N.T.S



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		

SURVEY
TOPOGRAPHIC SURVEY PROVIDED
BY ELLIOT & PARR DATED FEBRUARY 18TH, 2021

BENCHMARK

NOTES:

No.	REVISION	BY	DATE
2.	ISSUED FOR 2ND SUBMISSION	JL	2021-09-17
1.	ISSUED FOR 1ST SUBMISSION	JL	2021-04-16

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WILDFIRE BUILDING ADDITION

TOWNSHIP OF DOURO-DUMMER

STANDARD NOTES AND DETAILS

DRAWN BY: B.SANDERS	STAMP: LICENSED PROFESSIONAL ENGINEER B.T.PARSONS 100213434 2021-09-17 PROVINCE OF ONTARIO
DESIGNED BY: B.PARSONS	
APPROVED BY: B.PARSONS	
DATE: 2021-04-16	
SCALE: 1:300	

PROJECT NUMBER:	SHEET NAME:	SHEET:
21013	DET1	3 of 3

21013 - CS1
Date: Sep. 15, 2021 - 2:19 pm Plotted by: dsteffl Filename: S:\01 - Projects\21000\21013 - Wildfire Building Addition\02 Design\01 - Drawings\01 - Current Drawings\21013 - CS1.dwg