SCHEDULE "A"
Site Plan Control Agreement
Pirelli Cables

TO AGREEMENT EXECUTED THE 5th day of May, 2003.

BETWEEN: PIRELLI CABLES INC.

AND: THE CORPORATION OF THE TOWNSHIP OF EDWARDSBURGH/CARDINAL

DESCRIPTION OF THE PROPERTY

CONCESSION 1, PART LOTS 31, 32 AND 33
RP15R6166, PART 1
GEOGRAPHIC TOWNSHIP OF EDWARDSBURGH
PROVINCE OF ONTARIO

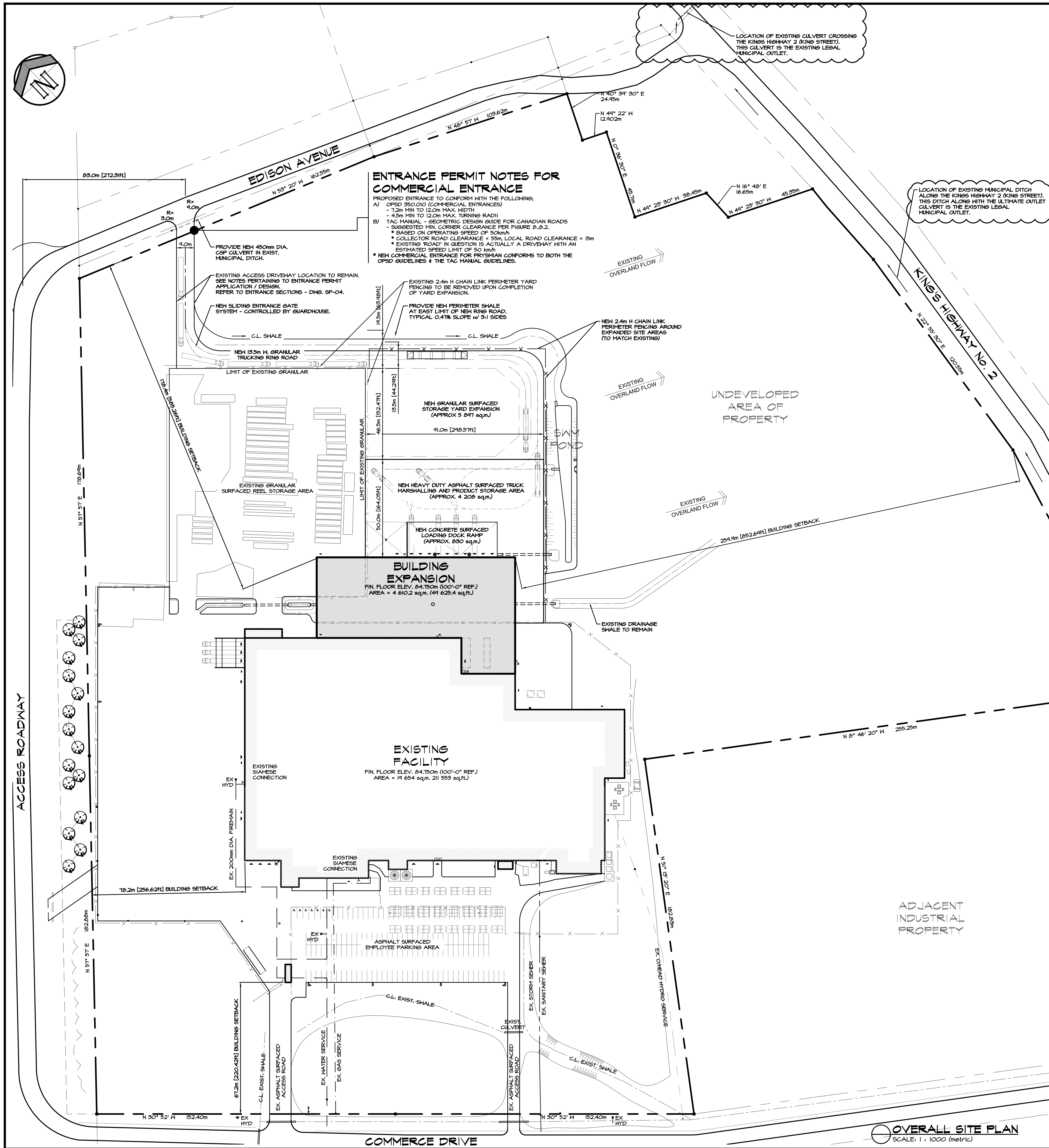
SCHEDULE "B"
Site Plan Control Agreement
Pirelli Cables

TO AGREEMENT EXECUTED THE 5th DAY OF May, 2003
AS AMENDED THE___DAY OF______2021

MASSING AND CONCEPTUAL PLAN SITE PLAN

EXHIBITS: The following Exhibit attached hereto shall form part of this Schedule:

SP01 Overall Site Plan
SP02 Enlarged Site Plan
SP03 Enlarged Grading and Drainage Plan
SP04 Site Details



ENTRANCE PERMIT NOTES FOR COMMERCIAL ENTRANCE

PROPOSED ENTRANCE TO CONFORM WITH THE FOLLOWING;

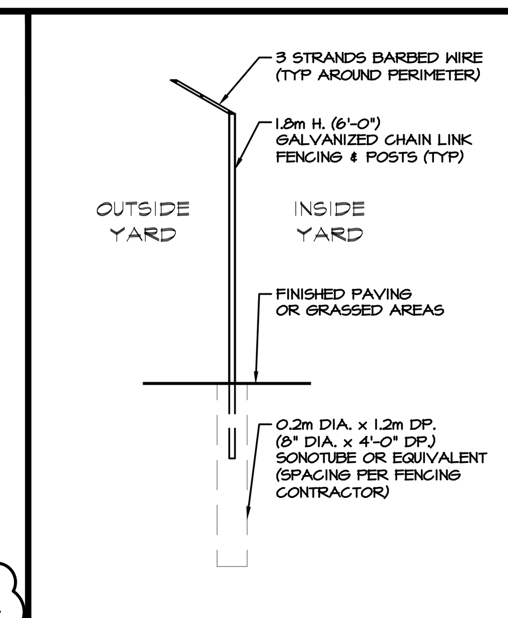
A) OPSD 350.010 (COMMERCIAL ENTRANCES)
- 7.2m MIN TO 12.0m MAX. WIDTH
- 4.5m MIN TO 12.0m MAX. TURNING RADII

B) TAC MANUAL - GEOMETRIC DESIGN GUIDE FOR CANADIAN ROADS
- SUGGESTED MIN. CORNER CLEARANCE PER FIGURE 8..8.2.
  * BASED ON OPERATING SPEED OF 50km/h
  * COLLECTOR ROAD CLEARANCE = 55m, LOCAL ROAD CLEARANCE = 15m
  * EXISTING 'ROAD' IN QUESTION IS ACTUALLY A DRIVEWAY WITH AN ESTIMATED SPEED LIMIT OF 50 km/h

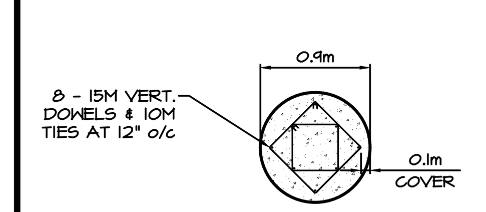
* NEW COMMERCIAL ENTRANCE FOR PRYSMIAN CONFORMS TO BOTH THE OPSD GUIDELINES & THE TAC MANUAL GUIDELINES.

OVERALL SITE PLAN
SCALE 1 : 1000 (metric)

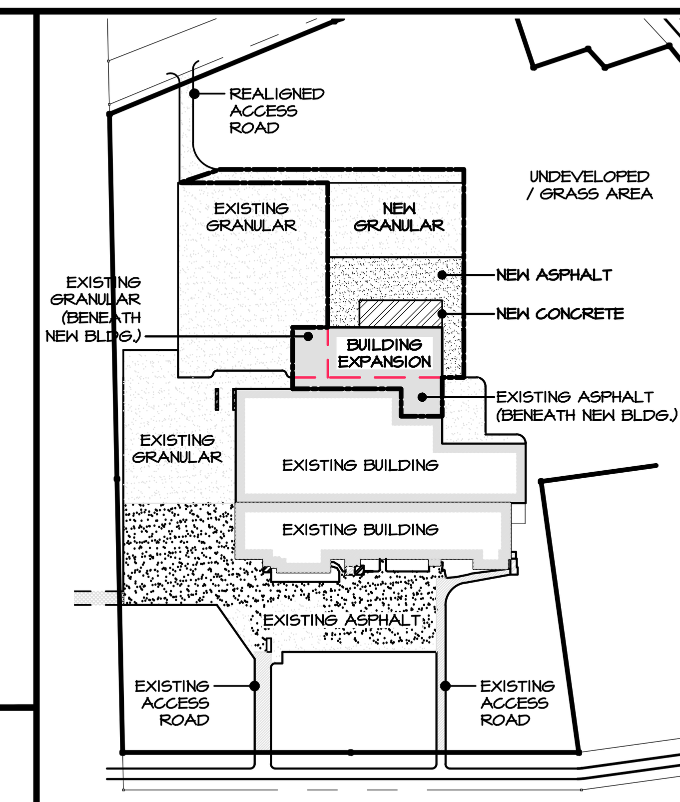
PRELIMINARY
NOT FOR CONSTRUCTION



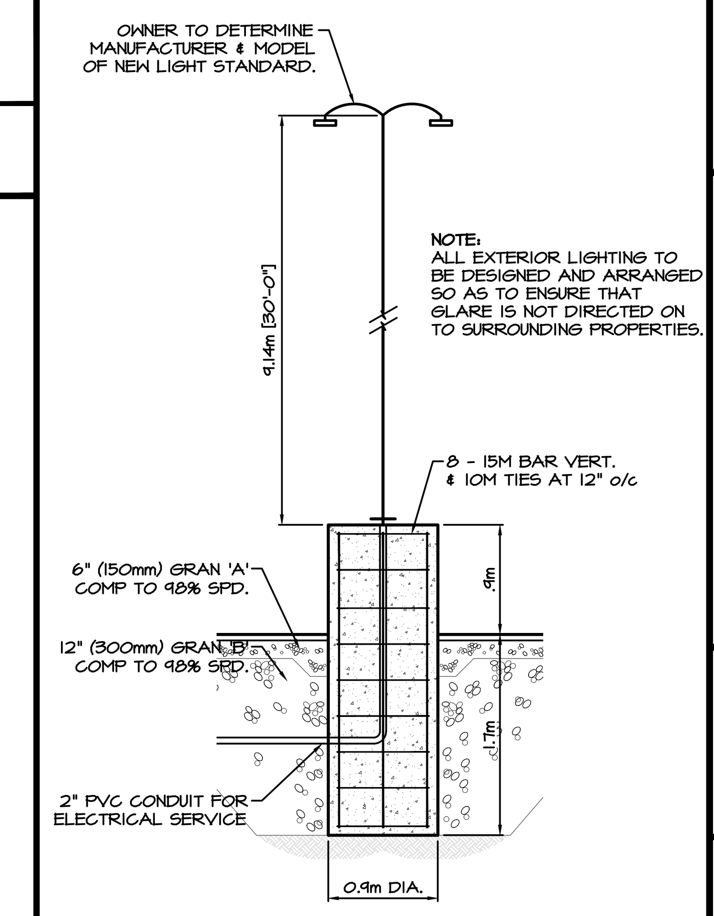
YARD FENCING
SCALE 1 : 40 (metric)



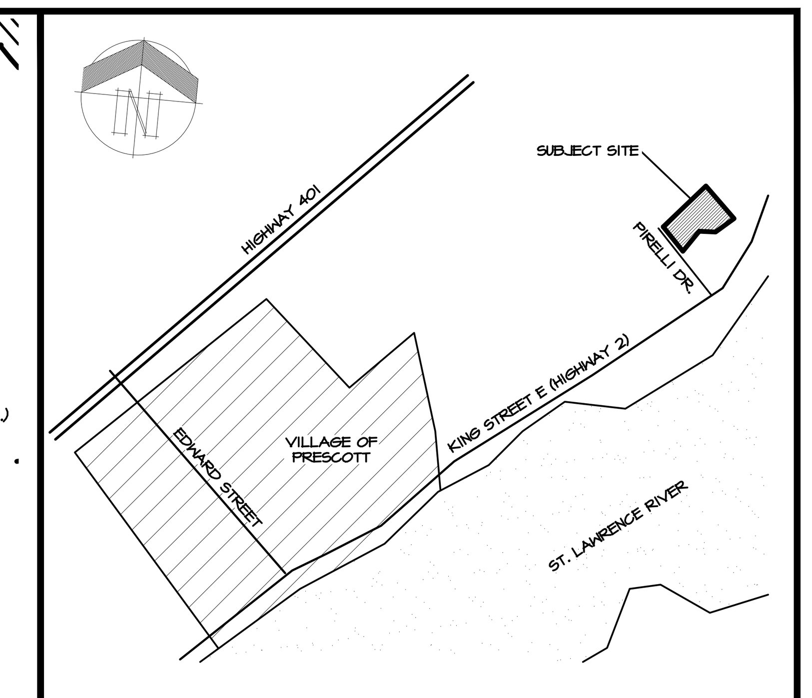
TYP. LIGHT BASE
SCALE 1 : 50 (metric)



SURFACING KEY PLAN
SCALE 1 : 2000 (metric)



TYP. LIGHT STANDARD BASE
SCALE 1 : 50 (metric)



SITE KEY PLAN
SCALE: N.T.S.

SITE DATA

PLAN OF SURVEY PART OF LOTS 31 AND 32 CONCESSION 1 PART OF BLOCK 1
REGISTERED PLAN 55 AND PART OF LOT D REGISTERED PLAN 90
TOWNSHIP OF EDWARDSBURGH
PART OF LOTS 3 AND 4 RANGE 1 PART CROWN RESERVE (SEE SCHEDULE 'B')
AND ALL OF BLOCK 1 WEST OF TOWN LOTS REGISTERED PLAN 6
JOHNSTOWN MUNICIPALITY OF TOWNSHIP OF EDWARDSBURGH
COUNTY OF GRENVILLE
R.F. MUCKLESTONE LIMITED
ONTARIO LAND SURVEYORS
DATED SEPTEMBER 25, 1980

OVERALL SITE AREA

GROSS LOT AREA:	187 579.7 sq.m. (2 019 090.8 sq.ft.) = 100%
EXISTING BUILDING AREA:	19 654 sq.m. (211 553.8 sq.ft.)
NEW BUILDING AREA:	4 610 sq.m. (49 625.4 sq.ft.)
TOTAL BUILDING AREA:	24 264 sq.m. (261 184 sq.ft.) = 12.94%
EXISTING ASPHALT AREA:	23 412.8 sq.m. (252 022 sq.ft.)
NEW ASPHALT AREA:	4 043 sq.m. (43 520 sq.ft.)
TOTAL ASPHALT AREA:	27 455.8 sq.m. (295 541 sq.ft.) = 14.6%
EXISTING GRANULAR AREA:	11 238.4 sq.m. (120 973.1 sq.ft.)
NEW GRANULAR AREA:	5 897 sq.m. (63 476.9 sq.ft.)
TOTAL GRANULAR AREA:	17 135.4 sq.m. (184 450 sq.ft.) = 9.13%
NEW CONCRETE AREA:	995 sq.m. (10 710 sq.ft.) = 0.50%
TOTAL LANDSCAPE AREA:	117 729.5 sq.m. (1 267 271 sq.ft.) = 62.76%
TOTAL LOT COVERAGE	187 579.7 sq.m. 100%

ZONING INFORMATION:

MP / HC INDUSTRIAL PARK / HIGHWAY COMMERCIAL

FRONT YARD SETBACK	MIN. 8.0 m	ACTUAL 67.2 m
REAR YARD SETBACK	MIN. 10.0 m	ACTUAL 30.6 m
INTERIOR SIDE YARD	MIN. 6.0 m	ACTUAL 78.2 m
EXTERIOR SIDE YARD	MIN. 6.0 m	ACTUAL 259.9 m
MAX. LOT COVERAGE	MAX. 35%	ACTUAL 12.94%

PARKING REQUIREMENTS:

ALL SPACES 3.0m W. x 6.0m LG. (SHOWN)

PARKING CALCULATED BASED ON MANUFACTURING, INDUSTRIAL OR WAREHOUSE PARKING REQUIREMENTS:

1 SP / 100 sq.m. UP TO 2,000 sq.m.	= 20 SPACES	plus
1 SP / 200 sq.m. THEREAFTER: (EXIST.) 19 654 - 2 000 sq.m. = 17 654 / 200	= 88.27 SPACES	plus
(NEW) 4 610 / 200	= 23.05 SPACES	
TOTAL PARKING SPACES REQ'D = 75.71	= 131.32 SPACES	

INCLUDING 7 EXISTING BARRIER FREE SPACES (TYP. 4.5m x 6.0m)

* 150 SPACES PROVIDED (150 EXISTING)

No.	REVISIONS	MADE BY	DATE
B	REVISED & REISSUED PER SWM COMMENTS	JWB	27MAY21
A	ISSUED FOR SITE PLAN APPROVAL	JWB	27APR21

CORNERSTONE BUILDERS LTD.
FAX: 613·968·4986 general@cornerstonebuilders.ca PH: 613·968·3501

PRYSMIAN CABLES & SYSTEMS

PROPOSED INDUSTRIAL EXPANSION

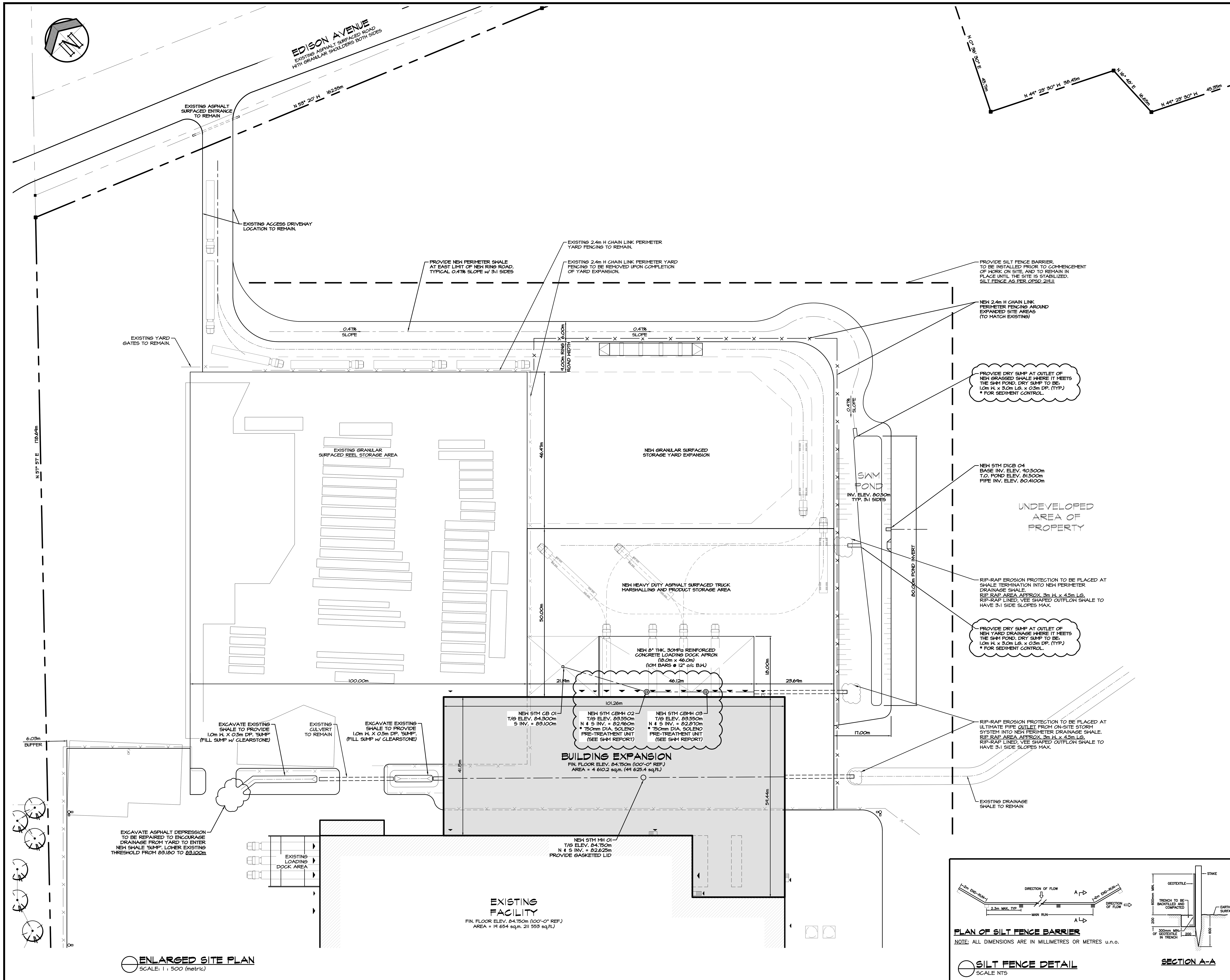
PRYSMIAN POWER CABLES & SYSTEMS CANADA LTD.

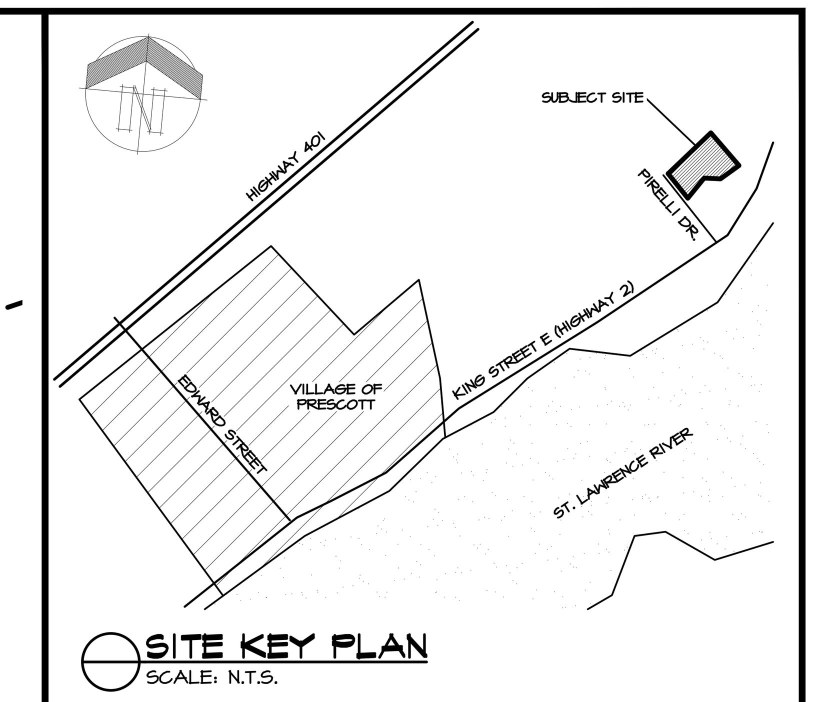
137 COMMERCE DRIVE
PRESCOTT, ONTARIO
K0E 1T0

OVERALL SITE PLAN

CHECKED BY:	DATE: FEB 2021	CONTRACT NO: 8206
DESIGNED BY:		DRAWING NO: SP-01
DRAWN BY: DSS		
SCALE: AS SHOWN		REVISION NO: B

PLOT DATE:



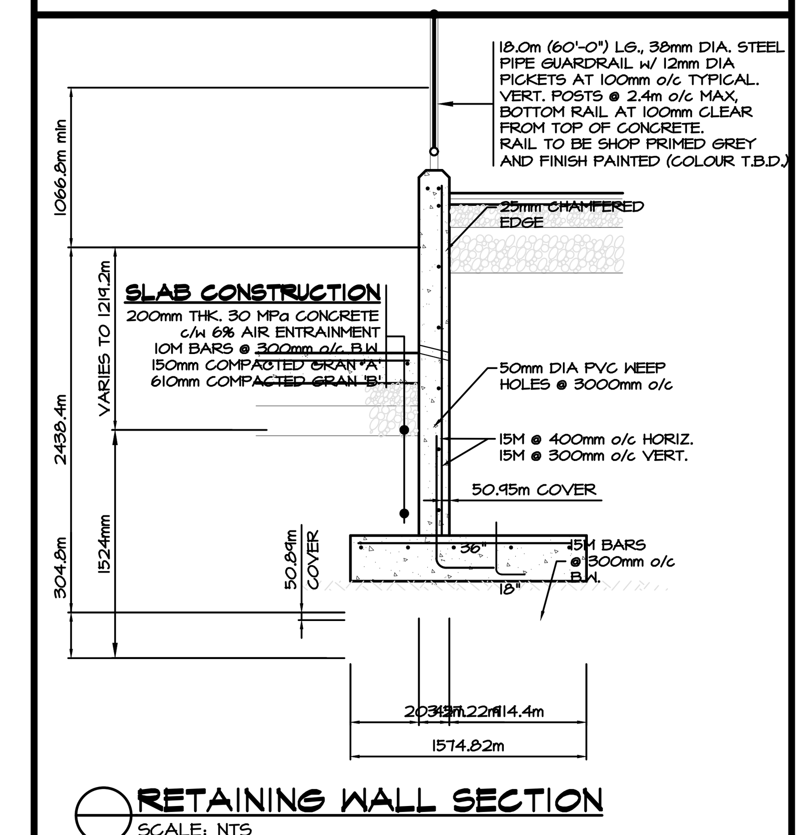


SITE LIGHTING NOTE:

THE COUNTY REQUESTS THAT ANY PROPOSED OR FUTURE OUTDOOR LIGHTING, INCL. FIXTURES AND SIGNS, BE DESIGNED, INSTALLED AND MAINTAINED TO PREVENT LIGHT SPILL OVER - OR GLARE ONTO THE COUNTY ROAD ALLOWANCE.

SITE DATA

PLAN OF SURVEY PART OF LOTS 31 AND 32 CONCESSION 1 PART OF BLOCK 1 REGISTERED PLAN 55 AND PART OF LOT D REGISTERED PLAN 90
TOWNSHIP OF EDWARDSBURGH
PART OF LOTS 3 AND 4 RANGE 1 PART CROWN RESERVE (SEE SCHEDULE 'B')
AND ALL OF BLOCK 1 WEST OF TOWN LOTS REGISTERED PLAN 6
JOHNSTOWN MUNICIPALITY OF TOWNSHIP OF EDWARDSBURGH
COUNTY OF GRENVILLE
R.P. MUCKLESTONE LIMITED
ONTARIO LAND SURVEYORS
DATED SEPTEMBER 25, 1980



PRELIMINARY
NOT FOR CONSTRUCTION

No.	REVISIONS	MADE BY	DATE
B	REVISED & REISSUED PER SWM COMMENTS	JWB	27MAY21
A	ISSUED FOR SITE PLAN APPROVAL	JWB	21APR21

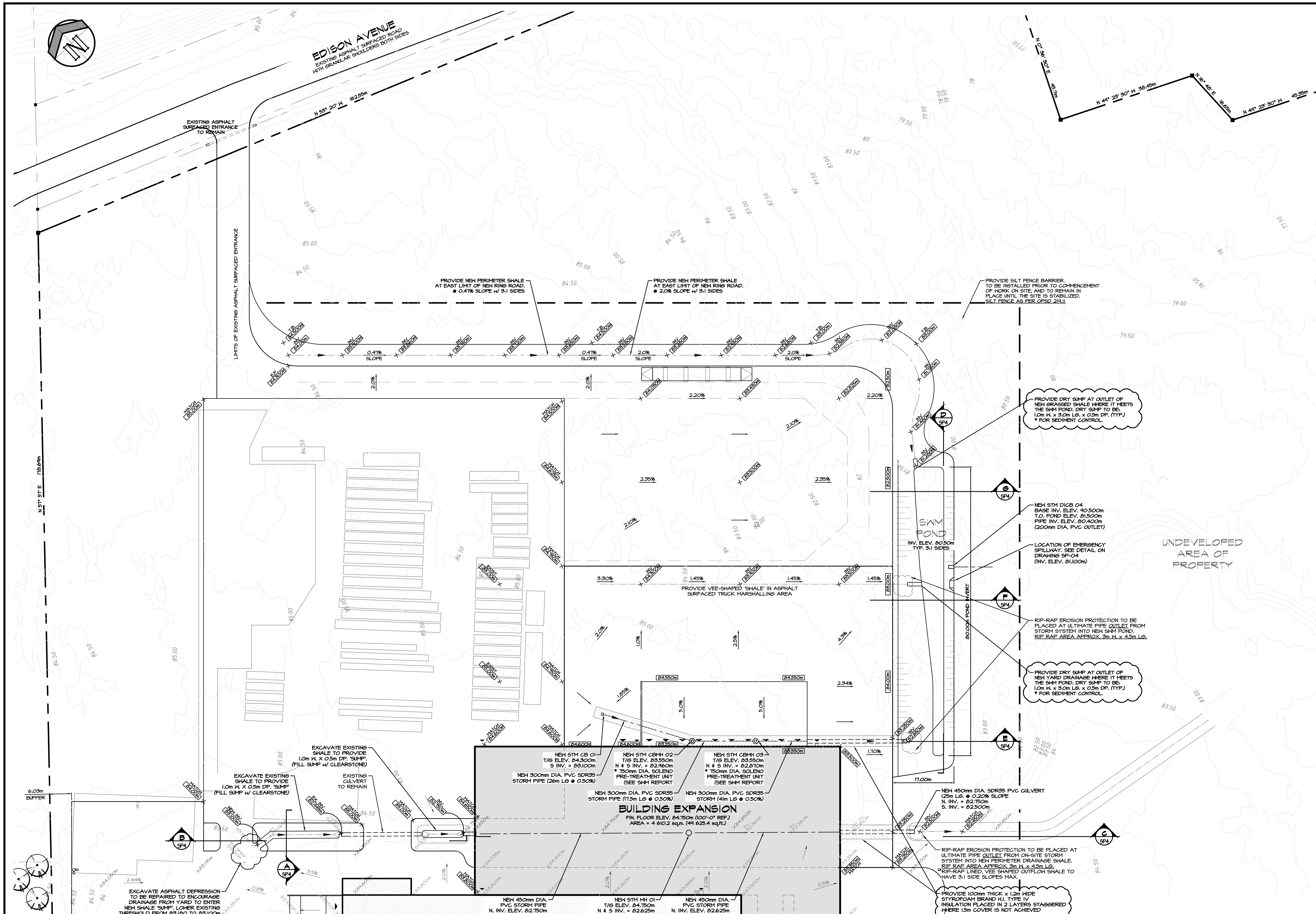
CORNERSTONE BUILDERS LTD.
FAX: 613-968-4986 general@cornerstonebuilders.ca PH: 613-968-3501

PRYSMIAN CABLES & SYSTEMS

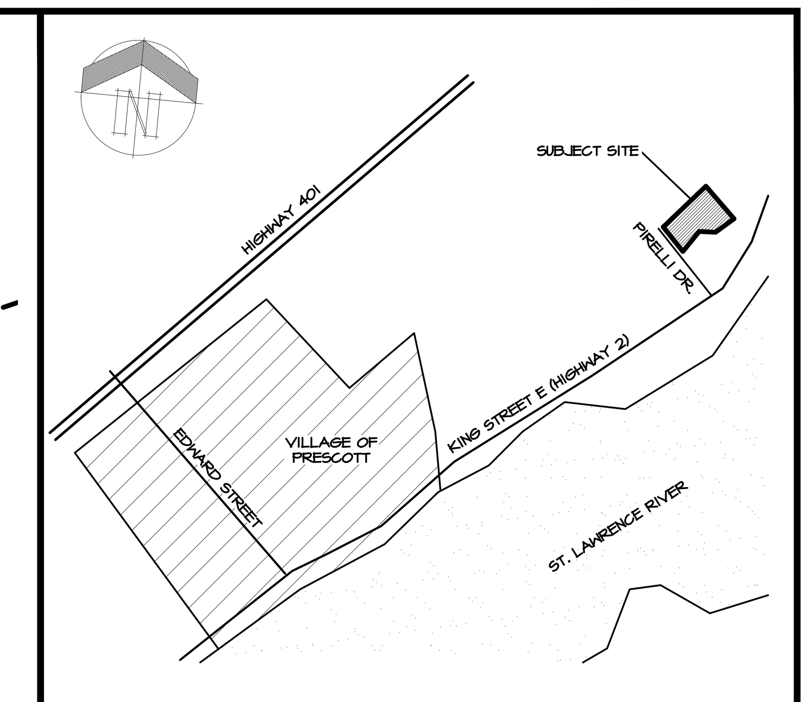
PROPOSED INDUSTRIAL EXPANSION
PRYSMIAN POWER CABLES & SYSTEMS CANADA LTD.
131 COMMERCE DRIVE
PRESCOTT, ONTARIO
K0E 1T0

ENLARGED SITE PLAN

CHECKED BY:	DATE: FEB 2021	CONTRACT No.: 8206	
DESIGNED BY:		DRAWING No.: SP-02	
DRAWN BY: DSS			
SCALE: 1 : 500 (metric)		REVISION No.: B	PLOT DATE:



ENLARGED GRADING & DRAINAGE PLAN
SCALE: 1 : 500 (metric)



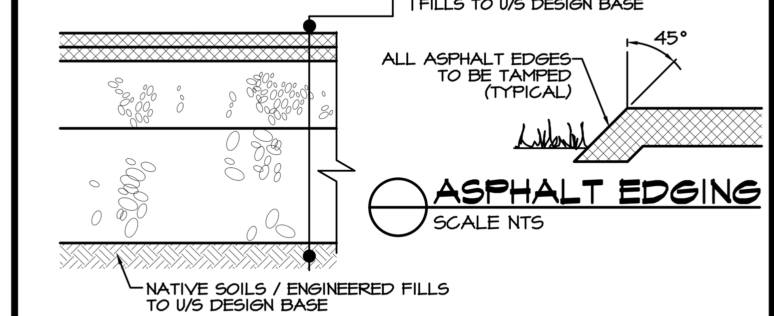
SITE KEY PLAN
SCALE: N.T.S.

SITE DATA

PLAN OF SURVEY PART OF LOTS 31 AND 32 CONCESSION I PART OF BLOCK I
REGISTERED PLAN 55 AND PART OF LOT D REGISTERED PLAN 90
TOWNSHIP OF EDWARDSBURGH
PART OF LOTS 3 AND 4 RANGE I PART CROWN RESERVE (SEE SCHEDULE 'B')
AND ALL OF BLOCK I WEST OF TOWN LOTS REGISTERED PLAN 6
JOHNSTOWN MUNICIPALITY OF TOWNSHIP OF EDWARDSBURGH
COUNTY OF GRENVILLE
R.F. MUCKLESTONE LIMITED
ONTARIO LAND SURVEYORS
DATED SEPTEMBER 25, 1980

STANDARD DUTY ASPHALT (S.D.)
CAR PARKING AREAS
2" (50.4mm) LIFT OF HL3
6" (150mm) GRAN 'A' COMP TO 98% SPD.
12" (300mm) GRAN 'B' COMP TO 98% SPD.
NATIVE SOIL OR ENGINEERED PIT RUN FILLS TO U/S DESIGN BASE

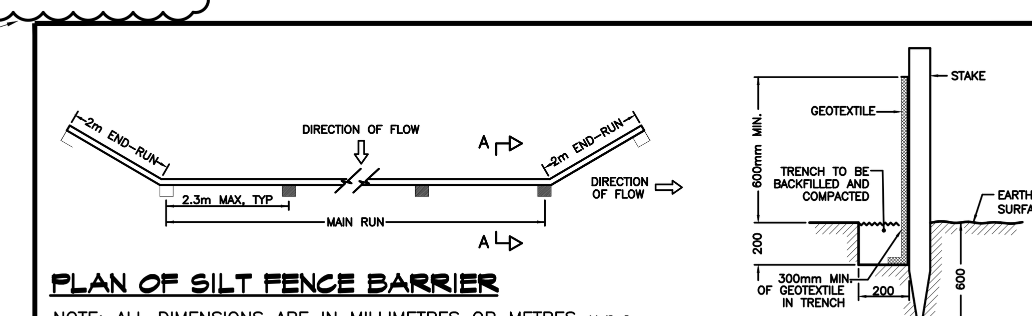
HEAVY DUTY ASPHALT (H.D.)
TRUCKING AREAS
1 1/2" (38.1mm) LIFT OF HL3
2 1/2" (63.5mm) LIFT OF HL8
6" (150mm) GRAN 'A' COMP TO 98% SPD.
12" (300mm) GRAN 'B' COMP TO 98% SPD.
NATIVE SOIL OR ENGINEERED PIT RUN FILLS TO U/S DESIGN BASE



ASPHALT EDGING
SCALE NTS

* NOTE: ALL EDGES NOT CURBED TO BE TAMPED - SEE DETAIL

ASPHALT SPECIFICATION
SCALE NTS



PLAN OF SILT FENCE BARRIER
NOTE: ALL DIMENSIONS ARE IN MILLIMETRES OR METRES u.n.o.

SECTION A-A

SILT FENCE DETAIL
SCALE NTS

PRELIMINARY
NOT FOR CONSTRUCTION

No.	REVISIONS	MADE BY	DATE
B	REVISED & REISSUED PER SWM COMMENTS	JWB	27MAY21
A	ISSUED FOR BUILDING PERMIT	JWB	27APR21

CORNERSTONE BUILDERS LTD.
FAX: 613·968·4986 general@cornerstonebuilders.ca PH: 613·968·3501

PRYSMIAN CABLES & SYSTEMS

PROPOSED INDUSTRIAL EXPANSION

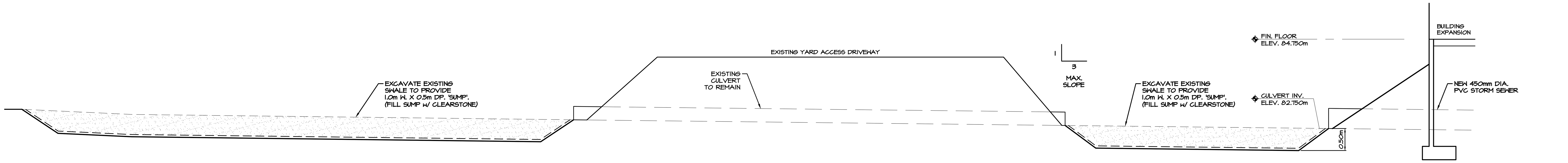
PRYSMIAN POWER CABLES & SYSTEMS CANADA LTD.

137 COMMERCE DRIVE
PRESCOTT, ONTARIO
K0E 1T0

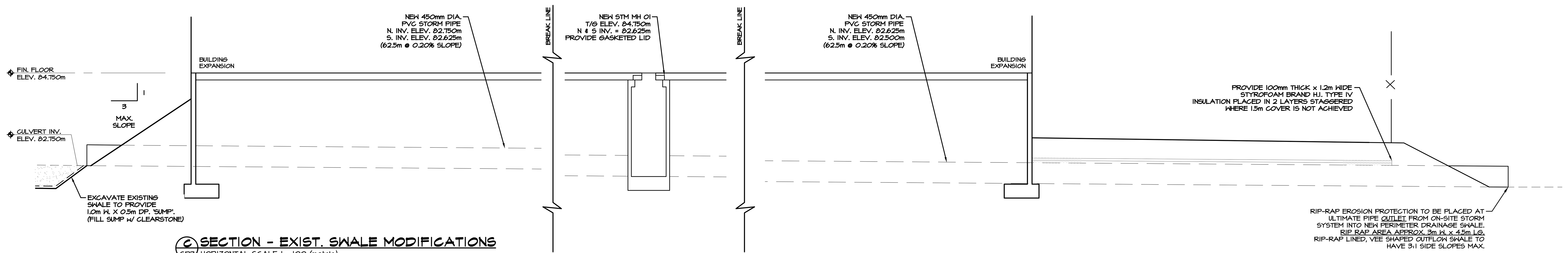
ENLARGED GRADING & DRAINAGE PLAN

CHECKED BY:	DATE: FEB 2021	CONTRACT NO: 8206
DESIGNED BY:		DRAWING NO: SP-03
DRAWN BY: DSS		
SCALE: 1 : 500 (metric)		REVISION NO: B

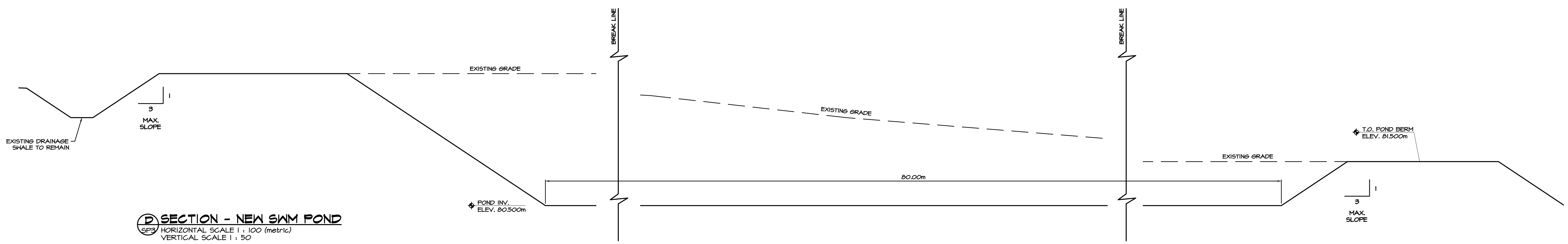
PLOT DATE:



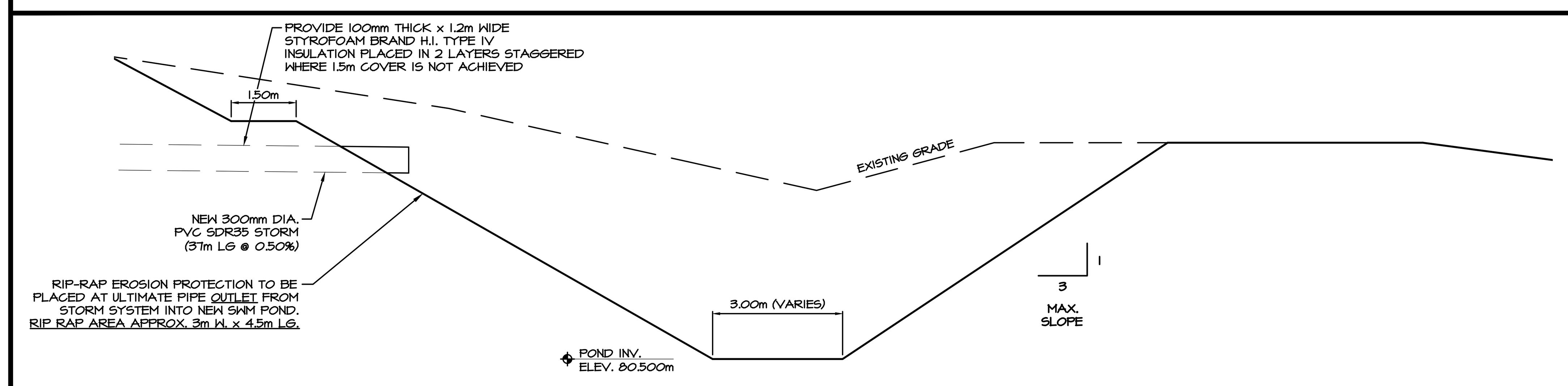
B SECTION - EXIST. SWALE MODIFICATIONS
SP3 HORIZONTAL SCALE 1 : 100 (metric)
VERTICAL SCALE 1 : 50



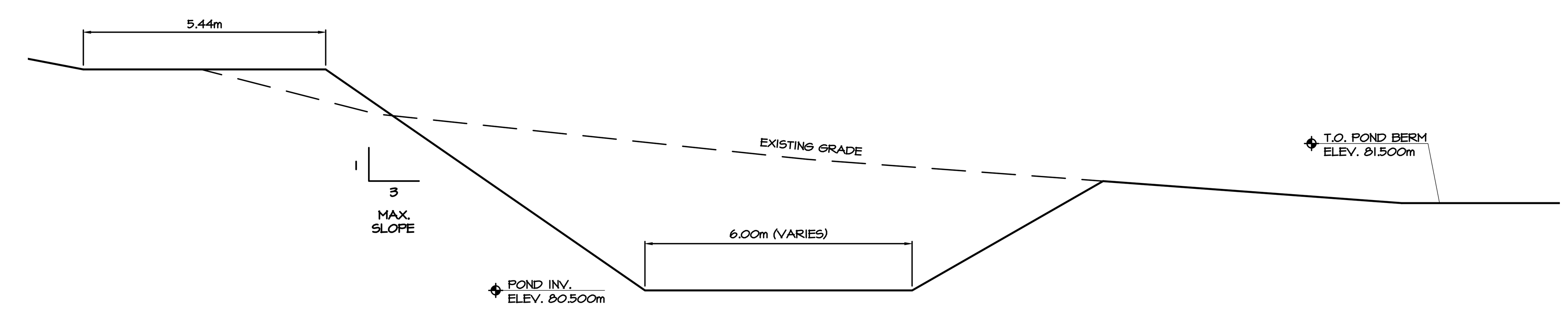
C SECTION - EXIST. SWALE MODIFICATIONS
SP3 HORIZONTAL SCALE 1 : 100 (metric)
VERTICAL SCALE 1 : 50



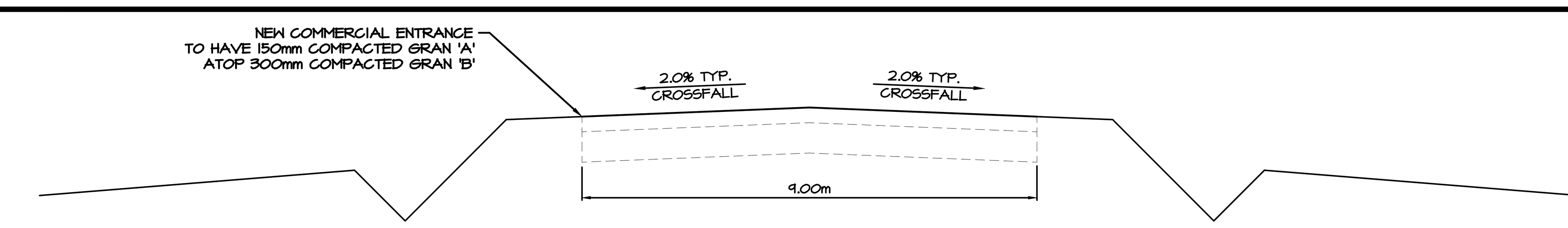
D SECTION - NEW SWM POND
SP3 HORIZONTAL SCALE 1 : 100 (metric)
VERTICAL SCALE 1 : 50



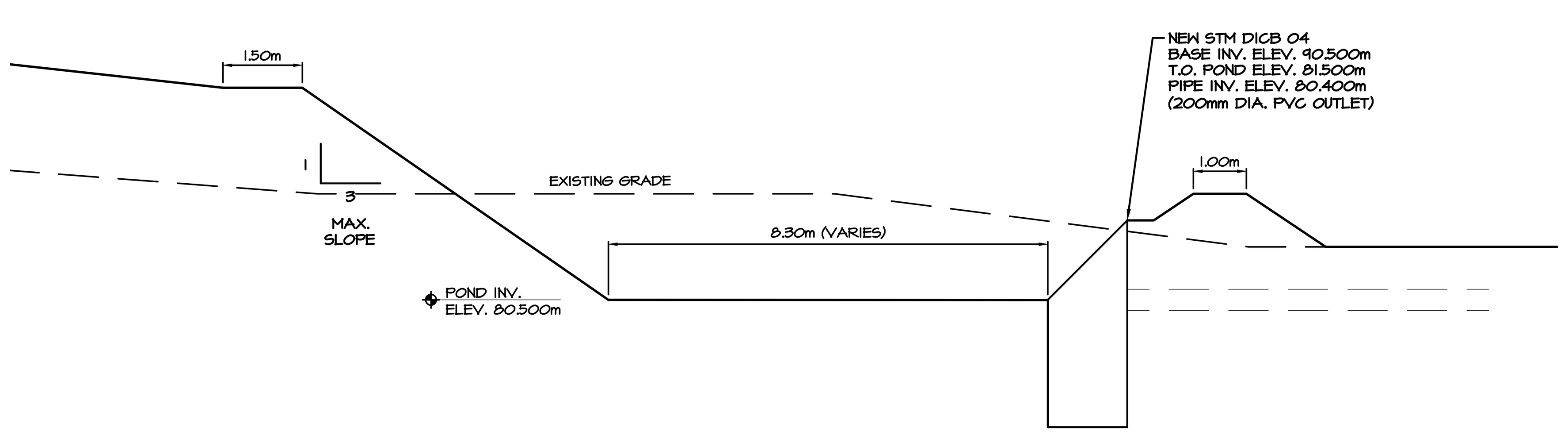
E SECTION - NEW SWM POND
SP3 HORIZONTAL SCALE 1 : 100 (metric)
VERTICAL SCALE 1 : 50



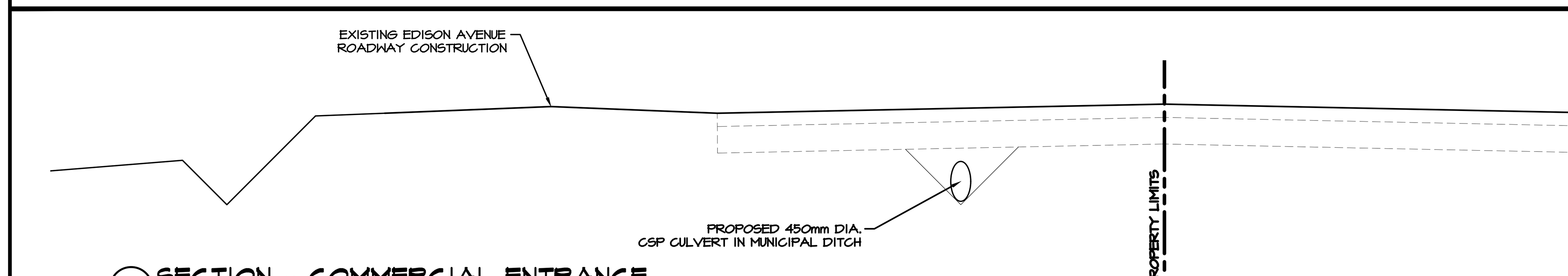
F SECTION - NEW SWM POND
SP3 HORIZONTAL SCALE 1 : 100 (metric)
VERTICAL SCALE 1 : 50



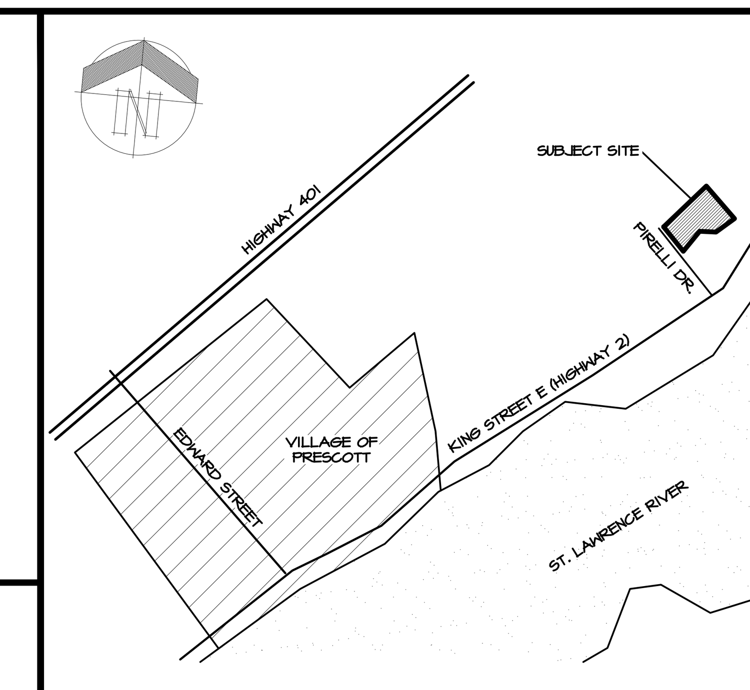
SECTION - COMMERCIAL ENTRANCE
SP1 HORIZONTAL SCALE 1 : 100 (metric)
VERTICAL SCALE 1 : 50



G SECTION - NEW SWM POND
SP3 HORIZONTAL SCALE 1 : 100 (metric)
VERTICAL SCALE 1 : 50



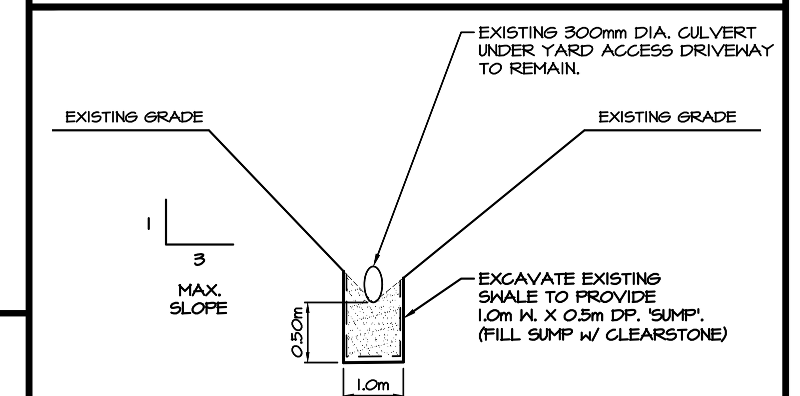
SECTION - COMMERCIAL ENTRANCE
SP1 HORIZONTAL SCALE 1 : 100 (metric)
VERTICAL SCALE 1 : 50



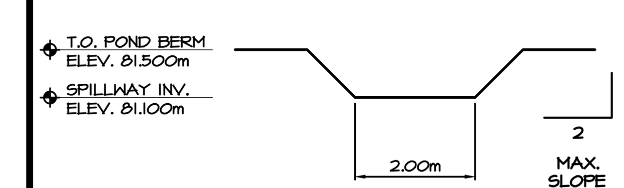
SITE KEY PLAN
SCALE: N.T.S.

SITE DATA

PLAN OF SURVEY PART OF LOTS 31 AND 32 CONCESSION 1 PART OF BLOCK 1 REGISTERED PLAN 55 AND PART OF LOT D REGISTERED PLAN 40 TOWNSHIP OF EDWARDSBURGH
PART OF LOTS 3 AND 4 RANGE 1 PART CROWN RESERVE (SEE SCHEDULE 'B') AND ALL OF BLOCK 1 WEST OF TOWN LOTS REGISTERED PLAN 6
JOHNSTOWN MUNICIPALITY OF TOWNSHIP OF EDWARDSBURGH
COUNTY OF GRENVILLE
R.F. HUCKLESTONE LIMITED
ONTARIO LAND SURVEYORS
DATED SEPTEMBER 25, 1980



A SECTION - EXIST. SWALE MOD'S
SP3 HORIZONTAL SCALE 1 : 100 (metric)
VERTICAL SCALE 1 : 50



- EMERGENCY SPILLWAY
SP3 HORIZONTAL SCALE 1 : 100 (metric)
VERTICAL SCALE 1 : 50

PRELIMINARY
NOT FOR CONSTRUCTION

No.	REVISIONS	MADE BY	DATE
A	ISSUED FOR SITE PLAN APPROVAL	JHB	27APR21

CORNERSTONE BUILDERS LTD.

FAX: 613-968-4986 general@cornerstonebuilders.ca PH: 613-968-3501

PRYSMIAN CABLES & SYSTEMS

PROPOSED INDUSTRIAL EXPANSION

PRYSMIAN POWER CABLES & SYSTEMS CANADA LTD.

131 COMMERCE DRIVE
PRESCOTT, ONTARIO
K0E 1T0

SITE DETAILS

LICENSED PROFESSIONAL ENGINEER
C.P. YEE
PROVINCE OF ONTARIO

CHECKED BY:	DATE: MAR 2021	CONTRACT NO: 8206
DESIGNED BY:		DRAWING NO: SP-04
DRAWN BY: DSS / JHB		
SCALE: AS NOTED		REVISION NO: A

PLOT DATE:

SCHEDULE "C"
Site Plan Control Agreement
Pirelli Cables

TO AGREEMENT EXECUTED THE 5th DAY OF May, 2003
AS AMENDED THE ____DAY OF _________, 2021

1. ACCESS FACILITIES

a) As per site plan forming Exhibit No. 1 of Schedule "B".

2. OFFSTREET PARKING AND LOADING

a) As per site plan forming Exhibit No. 1 of Schedule "B" to this Agreement.
b) All offstreet parking lots and access driveways on the owner's lands are to be paved within one year.

3. SNOW REMOVAL

a) Responsibility of the owner.

4. GRADING AND DISPOSAL OF STORM AND SANITARY WASTE

a) Sanitary waste as per requirements of the District Health Unit.
b) Storm water disposal as per Site Plan (Exhibit 1).

5. FLOODLIGHTING

a) Parking lots and access driveways on the owner's land are to be illuminated to the requirements of the Chief Building Official.

6. LANDSCAPING

a) As per site plan forming Exhibit No. 1 of Schedule "B" to this Agreement.

7. REFUSE STORAGE AND DISPOSAL

a) A refuse storage shall be provided by the owner.
b) The owner shall be responsible for the disposal of refuse from his property.

8. LOCATION OF BUILDING STRUCTURES AND FACILITIES

a) As per Exhibit No. 1 of Schedule "B" to this Agreement.

9. Pursuant to the 41(8)(a)(i) Planning Act and 6.2.2(d) Counties Official Plan, a dedication of land shall be made to the Counties along County Rd 2 for future potential road purposes. The road allowance should be 30.5 m. Should sufficient allowance exist, a letter from a surveyor would meet the Counties' needs. Should the allowance not meet minimum desired right-of-way, the appropriate dedication of 1/2 the desired allowance width, measured from the centerline of the current road shall be made. The lands to be transferred for road widening purposes shall be free and clear of all and any encumbrances.

10. Any proposed or future outdoor lighting, including fixtures and signs, be designed, installed and maintained to prevent light spill over or glare onto the County Rd allowance.

SCHEDULE "E"
Site Plan Control Agreement
Prysmian Power Cables

TO AGREEMENT EXECUTED THE 5TH DAY OF MAY, 2003
AS AMENDED THE _____DAY OF _______, 2021

STORMWATER MANAGEMENT DESIGN BRIEF

Prysmian Power Cables & Systems Canada Ltd.

137 Commerce Drive,

Prescott, ON

Stormwater Management Design Brief

March 16, 2021

CORNERSTONE
BUILDERS LTD.

FAX: 613·968·4986 general@cornerstonebuilders.ca PH: 613·968·3501

Revision Notes

This is the initial submission.

Table of Contents

Table of Tables

Table of Figures

Appendices

1 Introduction

The Prysmian facility in Prescott produces cables for the communications and energy sector. The 18.76ha site is located at the northeast corner of Commerce Drive and County Road 2 at 137 Commerce Drive (see Figure 1-1). Prysmian is seeking to expand their current facility with the addition of a 4,610m^2 building on the northeast side as well as an asphalt surfaced truck marshalling area and a granular yard.

The expanded building will extend over a drainage swale that must be modified to accommodate the addition. The swale drains west to east and ultimately discharges to the undeveloped portion of the property and eventually to County Road 2.

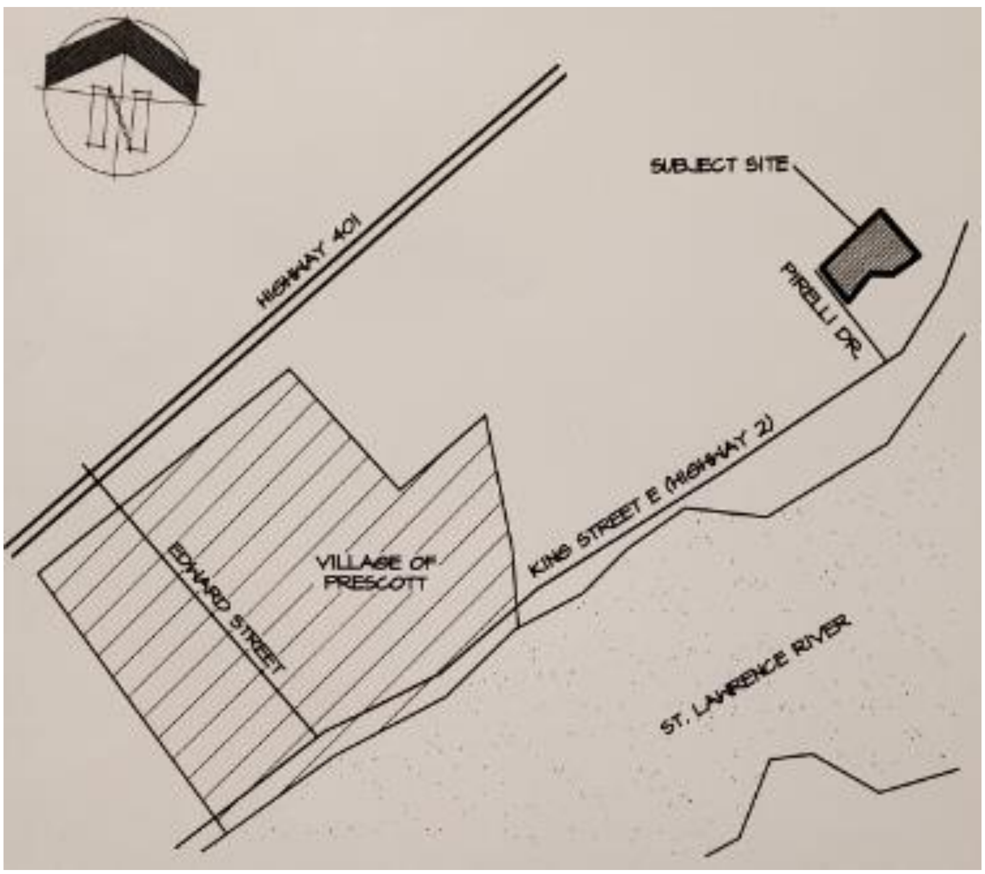


Figure 1-1: Site Location

An earlier stormwater management report prepared by WaterPlan Associates in 2010 was made available to CBL. The 2010 report provided good background information of the property and drainage information. Stormwater management measures were employed to mitigate peak flow impacts. A 240m long swale was provided in three segments of 80m each separated by rip-rap steps. Runoff flows through the swales sequentially. In total, the 2010 expansion featured 533m^3 of storage that was provided in the swale system to reduce peak flows during the 100-yr event to 155L/s.

The 2010 storage is shown below in Table 1-1.

Table 1-1: 2010 Storage and Peak Flow Summary

Event	Storage (m3)	Peak Outflow (L/s)
5-Yr	329	97
100-Yr	533	155

The proposed 2021 expansion will include additional surface hardening that is anticipated to increase peak flows from the site and adversely impact water quality. Stormwater management measures are required to mitigate the impacts.

Runoff from the proposed expansion will not connect to or affect the existing stormwater management system. A distinct and separate drainage route and stormwater management measures are planned as part of the new addition.

The proposed work will be constrained to a 1.55ha portion of the site. The plant expansion will add new gravel surfacing of 5,897m^2. New asphalt and roof areas of 5,038m^2 and 4,610m^2 respectively will replace existing grass and some gravel and hard surfacing. The proposed landcover is summarized in Table 1-2.

Table 1-2: Existing and Proposed Land Cover

Surface	Ex. Coverage (m^2)	Prop. Coverage (m^2)
Grassed	13,816	0
Asphalt	1,262	5,038
Building	0	4,610
Gravel	467	5,897
Total	**15,545**	**15,545**

2 Stormwater Management Targets

Development of the site will increase the surface hardening and runoff coefficient. This results in an increase in peak flows and total volume of runoff. Water quality degradation is typically inferred in relation to the amount of surface hardening. CBL has sought to provide measures that will result in an improvement of water quality.

Stormwater management is provided to mitigate the water quantity and quality impacts from increased development.

CBL met with representatives of the Township of Edwardsburgh Cardinal on Monday, January 25th, 2021. At this meeting, the Township indicated the following stormwater management targets would be applied to the development:

1) Quantity Control

Post-development peak flows controlled to pre-development peaks for all events up to and including the 100-yr event.

2) Quality Control

Enhanced criteria (TSS removal 80%)

3) County Culverts

No negative impacts for flows up to 5-yr.

CBL referenced the following documents in preparing the stormwater management report.

- Ministry of the Environment Stormwater Management Planning and Design Manual, 2003
- TRCA/CVC Low Impact Development Guidelines, 2010
- Prysmian Cables Plant Expansion – Stormwater Management Report, Jan 26 2010.

In addition to the above guidance, the province has issued direction to planning authorities that stormwater management planning shall:

a. be integrated with planning for *sewage and water services* and ensure that systems are optimized, feasible and financially viable over the long term;
b. minimize, or, where possible, prevent increases in contaminant loads;
c. minimize erosion and changes in water balance, and prepare for the *impacts of a changing climate* through the effective management of stormwater, including the use of *green infrastructure*;
d. mitigate risks to human health, safety, property and the environment;
e. maximize the extent and function of vegetative and pervious surfaces; and

f. promote stormwater management best practices, including stormwater attenuation and re-use, water conservation and efficiency, and low impact development.

Water quantity and quality control targets are discussed below.

2.1 Water Quantity Control Target

Stormwater quantity control targets are based on the principle of peak flow control. That is, post-development peak flows should not exceed pre-development peak flows for return period flows up to the 100-yr event.

2.2 Water Quality Target

Water quality targets are calculated on the basis of negative impacts caused by development. Water quality mitigation will be provided by directing runoff over extensive grass covered lands prior to discharge to the County Road 2 ditch and ultimately the St. Lawrence River. *Enhanced* protection is required.

2.3 Low Impact Development

The objectives of Low Impact Development include replicating the water budget as much as possible by reducing surface hardening and encouraging infiltration. The LID guidelines (Toronto and Region Conservation Authority, 2010) provide limitations on the application of infiltration technologies such that they not be used within 1m from the water table or rock. Stormwater measures will include the opportunity for infiltration, such as grassed swales and substantial grassy contact.

The Prysmian stormwater management plan makes use of grassed swales, a dry pond and extensive grassy contact that aligns with the LID objectives.

2.4 Climate Change

The province requires all planning applications to consider the implications of climate change. Specific direction is, however, not given. For small site plans, climate change mitigation is often interpreted to be provided by provision of additional storage. Some jurisdictions suggest 10% additional storage be provided for climate change mitigation.

At the Prysmian site, the climate change objective is satisfied by the provision of surplus storage.

3 Quantity Control

3.1 Rational Method

For small sites, stormwater management analysis may be completed using the Rational Method. Target peak flows for the Prysmian site are developed using the Rational Method (see Equation 1).

Equation 1: Rational Method

$$Q = \frac{1}{360} CiA$$

Where:

C = runoff coefficient

i = intensity of precipitation at time of concentration (mm/hr)

A = Area in hectares

3.1.1 Precipitation

Environment Canada maintains records of precipitation and develops statistics that aid in hydrologic analysis. Station 6106000 in Ottawa has records from 1967 to current. Intensity Duration and Frequency (IDF) Statistics are developed from the records and are included in Appendix A.

3.1.2 Runoff Coefficients

CBL referenced the earlier stormwater management report prepared by WaterPlan Associates for the 2010 plant expansion. In that report, the accepted runoff coefficients for the various land cover types were found. Runoff coefficients are adjusted for the return period as recommended by MTO, 1997. The runoff coefficients from WaterPlan were also applied to the current investigation (see Table 3-1).

Table 3-1: Runoff Coefficients

Surface	5-Yr	100-Yr
Gravel	0.5	0.6
Roof	0.9	0.95
Asphalt	0.9	0.95
Grass	0.2	0.25

Runoff coefficients were blended for the catchment of interest following a simple area weighted method per Equation 2.

Equation 2: Weighted Runoff Coefficient

$$C_w = \frac{C_1 \, x \, A_1 + C_2 \, x \, A_2 + \ \dots \ C_n \, x \, A_n}{A_1 + A_2 + \ \dots \ A_n}$$

Where:

C_i = Runoff Coefficient for A_i

A_i = Land Area (ha) of Cover Type

Table 3-2: Pre-Development Runoff Coefficients

Surface Cover	Area	R.C.	
	(m^2)	5-Yr	100-Yr
Grassed	13,816	0.2	0.25
Asphalt	1,262	0.9	0.95
Building	0	0.9	0.95
Gravel	467	0.5	0.6
Weighted	**15,545**	**0.27**	**0.32**

Table 3-3: Post-Development Runoff Coefficients

Surface Cover	Area	R.C.	
	(m^2)	5-Yr	100-Yr
Grassed	0	0.2	0.25
Asphalt	5,038	0.9	0.95
Building	4,610	0.9	0.95
Gravel	5,897	0.5	0.6
Weighted	**15,545**	**0.75**	**0.82**

3.1.3 Intensity

Rainfall intensity is related to the time of concentration of the catchment by Equation 3.

Equation 3: Solving for Intensity using IDF Values

$$I = A \times T_c^{\,B}$$

Where:

I = Intensity in mm/hr

T_c = Time of Concentration in hours

A and B = coefficients (see Appendix A)

3.1.4 Time of Concentration

At this location, the time of concentration to represent the existing conditions follows the Airport Method. The Airport Method is shown in Equation 4.

Equation 4: Airport Method of Determining Time of Concentration

$$Tc = \frac{3.26 \times (1.1 - C) \times L^{0.5}}{S_w^{0.33}}$$

Where:

T_c = Time of concentration (min)

C = runoff coefficient (dimensionless)

L = Length of the flow path (m)

S_w = Slope of the watershed (%)

The time of concentration for the post-development conditions was calculated using the Bransby-Williams equation (see Equation 5).

Equation 5: Bransby Williams Method of Determining Time of Concentration

$$T_c = \frac{0.057L}{{S_w}^{0.2} A^{0.1}}$$

Where:

T_c = Time of concentration (min)

L = Length of the flow path (m)

S_w = Slope of the watershed (%)

A = Area of watershed (ha)

3.2 Peak Flows

The 5-Yr and 100-Yr target (pre-development) and post-development uncontrolled peak flows for the 1.55ha catchment are provided in Table 3-4. Peak flows exceed the pre-development flows and therefore stormwater quantity control is triggered.

Table 3-4: Peak Flows

Event	Pre	Post
5-Yr	0.077	0.327
100-Yr	0.157	0.588

3.3 Storage

3.3.1 Required

Since the post development peak flows are higher than the target flows, controls are required to reduce the peak flows. This is accomplished through storage. The storage volume that is needed will be determined using the Modified Rational Method which is a preferred modelling tool for small sites.

A calculation of peak flow is made using Equation 1 using rainfall intensities adjusted for varying times of concentration. The difference between the peak flow and the allowable peak flow is converted to a volume assuming a duration equal to the time of concentration. The volume of storage required is the greatest volume. The calculation is repeated for each of the 5-yr and 100-yr events.

The storage required for the 5-yr event is 152.4m^3 and 259m^3 for the 100-yr event. See Tables 3-5 and 3-6.

Table 3-5: 5-Yr Storage Requirement

T_c (min)	i (mm/hr)	Q_{post} (cms)	Q_{cont} (cms)	Stor (m^3)
5	163.7	0.530	0.077	136.0
10	100.9	0.327	0.077	149.9
15	76.1	0.246	0.077	**152.4**
20	62.2	0.202	0.077	149.4
25	53.2	0.172	0.077	143.2
30	46.9	0.152	0.077	134.7
35	42.1	0.136	0.077	124.6
40	38.4	0.124	0.077	113.3
45	35.3	0.114	0.077	101.0
50	32.8	0.106	0.077	87.9
55	30.7	0.099	0.077	74.1
60	28.9	0.094	0.077	59.7

Table 3-6: 100-Yr Storage Requirement

T_c (min)	i (mm/hr)	Q_{post} (cms)	Q_{cont} (cms)	Stor (m^3)
5	267.5	0.947	0.157	237.0
10	166.0	0.588	0.157	258.5
15	125.6	0.445	0.157	**259.0**
20	103.1	0.365	0.157	249.5
25	88.4	0.313	0.157	234.0
30	78.0	0.276	0.157	214.4
35	70.1	0.248	0.157	191.8
40	64.0	0.227	0.157	166.8
45	59.0	0.209	0.157	140.1
50	54.9	0.194	0.157	111.8
55	51.4	0.182	0.157	82.3
60	48.4	0.171	0.157	51.7

3.3.2 Storage Facility

Stormwater quantity control will be addressed through a dry pond facility located at the east side of the proposed gravel storage yard and asphalt marshalling area.

The storage facility will contain 426m^3 at full storage elevation of 81.2m. An additional 0.3m freeboard is provided to help contain and safely pass unforeseen runoff events that exceed the design standard.

The flat bottom of the facility will help to enhance infiltration as retained water will slowly soak into the ground.

3.3.3 Controls

Two outlet controls are provided. See Table 3-7.

The minor events will be controlled using Outlet #1, a 200mm orifice pipe located within a ditch inlet. The grate of the inlet will help to reduce the tendency of debris from blocking the outlet. Larger events will crest up to engage Outlet #2, a 600mm rectangular weir located near the first outlet.

Table 3-7: Culvert Controls

Control	Size	Type	Invert
Outlet #1	200mm	Orifice	80.5m
Outlet #2	600mm	Rectangular Weir	81.0m

The stage:storage:discharge relationship of the dry pond is given in Table 3-8.

Table 3-8: Stage:Storage:Discharge Relationship of Dry Pond

Depth (m)	Elevation (m)	Storage (m^3)	Discharge (L/s)
0.000	80.5	0	0
0.100	80.6	48.6	4.4
0.200	80.7	97.2	26.4
0.300	80.8	152.3	37.3
0.400	80.9	214	45.7
0.500	81	275.7	52.8
0.600	81.1	350.8	92.8
0.700 *	***81.2***	***425.9***	***156.8***
0.800	81.3	507.8	233.1
0.900	81.4	596.7	316.7
1.000	81.5	685.6	404.5
		Storage (m^3)	**Controlled Flows (L/s)**
5-Yr	**81.06**	**298**	**77**
100-Yr	**81.20**	**426**	**157**

** Full Storage*

3.4 Controlled Peak Flow Summary

The dry pond affords sufficient storage opportunity for the orifice control pipe and weir to reduce the peak flows below the target flows.

A total storage volume of 426m^3 at a depth of 0.7m is provided in the dry pond, which exceeds the required storage of 259m^3 (*refer to Table 3-6*) for the 100-yr event. The dry pond will have 0.3m of additional storage within the freeboard that would become engaged in the event of unforeseen conditions, such as blockage of the low flow outlet or if an event exceeding the design event occurred.

Provision has been made for the climate change requirement of 10% additional storage within the freeboard. The 10% requirement is 25.9m^3. The surplus provided is 167m^3, exceeding what is required.

Should other portions of the site be intercepted or future site alterations be made that directs a larger area to the facility, the weir outflow will safely pass excess runoff up to a flow of about 0.4m^3/s and a storage volume of 686m^3 before uncontrolled spills would occur.

The storage summary is given in Table 3-9.

Table 3-9: Peak Flow Storage Summary

Event	Flow (m^3/s)			Storage (m^3)			Elev. (m)
	Pre	Post	Controlled	Req'd	Provided	Surplus	
5-Yr	0.077	0.327	0.077	152	298	146	81.06
100-Yr	0.157	0.588	0.157	259	426	167	81.20
Climate Change				25.9	167	141	81.20

Since the storage provided exceeds the storage required for the given outflows, the quantity control objectives are satisfied.

4 Water Quality Control Design

The water quality treatment follows a treatment train approach where stormwater quality will be improved through three technologies:

1) Shallow grassed swales.
2) Flat bottomed dry pond.
3) Sheet flow through unmanicured, undeveloped lands.

The dry pond has a wide flat bottom and is in excess of 90m long. The grassed swale will provide opportunity for filtration of runoff and will slow the velocity to less than 0.5m/s. In a study performed by Terry Lucke et al, researchers studied the effectiveness of TSS removal in grassed swales and concluded **grass swales were very effective in a treatment train approach at providing pretreatment to prevent clogging of downstream treatment systems**. Swales investigated were triangular in shape and had slopes of 1% or less. They found:

> *Results showed that between 50% and 80% of the TSS was generally removed within the first 10 m of the swales. A further 10% to 20% reduction in TSS concentrations can be expected in swales up to 30 m long.*

The same removal rate can be expected in the dry pond with a bottom length in excess of 90m. The flat bottom would be more effective than the V-bottom swales in the study. In addition, the runoff will be intercepted by shallow grassed swales that will improve the treatment.

The Low Impact Development Guidelines (Toronto and Region Conservation Authority, 2010, pp. 4-141) states the dry pond bottom can be expected to achieve the following removal rates during small runoff events similar to the quality event:

TSS	76%
Total Phosphorus	55%
Total Nitrogen	50%

Factors that improve the removal rates include a reduced longitudinal slope and reduced velocity. The widened flat bottom and restricted outflow will help to reduce the velocity well below 0.5m/s.

A TSS removal in excess of 80% can be expected at the point of discharge from the control structure. Further water quality polishing can be expected after the outlet of the facility and before discharge into the ditch at County Road 2.

Extensive grassy contact and settlement in the grassy surfaces within the swales, dry pond and sheet flow outlet will provide water quality mitigation to achieve *Enhanced* water quality objectives.

5 Sediment and Erosion Controls

During construction, the cover material is disturbed and the underlying soils are more susceptible to erosion. Eroded soils may be transported into the drainage system during runoff events and can be deposited as sediment in storm sewers, stormwater management facilities and watercourses.

Materials from site should be protected during construction by temporary siltation control fencing and with the use of rock check dams or straw bale checks where concentrated flows may be experienced.

The dry pond facility will capture sediment released during construction. It should be constructed first in the sequence of the project to protect downstream water quality. The dry pond will act as a secondary sediment and erosion control during construction.

After construction is completed and the site has become stabilized, the temporary controls may be removed. Sediment that may have accumulated in the dry pond should also be removed and the facility be returned to its design conditions.

6 Maintenance

Dry Pond Facility

Debris has the potential to become lodged within the controls of the facility and operators of the facility should inspect the pond monthly and remove any accumulated debris.

The vegetation within the dry pond may be allowed to grow long, but should be cut once or twice per year to prevent growth of trees.

The dry pond will require infrequent maintenance to remove sediment that will accumulate. The sediment will impair the infiltration potential and reduce the performance of the quantity control. Sediment should be removed when the sediment depth accumulates to 0.2m.

Controls

The 200mm outlet pipe is intended to induce shallow ponding in the dry pond that will provide peak flow control during minor runoff events. Larger events will also engage the rectangular weir that will act in tandem with the 200mm outlet pipe a second control.

However, the small diameter opening is susceptible to clogging and should be checked after each large runoff event to ensure the opening is clear.

The weir, although less susceptible to clogging should also be inspected after each large event to maintain the flood protection for the site.

6.1 Maintenance Summary

6.1.1 Monthly Maintenance

- Inspect the dry pond for debris and remove any accumulated debris
- Check the outlets to ensure they are not obstructed

6.1.2 After each large runoff event

- The facility should be inspected for damage and that the outlets are working correctly.

6.1.3 Annually

- Mow the vegetation in the dry pond

6.1.4 Infrequently (10yrs to 20yrs)

- Remove sediment within the facility using excavation equipment.

7 Conclusions

Prysmian Canada plans to construct a large expansion to their facility on Commerce Drive in Prescott. The expansion will include an asphalt marshalling yard and a gravel yard. CBL completed hydrologic calculations using the Rational Method to determine the predevelopment and post-development peak flows for the 5-yr and 100-yr events. Target peak flows were calculated for the 5-yr and 100-yr events at $0.077m^3/s$ and $0.157m^3/s$ respectively.

Using the Modified Rational Method, CBL determined the storage required in order to reduce peak flows below the target flows. A dry pond facility with two outlet controls provides the necessary storage.

- Control #1 = 200mm orifice at 80.5m invert
- Control #2 = 600mm wide rectangular weir with invert = 81.0m

Table 7-1 shows the peak flow summary. Table 7-2 shows the storage summary.

Table 7-1: Summary of Stormwater Management Mitigation

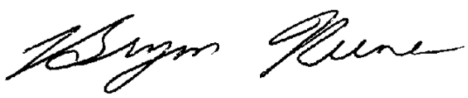
Target	Pre-Development (m^3/s)	Post-Development (m^3/s)	Controlled (m^3/s)	Target Achieved
5-Yr	0.077	0.327	0.077	✓
100-Yr	0.157	0.588	0.157	✓

Table 7-2: Summary of Storage Required and Provided

Target	Storage Required (m^3)	Storage Provided (m^3)	Target Achieved
5-Yr	152	298	✓
100-Yr	259	426	✓
Climate Change	25.9	141 (*at 81.2m*)	✓

The Enhanced water quality target is also achieved using the grassed swales, dry pond and sheet flow discharge. **The stormwater measures achieve the required quantity control and water quality mitigation targets.**

Report Submitted by



Bryon Keene, P.Eng.

Peter Yee, P.Eng.

References

Lucke, T. (2014). *Pollutant Removal and Hydraulic Reduction Performance of Field Grassed Swales during Runoff Simulation Experiments. .* Water.

Ministry of the Environment. (2003). *Stormwater Management Planning and Design Manual.*

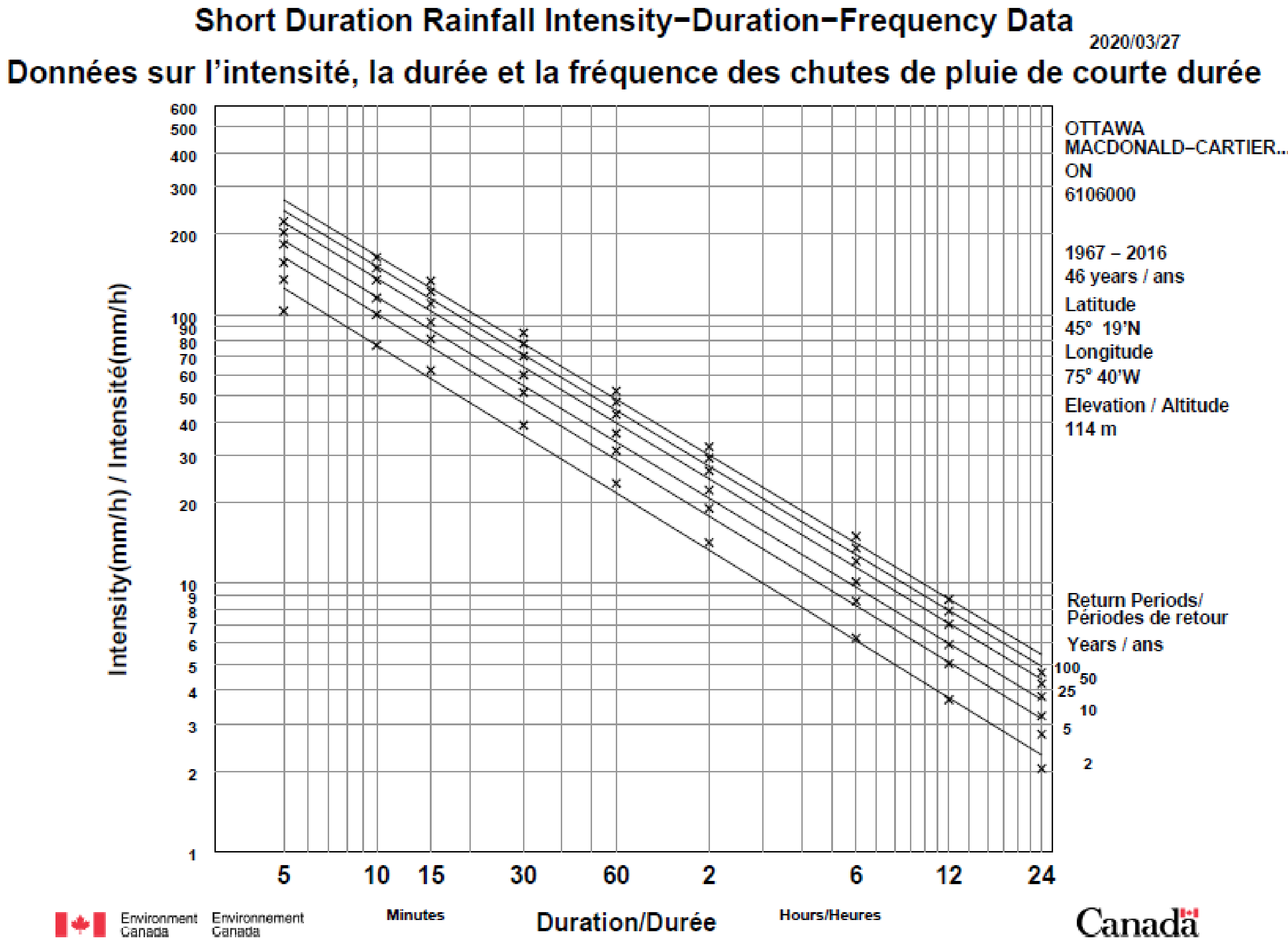
Ministry of Transportation. (1997). *Drainage Management Manual.*

Toronto and Region Conservation Authority. (2010). *Low Impact Development Stormwater Management Planning and Design Guide, Version 1.0.*

APPENDIX A

IDF CURVES OTTAWA INTERNATIONAL AIRPORT

STATION 6106000


Short Duration Rainfall Intensity−Duration−Frequency Data
2020/03/27
Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée
OTTAWA
MACDONALD−CARTIER...
ON
6106000
1967 – 2016
46 years / ans
Latitude
45° 19'N
Longitude
75° 40'W
Elevation / Altitude
114 m
Return Periods/
Périodes de retour
Years / ans
100
50
25
10
5
2
Intensity(mm/h) / Intensité(mm/h)
600
500
400
300
200
100
90
80
70
60
50
40
30
20
10
9
8
7
6
5
4
3
2
1
5
10
15
30
60
2
6
12
24
Minutes
Duration/Durée
Hours/Heures
Environment Canada
Environnement Canada
Canada

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Short Duration Rainfall Intensity-Duration-Frequency Data
Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée

Gumbel - Method of moments/Méthode des moments

2020/03/27

==

OTTAWA MACDONALD-CARTIER INT'L A ON 6106000

Latitude: 45 19'N Longitude: 75 40'W Elevation/Altitude: 114 m

Years/Années : 1967 - 2016 # Years/Années : 46

==

****

Table 1 : Annual Maximum (mm)/Maximum annuel (mm)

****

Year Année	5 min	10 min	15 min	30 min	1 h	2 h	6 h	12 h	24 h
1967	13.2	15.2	15.7	16.5	24.6	35.3	43.4	45.7	55.6
1968	8.1	14.0	18.5	23.1	33.3	34.0	41.1	44.7	44.7
1969	7.6	13.2	19.8	26.4	32.5	32.5	46.7	47.2	50.3
1970	14.5	23.4	27.7	34.3	35.6	36.6	43.2	43.4	43.4
1971	15.7	16.0	16.5	18.8	33.3	35.1	36.8	37.3	37.3
1972	11.4	17.3	23.4	31.7	38.1	38.4	48.8	53.8	60.5
1973	7.4	11.9	15.7	20.6	30.2	34.5	43.4	43.7	45.2
1974	5.6	7.9	10.2	19.3	20.6	30.7	31.0	35.8	39.1
1975	10.4	18.3	22.9	26.2	34.8	36.8	37.8	39.9	41.4
1976	9.7	12.7	13.5	13.7	14.5	18.3	27.9	28.2	33.0
1977	9.1	14.7	15.5	19.0	21.8	30.5	39.1	39.6	39.6
1978	17.5	22.2	29.3	35.5	36.2	36.3	36.3	36.5	39.4
1979	13.2	25.5	32.1	41.4	43.9	44.0	44.0	62.3	63.0
1980	8.9	16.0	17.4	17.8	18.3	18.4	28.3	42.8	47.2
1981	7.9	14.4	19.4	27.5	35.3	63.7	108.9	111.3	115.9
1982	7.1	10.6	14.1	19.7	20.9	21.5	35.0	40.3	40.3
1983	5.1	7.3	9.1	9.9	12.0	19.6	32.6	38.2	56.7
1984	8.2	9.3	11.7	16.4	18.4	19.4	26.1	36.1	44.3
1985	5.4	9.6	11.2	15.9	19.0	34.5	39.6	39.6	39.6
1986	12.2	21.0	24.4	31.1	34.9	35.6	42.4	46.0	69.3
1987	8.8	13.2	15.5	21.4	21.8	41.4	42.3	58.4	59.0
1988	12.7	17.0	21.0	24.2	28.2	36.4	44.2	45.4	45.8
1989	6.7	10.4	15.4	19.2	23.7	25.9	34.5	36.3	40.6

1990	10.4	12.6	13.6	17.5	20.8	24.7	35.0	53.5	54.0
1991	4.1	5.8	6.8	8.6	15.0	19.8	24.6	30.4	41.2
1992	6.2	10.3	13.8	19.6	31.5	37.4	43.3	49.7	54.2
1993	6.4	8.8	11.9	12.8	13.2	13.2	22.3	43.0	55.5
1994	15.6	20.0	21.8	23.6	23.8	23.8	32.5	35.0	42.9
1995	6.2	8.5	11.1	11.9	17.1	26.5	54.3	76.2	83.4
1996	6.4	11.9	14.3	18.9	26.9	27.1	33.0	35.6	44.1
1997	5.8	6.9	7.8	11.7	13.5	15.4	26.6	34.9	40.4
1998	9.1	12.1	12.3	15.8	15.8	17.8	24.0	30.5	43.6
1999	8.9	12.9	16.3	17.7	17.7	20.4	39.4	39.7	39.8
2000	7.7	8.7	9.9	11.5	15.9	19.6	38.8	46.7	46.7
2002	8.7	14.6	20.7	33.6	45.4	54.4	57.0	57.0	59.5
2003	7.4	10.8	12.1	17.1	20.0	20.0	26.1	38.2	44.6
2004	8.0	13.0	18.3	25.6	31.9	50.4	98.9	125.7	136.6
2006	11.3	12.8	14.9	16.9	18.1	21.3	40.0	46.1	50.7
2007	8.2	12.8	13.6	21.3	23.2	23.2	44.4	67.8	67.8
2008	7.6	12.0	15.9	18.3	20.9	23.5	33.1	44.8	49.6
2009	9.5	14.7	17.0	21.5	36.0	47.0	47.0	62.8	66.9
2010	8.4	15.5	17.6	21.4	29.0	33.1	35.6	41.4	46.6
2013	9.4	16.2	20.1	21.3	25.1	41.3	42.7	42.7	44.1
2014	11.4	17.7	19.4	22.8	24.9	26.6	33.4	46.2	56.2
2015	6.2	9.2	12.1	12.7	15.3	18.8	26.1	36.9	41.2
2016	9.5	14.2	14.6	14.8	16.4	24.6	35.6	37.3	40.4
# Yrs. Années	46	46	46	46	46	46	46	46	46
Mean Moyenne	9.1	13.5	16.4	20.6	25.0	30.2	40.2	47.3	52.2
Std. Dev. Écart-type	3.0	4.4	5.4	7.1	8.6	10.9	15.9	18.3	19.0
Skew. Dissymétrie	0.92	0.68	0.83	0.88	0.50	0.86	2.94	2.86	2.92
Kurtosis	3.69	3.60	3.99	3.91	2.50	3.87	13.66	12.49	13.04

*-99.9 Indicates Missing Data/Données manquantes

Warning: annual maximum amount greater than 100-yr return period amount
Avertissement : la quantité maximale annuelle excède la quantité pour une période de retour de 100 ans

Year/Année	Duration/Durée	Data/Données	100-yr/ans
1981	6 h	108.9	89.9
1981	12 h	111.3	104.6
1981	24 h	115.9	111.9
2004	6 h	98.9	89.9
2004	12 h	125.7	104.6
2004	24 h	136.6	111.9

****

Table 2a : Return Period Rainfall Amounts (mm)
Quantité de pluie (mm) par période de retour

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	8.6	11.3	13.0	15.3	16.9	18.5	46
10 min	12.8	16.7	19.2	22.5	24.9	27.2	46
15 min	15.5	20.3	23.5	27.5	30.5	33.4	46
30 min	19.4	25.7	29.8	35.1	39.0	42.9	46
1 h	23.6	31.2	36.2	42.6	47.3	52.0	46
2 h	28.4	38.1	44.5	52.6	58.6	64.5	46
6 h	37.5	51.6	60.9	72.6	81.3	89.9	46
12 h	44.3	60.4	71.1	84.6	94.7	104.6	46
24 h	49.1	65.9	77.0	91.1	101.5	111.9	46

****

Table 2b :

Return Period Rainfall Rates (mm/h) - 95% Confidence limits
Intensité de la pluie (mm/h) par période de retour - Limites de confiance de 95%

****

Duration/Durée	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans	#Years Années
5 min	103.3	135.2	156.3	183.0	202.8	222.5	46
	+/- 9.6	+/- 16.1	+/- 21.8	+/- 29.4	+/- 35.1	+/- 40.9	46
10 min	77.0	100.1	115.5	134.8	149.2	163.5	46
	+/- 6.9	+/- 11.7	+/- 15.8	+/- 21.3	+/- 25.5	+/- 29.7	46
15 min	62.2	81.3	94.0	110.0	121.9	133.7	46
	+/- 5.7	+/- 9.7	+/- 13.1	+/- 17.6	+/- 21.1	+/- 24.6	46
30 min	38.8	51.4	59.7	70.2	78.0	85.7	46
	+/- 3.8	+/- 6.3	+/- 8.6	+/- 11.6	+/- 13.8	+/- 16.1	46
1 h	23.6	31.2	36.2	42.6	47.3	52.0	46
	+/- 2.3	+/- 3.8	+/- 5.2	+/- 7.0	+/- 8.4	+/- 9.8	46
2 h	14.2	19.0	22.2	26.3	29.3	32.3	46
	+/- 1.5	+/- 2.4	+/- 3.3	+/- 4.5	+/- 5.3	+/- 6.2	46
6 h	6.3	8.6	10.1	12.1	13.5	15.0	46
	+/- 0.7	+/- 1.2	+/- 1.6	+/- 2.2	+/- 2.6	+/- 3.0	46
12 h	3.7	5.0	5.9	7.1	7.9	8.7	46
	+/- 0.4	+/- 0.7	+/- 0.9	+/- 1.2	+/- 1.5	+/- 1.7	46
24 h	2.0	2.7	3.2	3.8	4.2	4.7	46
	+/- 0.2	+/- 0.4	+/- 0.5	+/- 0.6	+/- 0.8	+/- 0.9	46

****

Table 3 : Interpolation Equation / Équation d'interpolation: R = A*T^B

R = Interpolated Rainfall rate (mm/h)/Intensité interpolée de la pluie (mm/h)
RR = Rainfall rate (mm/h) / Intensité de la pluie (mm/h)
T = Rainfall duration (h) / Durée de la pluie (h)

****

Statistics/Statistiques	2 yr/ans	5 yr/ans	10 yr/ans	25 yr/ans	50 yr/ans	100 yr/ans
Mean of RR/Moyenne de RR	36.8	48.3	55.9	65.5	72.7	79.8
Std. Dev. /Écart-type (RR)	36.4	47.5	54.8	64.0	70.8	77.6
Std. Error/Erreur-type	8.8	11.2	12.7	14.7	16.2	17.7
Coefficient (A)	21.7	28.9	33.6	39.6	44.0	48.4
Exponent/Exposant (B)	-0.707	-0.698	-0.695	-0.692	-0.690	-0.688
Mean % Error/% erreur moyenne	7.5	7.8	7.9	8.1	8.1	8.2

APPENDIX B

HYDROLOGIC CALCULATIONS

Stage:Storage:Discharge

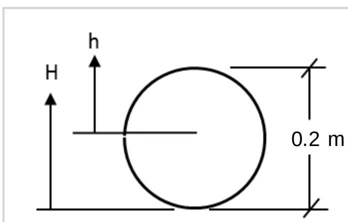
Determine Stage - Storage - Discharge Relationship

Active Storage Calculations

Full Storage Elevation (m)	**81.2**	
Depth of Active Storage (m)	**0.7**	
Bottom of Active Storage (m)	**80.5**	
Active Volume (cu.m)	**426**	*(approx)*

Select Storage Value Method User Defined

Select Stage Increment (m) 0.1
(not less than 0.01 m)



Outlet 1	Outlet 2	Outlet 3
Use Outlet 1 ? **Yes**	Use Outlet 2 ? **Yes**	Use Outlet 3 ? **No**
Orifice	Sharp Crested Weir	Broad Crested Weir
Formula: $Q = CA_o(2gh)^{0.5}$	Formula: Q = 1.84LH^(3/2)	Formula: Q = 1.67LH13/2
Invert = 80.500 m	Invert = 81.00 m	Invert = 81.20 m
Coeff = 0.60	Coeff = 0.60	Length 1.0 m
Orifice Dia = 0.2 m	Length = 0.60 m	
Circular? Yes *(Select Yes or No)*	*End Contractions: Reduces L by 0.2H*	*(No End Contractions)*
Area = 0.031 m^2		
Obvert = 80.70 m		

Elevation	Length	Width	Incr Vol	Cum vol	Low Flow Outlet (Orifice) Weir (H)	Head (h)	Flow (Q)	Sharp Crested Weir Head (H)	Head (h)	Flow (Q)	Emergency Spillway Head (H)	Flow (Q)	Total Discharge
m	m	m	m3	m3	m	m	cms	m	m	cms	m	cms	cms
80.5			0	0	0.000	-0.100	0.000	0.000	-0.300	0.000	0.000	0.000	0.000
80.6			49	49	0.100	0.000	0.004	0.000	-0.300	0.000	0.000	0.000	0.004
80.7			49	97	0.200	0.100	0.026	0.000	-0.300	0.000	0.000	0.000	0.026
80.8			55	152	0.300	0.200	0.037	0.000	-0.300	0.000	0.000	0.000	0.037
80.9			62	214	0.400	0.300	0.046	0.000	-0.300	0.000	0.000	0.000	0.046
81			62	276	0.500	0.400	0.053	0.000	-0.300	0.000	0.000	0.000	0.053
81.1			75	351	0.600	0.500	0.059	0.100	-0.200	0.034	0.000	0.000	0.093
81.2			75	426	0.700	0.600	0.065	0.200	-0.100	0.092	0.000	0.000	0.157
81.3			82	508	0.800	0.700	0.070	0.300	0.000	0.163	0.100	0.053	0.233
81.4			89	597	0.900	0.800	0.075	0.400	0.100	0.242	0.200	0.149	0.317
81.5			89	686	1.000	0.900	0.079	0.500	0.200	0.325	0.300	0.274	0.404

Pre-Development Time of Concentration

Calculate Time of Concentration by ***Airport Method***

$$Tc = \frac{3.26 \times (1.1 - C) \times L^{0.5}}{S_w^{0.33}}$$

5-Yr

Where:		Slope Calculation	
T_c = Time of Concentration in min		85/10 Method	
L = Watershed length in metres =	110 m	Longest Flow Length =	110 m
C = Runoff Coefficient =	0.27	Elevation at 85% =	85 m
S_w = Watershed Slope in %	3.6 %	Elevation at 10% =	82 m
A = Watershed area in hectares	1.5545 ha	Length at 85/10 =	82.5 m
T_c = 18.5 min		Slope =	0.036 m/m

100-Yr

Where:		Slope Calculation	
T_c = Time of Concentration in min		85/10 Method	
L = Watershed length in metres =	110 m	Longest Flow Length =	110 m
C = Runoff Coefficient =	0.32	Elevation at 85% =	85 m
S_w = Watershed Slope in %	3.6 %	Elevation at 10% =	82 m
A = Watershed area in hectares	1.5545 ha	Length at 85/10 =	82.5 m
T_c = 17.4 min		Slope =	0.036 m/m

Post-Development Time of Concentration

Calculate Time of Concentration by ***Bransby Williams Method***

$$Tc = \frac{0.057 \times L}{S_w^{0.2} \times A^{0.1}}$$

Where:

T_c = Time of Concentration in min	
L = Watershed length in metres =	110 m
S_w = Watershed Slope in %	3.6 %
A = Watershed area in hectares	1.5545 ha

T_c = 4.6 min

Peak Runoff Estimate by Rational Method

$$Q = \frac{1}{360}\, C\, i\, A$$

Where:

Q =	Peak Flow in cms
C =	Runoff Coefficient
i =	Rainfall Intensity in mm/hr
A =	Area in hectares

$$i = A * T_c^{\ B}$$

Where:

i =	Rainfall Intensity in mm/hr		
T_c =	Time of Concentration in hours		
		5-Yr	100-Yr
	A =	28.9	48.4
	B =	-0.698	-0.688

5-Yr

Area =	1.5545	ha		
	Pre	**Post**		
C =	0.27	0.75		
T_c =	18.5	10	min	
	Airport	*Bransby Williams*		
Intensity =	65.70	mm/hr		
Q_{allow} =	0.077	cms		
Q_{cont} =	0.077	cms		
T_c (min)	**i (mm/hr)**	**Q_{post} (cms)**	**Q_{cont} (cms)**	**Stor (m^3)**
5	163.7	0.530	0.077	136.0
10	100.9	0.327	0.077	149.9
15	76.1	0.246	0.077	**152.4**
20	62.2	0.202	0.077	149.4
25	53.2	0.172	0.077	143.2
30	46.9	0.152	0.077	134.7
35	42.1	0.136	0.077	124.6
40	38.4	0.124	0.077	113.3
45	35.3	0.114	0.077	101.0
50	32.8	0.106	0.077	87.9
55	30.7	0.099	0.077	74.1
60	28.9	0.094	0.077	59.7

100-Yr

Area =	1.5545	ha		
	Pre	**Post**		
C =	0.32	0.82		
T_c =	17.4	10	min	
	Airport	*Bransby Williams*		
Intensity =	113.43	mm/hr		
Q_{allow} =	0.157	cms		
Q_{cont} =	0.157	cms		
T_c (min)	**i (mm/hr)**	**Q_{post} (cms)**	**Q_{cont} (cms)**	**Stor (m^3)**
5	267.5	0.947	0.157	237.0
10	166.0	0.588	0.157	258.5
15	125.6	0.445	0.157	**259.0**
20	103.1	0.365	0.157	249.5
25	88.4	0.313	0.157	234.0
30	78.0	0.276	0.157	214.4
35	70.1	0.248	0.157	191.8
40	64.0	0.227	0.157	166.8
45	59.0	0.209	0.157	140.1
50	54.9	0.194	0.157	111.8
55	51.4	0.182	0.157	82.3
60	48.4	0.171	0.157	51.7

CORNERSTONE BUILDERS LTD. 195 Bellevue Drive, RR 5, Belleville, ON K8N 4Z5 (613) 968-3501 Fax: 968-4986

Township of Edwardsburg-Cardinal
18 Centre Street, P.O. Box 129
Spencerville, ON

27 May, 2021

Attn: Ms. Wendy Van Keulen
Community Development Coordinator

Re: **Site Plan Control Application Review**
Roll No. 070170102009906

We herein submit our response to South Nation Conservation comments dated – May 13, 2021 for the proposed Expansion at Prysmian Cables in Prescott, ON. We have reviewed these comments and have made some modifications to the stormwater design as discussed below. In some cases, we respectfully offer differing opinions to the SNC comments.

Comment 1

The first comment was regarding the legal outlet for the drainage from the site. The site drains directly to King Street East which is a legal outlet. We have updated our site plan drawings to show overland flow on the site to the legal municipal ditch running parallel to the King Street East.

Comment 2

The second comment included several issues and questioned the suitability of infiltration technologies to the site. The Prysmian Cables SWM report relies on grassed swales and does not appeal to infiltration technologies for the quality treatment.

The stormwater quality treatment technologies available to industrial sites are limited. The listing of common technologies available is provided in Table 4.1 from MOE, 2003). Given that the contributing area is about 1.5ha and the land use is industrial, the only technologies available (with the exception of Oil Grit Separators) are infiltration based. If all infiltration technologies are ruled out for industrial sites, then for small sites with less than 5ha of contributing area the only suitable technology remaining is an oil grit separator. However, oil grit separators are best matched with sites that are drained by storm sewer systems. The subject site is proposed to be surface drained.

SNC stated that grassed swales are predominantly an infiltration technology and for this reason they should not be used at industrial sites and in areas with low permeability soils and in areas where the groundwater table is high. Each is discussed below.

Contamination Risk of Industrial Sites

Industrial sites are assumed to present a much higher risk to the environment. However, later guidelines recognize a universal assumption that all industrial sites present high risk is incorrect. The DRAFT Low Impact Development (LID) Stormwater Management Guidance Manual, April 20, 2017 states, "for example, a moratorium on the infiltration of all water from industrial sites would miss opportunities to infiltrate generally clean runoff originating on rooftops and landscaped areas". P68

In another study, by TRCA in 2009 prepared for the MECP called, Review of the Science and Practice of Stormwater Infiltration in Cold Climates, they concluded that a universal restriction on infiltration in industrial sites should be reconsidered.

> Current stormwater planning and design guidelines in Ontario can be interpreted as blanket restrictions on infiltration practices installed within any industrial or commercial land use, which leaves little flexibility for exceptions. Improving direction in this regard in the updated guideline would reduce a significant barrier to the application of infiltration practices in Ontario.
>
> Of particular note are differences in direction regarding the types of land uses that are considered unsuitable for application of stormwater infiltration practices. Some guidelines, such as in Ontario and Alberta, caution against the use of infiltration practices in all commercial and industrial developments, whereas most others suggest restrictions only in stormwater 'hot spots', such as gas stations and loading yards, where spills or leaks of organic compounds are more likely., P3

The Prysmian Cables yard will drain to the proposed stormwater management features. The yard area is used for storage of large spools of cables where the risk of contamination is extremely low. The loading area also contributes drainage. Drainage from the loading area is collected by a catchbasin. The contamination risk due to the loading area is from oils and fuels originating from trucks. Such contaminants are consistent with parking lots and linear infrastructure. This does not provide a high contamination risk. But, CBL agrees that pre-treatment would be an improvement for the runoff from the loading area.

Action: CBL has agreed to replace the standard catchbasin with a Soleno Catchbasin Treatment Unit that will pre-treat the runoff from the loading area and collect sediment and floating contaminants.

Action: CBL has also agreed to place sumps at the points of connection of the grassed swales to the dry pond to assist with grit collection.

Low Permeability Soils

It is commonly believed that infiltration technologies are not to be applied to soils with infiltration rates less than 15mm/hr. This is no longer the case. TRCA published Stormwater Management Criteria, August 2012, appendix C which states,

> The MOE Manual 2003 recommends applying lot level and conveyance controls to areas with infiltration rates of greater than 15 mm/hr (soils with hydraulic conductivity as low as 10^{-8} m/s). For the purposes of site suitability, where the tested soil infiltration rate is low (i.e. less than 15 mm/h), infiltration may still be feasible and therefore should still be considered for all soil types.

Infiltration is not relied upon at the Prysmian site (as discussed below), but it should not be discouraged.

Grassed Swales Treatment Process

The list of technologies in Table 4.1 from MOE 2003 indicates that grassed swales are not required to be separated from the groundwater table by any distance. Further, grassed swales are not constrained by any particular soil type. Infiltration practices are required to be separated from the groundwater table and are reliant upon the soil types. Grassed swales are not (reference Table 4.1). This also suggests that infiltration is not the dominant process since infiltration is reliant on the soil type and depth to groundwater table.

MOE, 2003 states, "Stormwater management objectives have changed and grassed swales are now being promoted to **filter** and **detain** stormwater runoff". This indicates the MOE understood the dominant processes of quality treatment by grassed swales is filtration and settling.

In the LID manual, the study authors rely on a report by Deletic and Fletcher, who published the TSS and TP and TN removal rates referenced in the stormwater management report for Prysmian Cables. The LID manual continues to explain the processes that TSS removal is a physical process. (p37)

> As reported by Deletic and Fletcher (2006), median pollutant removal rates of swales from available performance studies are 76% for TSS, 55% for total phosphorus and 50% for total nitrogen. In their own field studies of the performance of grassed swales they observed variable TSS removal rates ranging from 61-86%. **They concluded that TSS removal from runoff is primarily a physical process, reflecting the balance between flow and particle settling velocity and that removal performance is a function of flow rate, grass density and particle size and density** (Deletic and Fletcher, 2006).

This reference suggests that settling is the dominant process for grassed swales for TSS removal.

Since TSS removal is the yard stick for demonstrating Normal Treatment (70% TSS removal), water quality treatment success at the Prysmian site is inferred if 70% removal of TSS can be demonstrated.

The outlet from the dry pond will drain discharged flows across an additional 150m through well vegetated lands prior to being received by the municipal ditch. CBL believes the TSS targets are achieved at the outlet of the dry pond, but additional sedimentation can be expected along this very extended diffuse flow path. TSS target of Normal can be reasonably assured.

Other Jurisdictions

MECP has adopted principles and understanding of water quality treatment technologies from many jurisdictions and continues to look abroad. In a recent investigation commissioned by MECP, STEP Review of the Science and Practice of Stormwater Infiltration in Cold Climates, (TRCA, 2009), the study authors reviewed the state of practice in many jurisdictions including Australia. The following is a quotation from the TRCA study (p39).

> Concentrations of metals, nutrients pesticides and phenolic compounds in groundwater near three infiltration basins studied in Perth, Australia, receiving runoff from a mixture of light industrial, medium density residential and a high traffic road, and located on predominantly sandy soil with some clay and limestone, were low and well within drinking water guidelines (Appleyard, 1993).

The same study also referenced research in many U.S. states and European Countries. MECP, having learned from study results from other jurisdictions, retreated from firm restrictions on stormwater practices for industrial lands and for low permeability and high permeability soils concluding the **infiltration technologies did not negatively impact groundwater resources**.

The SNC review comments make reliance on a study by Bäckström et al., 2006. This study was carried out in Sweden.

The Prysmian Cables SWM report reference to the Terry Lucke study should not be dismissed based on its location.

Design

The LID guidelines recommend sideslopes 3:1 or less and geometries that can reduce velocities to less than 0.5m/s within the swale of the 25mm 4hr Chicago event. The dry pond has 3:1 side slopes, flat bottom and 0% linear slope. Lucke studied swales that had breadths measured at the top of swale ranging from 3m to 6m and depths up to 0.49m. The dry pond used at Prysmian site would have dimensions exceeding those in the Lucke study and would have velocities much lower than 0.5m/s.

The average velocity of the 25mm quality event must be less than 0.5m/s. The CBL SWM report states the average velocity in the dry pond is less than 0.5L/s. While a 25mm 4-hr Chicago event was not simulated since hand calculations were employed in the modelling, the 2-yr peak flow can be readily investigated as a conservative approach. The 2-yr peak flow within the dry pond is 58L/s (0.058m^3/s). Given an average cross-sectional area of 4m^2 the velocity in the dry pond is 0.0145m/s, which is well below the velocities considered acceptable for settling technologies.

The guidelines recommend soil amelioration, but only if the soils are not sufficiently fertile to produce grasses.

It is also recommended that the swales have some form of pretreatment. CBL has agreed to increase the pretreatment at the Prysmian Cables site as discussed above.

Short circuiting through the dry pond has been reduced by moving the outlet.

Action: Two sumps have been added to offer some pre-treatment. They will collect the courser sediment fraction.

Comment #3

SNC is concerned with the use of the dry pond during construction as a sediment collection device.

Action: To address this concern, CBL will not use the dry pond for sediment control during construction.

We trust this will satisfy your concerns.

Yours truly
Cornerstone Builders Ltd.