STORMWATER MANAGEMENT REPORT

MISSISSIPPI MILLS BUSINESS PARK PHASE2&3

Prepared By:

NOVATECH ENGINEERING CONSULTANTS LTD.
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario
K2M 1P6

March 15, 2005

Novatech File: 104161
Ref: R-2005-022

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Figures

Plans

1.0 INTRODUCTION

The purpose of this stormwater management report is to outline a responsible stormwater management scheme that will drain the proposed Mississippi Mills Business Park; therefore, minimizing the possibility of flooding within the site and at the same time limiting the stormwater discharge to ensure the capacity of the ditch downstream of the subject site is not exceeded. The subject site is 26.49ha and is divided into the 3 phases (Figure 1). To date, construction on phase 1 is complete with phase 2 scheduled for construction in the summer of 2005. The subject site is located in the Township of Mississippi Mills and more specifically within the town of Arnprior (Figure 2). An original stormwater drainage report was completed by Novatech Engineering in July 2000 and will be reference throughout this report.

2.0 CRITERIA

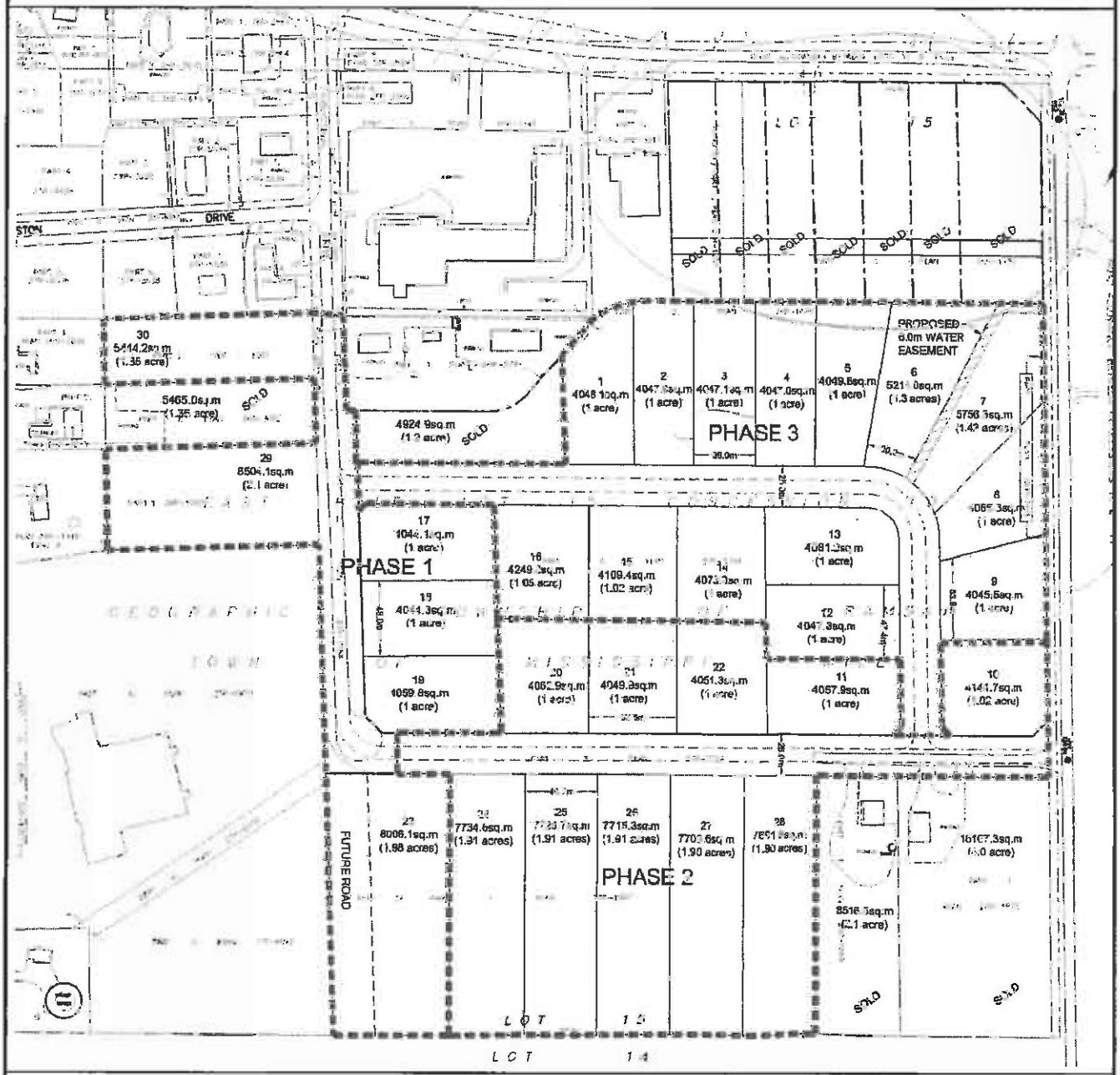
Through correspondence with the Town of Mississippi Mills, the Mississippi Valley Conservation Authority (MVCA), Novatech Engineering's knowledge of typical site developments, and the previous stormwater drainage report completed by Novatech Engineering the following criteria have been adopted:

- On-site release rates must be limited to 14L/s/ha, 20L/s/ha, and 56L/s/ha for the 2 year, 5 year, and 100 year storm events respectively.
- Post-construction stormwater discharge must be less than or equal to the pre-construction stormwater discharge for the subject site.
- Individual sites within the business park must limit stormwater discharge to meet the 2 criteria listed above.
- Ensure that site preparation and construction is in accordance with current best management practices.
- Ensure erosion and sediment controls are provided.

3.0 STORMWATER MANAGEMENT CALCULATIONS

3.1 Pre-Construction Stormwater Discharge

A July 2000 Stormwater Drainage Report completed by Novatech Engineering prepared for the Town of Mississippi Mills explored several options to deal with the stormwater discharge from the subject site but concluded that the business park must control post-construction stormwater discharge to pre-construction stormwater discharge levels. In addition to limiting stormwater discharge to pre-construction levels the July 2000 report recommends that the post-construction stormwater discharge for and particular lot within the subject site be limited to 14, 20, & 56L/s/ha for the 2, 5, & 100 year storm events respectively. Refer to Appendix A for the conclusions and recommendations from the July 2000 Stormwater Drainage Report.



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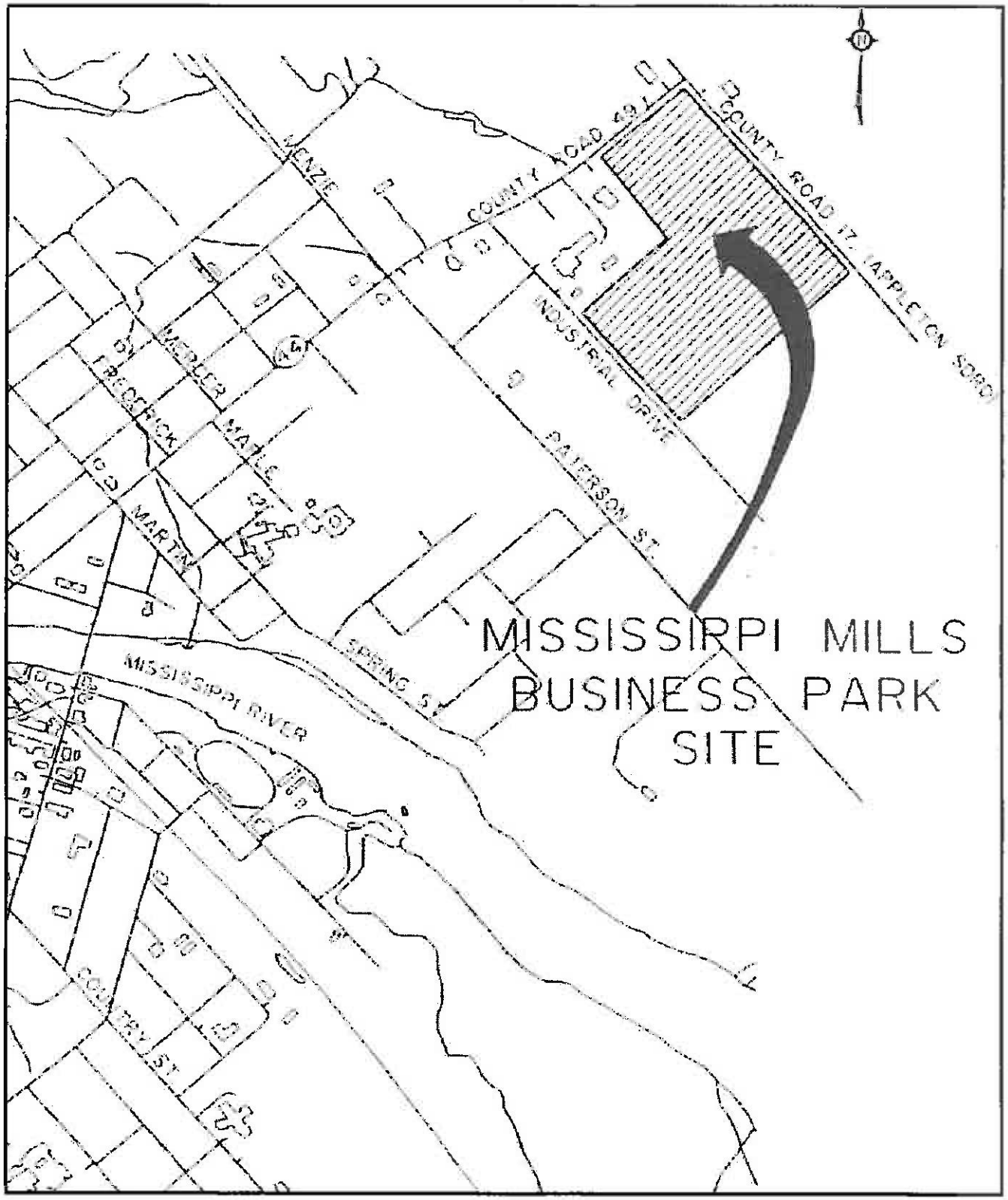
MISSISSIPPI MILLS BUSINESS PARK

SITE PLAN

10416	N.T.S	FIGURE 1

SHTB.XWLDWG - 216mmX279mm



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MISSISSIPPI MILLS BUSINESS PARK

KEY PLAN

10416	N.T.S	FIGURE 2

S.HT.8.X11.DWG - 216mmX.279mm

3.1.1 Limit Post-Construction Discharge To 14, 20, & 56 L/s/ha

Q_{post2}=14 L/s/ha * area(ha)
Q_{post2}=14 L/s/ha * 26.49ha
Q_{post2}=371 L/s

Q_{post5}=20 L/s/ha * area(ha)
Q_{post5}=20 L/s/ha * 26.49ha
Q_{post5}=530 L/s

$Q_{post100}$=56 L/s/ha * area(ha)
$Q_{post100}$=56 L/s/ha * 26.49ha
$Q_{post100}$=1,483 L/s

3.1.2 Limit Post-Construction Discharge To Pre-Construction Levels

The Modified Rational Method was used to determine the pre-construction stormwater discharge. The subject site is covered with trees and low-lying vegetation with no evidence of severe ponding. The site possesses ±0.3m of topsoil over silty sand and weathered bedrock. Based of the vegetation present and soil type an average existing runoff coefficient of 0.20 was assumed. Refer to Appendix B for pictures that show existing site conditions.

C_2=0.20
i = 52mm/hr
A =26.49 ha
T_c= 20 min

Q_{Pre2} = 2.78CiA
Q_{Pre2} = 2.78*(0.20)*(52)*(26.49)
Q_{Pre2} = 766L/s

C_5=0.20
i = 70mm/hr
A =26.49 ha
T_c= 20 min

Q_{Pre5} = 2.78CiA
Q_{Pre5} = 2.78*(0.20)*(70)*(26.49)
Q_{Pre5} = 1031L/s

C_{100}=0.20
i = 141mm/hr
A =26.49 ha
T_c= 20 min

Q_{Pre100} = 2.78CiA
Q_{Pre100} = 2.78*(0.20)*(141)*(26.49)
Q_{Pre100} = 2,077L/s

Since limiting the site to a stormwater discharge of 14, 20, & 56L/s/ha is less than the preconstruction levels, the site will be limited to a total discharge of 371, 530, & 1,483L/s for the 2, 5, & 100 year storm events respectively. It should be noted that that the rainfall intensity used to limit the post-construction stormwater discharge to pre-construction levels is based on the November 2004 City of Ottawa rainfall intensities and the rainfall intensity used to determine the maximum stormwater discharge be limited to 14, 20, & 56L/s is based on the outdated City of Ottawa Guidelines.

3.2 Post-Construction Stormwater Discharge

Due to the fact that the design for individual lots will not be finalized until the lots are sold, the Stormwater Drainage scheme presented and the Storm Drainage Area Plan located at the back of this report are designed for the worst case scenario and includes a factor of safety of 50%. In addition to the factor of safety the ditches are designed with a 0.3m freeboard to ensure that the water level in the roadside ditches and main drainage swale do not exceed capacity regardless how the site is drained. Manning's Formula was used to calculate swale capacities and the Modified Rational method was used to determine peak flows. Refer to Appendix C for the capacity and peak flows of every swale and ditch located within the subject site. Table 1 shows that if the individual lot's stormwater runoff is controlled to pre-construction levels the swale has adequate capacity for the 100 year storm event.

Table 1
Ditch Outlet Capacity and Peak Flows of the Outlet Swale.

Storm Event	Swale Capacity (m^3/s)	Peak Flow (m^3/s)	Factor of Safety
2Year	2.34	0.159	14.72
5Year	2.34	0.305	7.67
100 Year	2.34	1.462	1.60

Table 2 shows that at the outlet the stormwater discharge from the site is less than the allowable stormwater discharge per hectare as indicated in the July 2000 Stormwater Drainage Report.

Table2
Outlet Ditch Peak Flows and Allowable Discharge

Storm Event	Peak Flow at Outlet (L/s)	Drainage Area (ha)	Allowable Discharge (L/s/ha)	Allowable Discharge (L/s)
2Year	159	26.49	14	371
5 Year	305	26.49	20	530
100 Year	1462	26.49	56	1,483

Given the peak flows in the outlet swale are less than the allowable discharge and swale capacity and the factor of safety in the rest of the swales and roadside averages 11.6, the proposed ditches and swales are adequate to facilitate any reasonable change to the Storm Drainage Area Plan that would arise from a finalized design.

3.4 Major Overland Drainage

The finalized grading design needs to take into account major overland drainage (i.e. storms greater than the 100 year storm event) to minimize the risk of flooding. The finalized grading plan must ensure all grades slope away from structures towards ditches or swales. All ditches and swales should be maintained to ensure maximum capacity. The majority of the site development is perched due to the presence of bedrock near the original ground surface. Since the subject site is significantly higher than the surrounding areas, major storm water events will be routed overland through the existing undeveloped major channels.

4.0 Individual Lot Design

To achieve the desired stormwater discharge of 1483 L/s at the ditch outlet for the 100 year storm event, the stormwater discharge from the individual lots within the business park must be controlled to a runoff coefficient ("C") of 0.62 or less. The individual lots are large and if required a lots "C" value could be reduced through a number of techniques: surface ponding, underground storage, temporary storage swales, etc. The maximum stormwater runoff coefficient of 0.62 will be a condition of the site plan agreement.

5.0 Erosion & Sediment Control Requirements

The erosion and sediment controls requirements outlined in the July 2000 report are still valid and have been included in Appendix D of this report and will be included in all road and site construction projects.

6.0 Conclusions

Based on the findings of this report the following conclusions can be drawn:

- A stormwater management scheme has been identified that will limit the post-construction stormwater discharge to less than 14L/s/ha, 20L/s/ha, and 56L/s/ha for the 2 year, 5 year, and 100 year storm events respectively.
- A stormwater management scheme has been identified that will limit the post-construction stormwater discharge too less than the pre-construction stormwater discharge.
- Both temporary and permanent erosion and sedimentation controls have been outlined.
- Regardless of the final grading design for the individual lots within the subject site the proposed swales and roadside ditches will possess the required capacity.
- The site plan agreement must include a clause limiting stormwater runoff of individual sites to 0.62.

6.0 Closure

This report has been prepared in accordance with requirements for site development and is submitted for approval.

NOVATECH ENGINEERING CONSULTANTS

Prepared by:

Mark Bowen

Reviewed by:

Phil Desmarais
Project Manager

APPENDIX A

Conclusions and Recommendations
(July 2000 Stormwater Drainage Report)

6.0 CONCLUSIONS

The following conclusions can be drawn from the results of the model analysis and overall review of the proposed development on the Mississippi Mills Business Park:

- The existing watercourse does not have the capacity to convey any additional flows and on site storage by a site detention facility as described by Option A in Section 3.4.1 is not considered appropriate. Therefore, the only feasible solution for stormwater management for the business park is for individual sites to control post-development storm flows to pre-development levels on an area basis as determined by the model calculations contained in this report.
- Utilisation of the roadside ditch on the east side of the Appleton Sideroad is the preferred method of outlet by installing twin culverts to convey the storm runoff from the site to the ditch on the east side of the Appleton Sideroad.
- Alternatively, the roadside ditch on the west side of the Appleton Sideroad could be regraded and utilised to convey all or part of the storm flows from the site to the creek watercourse south of the Business Park but it is the preferred solution. Selection of the preferred alternative was determined based on agency input and an analysis.
- In order to ensure the implementation of stormwater management for the individual lot developments, the development of individual blocks should proceed via the site plan process at which time the stormwater management reports will be required for the individual lot developments. (Consistent with recent developments in the Park)
- The stormwater Reports should detail stormwater quality, quantity and erosion and sediment control in accordance with the basic design guidelines and the recommendations presented in this report.
- All stormwater management reports should include Best Management Practices (BMP's) as outlined in the "SWM Planning and Practices Design Manual." (MOEE, June 1994).
- The improvements outlined in CHAPTER 5.0 – WATERCOURSE EVALUATION, while not essential, need to be considered and are important elements in the overall storm drainage improvements for the Park. Given the significance of the outlet, a formal status (through the Drainage Act) should be adopted within the next 5 years.

7.0 RECOMMENDATIONS

Based on the information in this report and the conclusion above, it is recommended that:

1.) On-site release rates be limited to 14L/S/ha, 20 L/s/ha and 56 L/s/ha for the 2 year, 5 year and 100 year storm events respectively and achieved through the site plan process;

2.) If the east roadside ditch along the Appleton Sideroad is to be utilised, two 1.03m x 0.74m CSPA culverts be installed under Appleton Sideroad to allow flow to the east side ditch along Appleton Sideroad (Hwy.#17) and a new 1.39 x 0.97m CSPA culvert be installed to twin the existing culvert south;

3.) If the west roadside ditch along the Appleton Sideroad is to be utilised the ditch will have to regraded and as per the detail cross-sections shown on Dwg. 99110-STM;

4.) Dropped curb outlets, site grading and roof-top control devices be utilised to create on-site stormwater storage in parking areas and on roof tops where possible; and

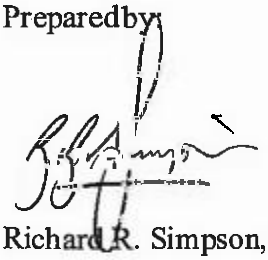
5.) Pre & Post-Construction erosion and sediment control measures should be implemented and inspected to ensure their continued efficient operation;

6.) Individual lot developments should follow Engineering Design Guidelines as set out in Appendix C.

7.) The Town retain the right, through appropriate site plan agreement clauses, to undertake periodic inspections and, if necessary, take corrective action for the individual site stormwater management facilities.

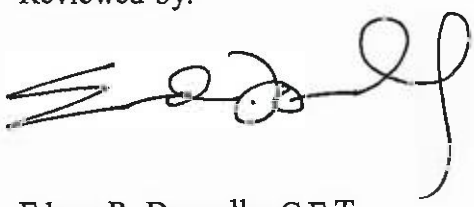
NOVATECH ENGINEERING CONSULTANTS LIMITED.

Prepared by:



Richard R. Simpson, E.I.T.

Reviewed by:



Edson R. Donnelly, C.E.T.

APPENDIX B

Existing Conditions

APPENDIXC

Capacity and Peak Flows

NOVATECH ENGINEERING CONSULTANTS LTD.

SWALE AND ROADSIDE DITCH DESIGN SHEET

PROJECT: **Mississippi Mills Business Park (Job No. 104161)**
DEVELOPER: **Town ofMississippi Mills**

DESIGNED BY : MWB
CHECKED BY:

DATE: March 9, 2005
REVISION: April 25, 2005

2 YEAR STORM EVENT

LOCATION						AREA(ha)							PROPOSED SWALE						
Street	Station			Ditch Elev		R=	Drainage Areas	INDIV 2.78AR	ACCUM 2.78 AR	TIME OF CONC	RAINFALL 100YR INTENSITY	PEAK FLOW NO CONTROL	Manning's	GRADE	LENGTH	CAPACITY	VELOCITY	TIME OF FLOW	Factor of Safety
	From	TO	Side	UP	DOWN	0.62				(min)	(mm/hr)	Q (m^3/s)	n	(m/m)	(m)	(m^3/s)	(m/s)	(min)	
Swale	5+000.00	5+086.05		139.63	139.46	1.29	7,8,9	2.22	2.22	20.00	52	**0.116**	0.035	0.0020	86.1	**2.0250**	0.04	33.72	17.50
Swale	5+235.86	5+086.05		139.76	139.46	2.02	10,11,12,13	3.48	3.48	20.00	52	**0.181**	0.035	0.0020	149.8	**2.0388**	0.07	37.49	11.25
Swale	4+000.00	4+108.69		139.46	139.26			0.00	5.71	57.49	25	**0.145**	0.035	0.0018	108.7	**1.9543**	0.05	34.08	13.52
Phase 3	3+339.44	3+310.60	L	139.46	139.26	0.40	14	0.69	0.69	20.00	52	**0.036**	0.035	0.0069	28.8	**2.3944**	0.02	25.73	66.75
Phase 3	3+225.80	3+310.60	L	139.83	139.26	0.87	5,6,41	1.50	1.50	20.00	52	**0.078**	0.035	0.0067	84.8	**2.3574**	0.04	34.78	30.21
900mm Culvert	4+108.69	4+125.73		139.26	139.23			0.00	7.89	91.57	18	**0.141**	0.035	0.0018	17.0	**1.9115**	0.05	5.46	13.52
Phase 3	3+339.44	3+310.60	R	139.46	139.23			0.00	0.00	20.00	52	**0.000**	0.035	0.0080	28.8	**2.5678**	0.00	#DIV/0!	#DIV/0!
Phase 3	3+310.60	3+287.61	R	139.23	139.18			0.00	7.89	97.04	17	**0.135**	0.035	0.0022	23.0	**1.3409**	0.07	5.44	9.91
Phase3	3+225.80	3+287.61	R	139.83	139.18	0.56	22,41	0.97	0.97	20.00	52	**0.050**	0.035	0.0105	61.8	**2.9486**	0.03	39.38	58.71
Swale	4+150.00	4+301.86		139.18	137.73	0.54	21b,20b,19b	0.93	9.79	102.48	16	**0.161**	0.035	0.0095	151.9	**4.4519**	0.06	42.78	27.67
Phase 3	3+339.44	3+417.65	L	139.46	138.94	1.52	38,15,16	2.62	2.62	20.00	52	**0.136**	0.035	0.0066	78.2	**2.3445**	0.07	18.36	17.20
Phase 3	3+339.44	3+417.65	R	139.46	138.94	0.18	21a	0.31	0.31	20.00	52	**0.016**	0.035	0.0066	78.2	**2.3445**	0.01	155.04	145.24
Phase 3	3+417.65	3+529.50	L	138.94	137.87	0.83	17,18	1.43	4.05	38.36	34	**0.137**	0.035	0.0096	111.9	**2.8123**	0.07	26.11	20.52
Phase 3	3+417.65	3+529.50	R	138.94	137.85	0.36	19a,20a	0.62	0.93	175.04	11	**0.010**	0.035	0.0097	111.9	**2.8385**	0.01	354.05	280.77
Industrial	2+900.00	2+857.00	L	137.92	137.87	0.26	42	0.45	0.45	20.00	52	**0.023**	0.035	0.0012	43.0	**0.9805**	0.01	59.01	42.05
Industrial	2+900.00	2+857.00	R	137.92	137.87	0.26	42	0.45	0.45	20.00	52	**0.023**	0.035	0.0012	43.0	**0.9805**	0.01	59.01	42.05
600mm Culvert	2+857.00	2+838.50	L	137.87	137.85			0.00	4.50	79.01	20	**0.090**	0.035	0.0011	18.5	**0.9454**	0.05	6.57	10.50
	2+857.00	2+838.50	R	137.87	137.85			0.00	0.45	79.01	20	**0.009**	0.035	0.0011	18.5	**0.9454**	0.00	66.00	105.40

NOVATECH ENGINEERING CONSULTANTS LTD.

SWALE AND ROADSIDE DITCH DESIGN SHEET

PROJECT: **Mississippi Mills Business Park (Job No. 104161)**
DEVELOPER: **Town ofMississippi Mills**

DESIGNED BY : MWB
CHECKED BY:

DATE: March 9, 2005
REVISION: April 25, 2005

2 YEAR STORM EVENT

LOCATION						AREA(ha)		INDIV	ACCUM	TIME OF	RAINFALL 100YR	PEAK FLOW	PROPOSED SWALE						
Street	Station		Side	Ditch Elev		R=	Drainage Areas	2.78AR	2.78AR	CONC	INTENSITY	NO CONTROL	Manning's	CRADE	LENCTH	CAPACITY	VELOCITY	TIME OF FLOW	Factor of Safety
	From	TO		UP	DOWN	0.62				(min)	(mm/hr)	Q (m^3/s)	n	(m/m)	(m)	(m^3/s)	(m/s)	(min)	
Industrial	2+838.50	2+753.00	L	137.85	137.72	0.25	42	0.43	5.86	529.09	5	**0.026**	0.035	0.0015	85.5	**1.1212**	0.01	103.34	42.35
Industrial	2+838.50	2+753.00	R	137.85	137.72	0.25	42	0.43	0.88	145.01	13	**0.011**	0.035	0.0015	85.5	**1.1212**	0.01	247.46	101.40
Industrial	2+753.00	2+642.00	L	137.72	137.52	0.82	25,23	1.41	17.06	632.43	4	**0.067**	0.035	0.0018	111.0	**1.2205**	0.03	53.16	18.27
Industrial	2+753.00	2+642.00	R	137.68	137.47			0.00	0.88	392.47	6	**0.005**	0.035	0.0019	111.0	**1.2506**	0.00	704.51	248.05
Phase 3	3+225.80	3+050.00	L	139.83	137.78	1.51	2,3,4,40	2.60	2.60	20.00	52	**0.135**	0.035	0.0117	175.8	**3.1050**	0.07	41.54	22.93
Phase 3	3+225.80	3+050.00	R	139.83	137.69	1.06	24,26,40	1.83	1.83	20.00	52	**0.095**	0.035	0.0122	175.8	**3.1724**	0.05	59.18	33.37
Industrial	2+215.26	2+312.87	L	138.61	137.83			0.00	0.00	20.00	52	**0.000**	0.035	0.0080	97.6	**2.5703**	0.00	#DIV/0!	#DIV/0!
Industrial	2+215.26	2+312.87	R	138.61	137.83	0.94	1	1.62	1.62	20.00	52	**0.084**	0.035	0.0080	97.6	**2.5703**	0.04	37.05	30.49
Industrial	2+312.87	2+329.73	R	137.83	137.81	0.94	1	1.62	3.24	57.05	25	**0.083**	0.035	0.0012	16.9	**0.9903**	0.04	6.53	11.99
Phase 3	3+019.41	3+050.00	L	137.83	137.78			0.00	0.00	20.00	52	**0.000**	0.035	0.0016	30.6	**1.1625**	0.00	#DIV/0!	#DIV/0!
600mm Culvert		17.8		137.83	137.69			0.00	2.60	20.00	52	**0.135**	0.035	0.0079	17.8	**2.5500**	0.07	4.21	18.83
Phase 3	3+050.00	3+019.41	R	137.69	137.66			0.00	4.43	79.18	20	**0.089**	0.035	0.0010	30.6	**0.9004**	0.05	11.06	10.17
Industrial	2+329.73	2+460.89	L	137.66	137.49	1.15	28,29,39	1.98	6.41	90.24	18	**0.116**	0.035	0.0013	131.2	**1.0352**	0.06	36.15	8.92
Industrial	2+329.73	2+460.89	R	137.81	137.66	0.33	39	0.57	3.81	63.59	24	**0.090**	0.035	0.0011	131.2	**0.9724**	0.05	46.83	10.85
Industrial	2+460.89	2+635.00	L	137.49	137.30	1.14	27,30,39	1.96	8.38	126.39	14	**0.117**	0.035	0.0011	174.1	**0.9498**	0.06	47.54	8.10
Industrial	2+460.89	2+635.00	R	137.66	137.30	0.33	39	0.57	4.38	110.41	16	**0.068**	0.035	0.0021	174.1	**1.3075**	0.04	81.98	19.24
900mm Arch Crvt	4+415.00	4+433.00		137.25	137.15			0.00	25.44	685.59	4	**0.093**	0.035	0.0056	18.0	**3.3958**	0.03	8.74	36.37
Swale	4+433.00	4+893.00		137.15	135.94	7.63	31-37,43	13.15	43.85	694.33	4	**0.159**	0.035	0.0026	460.0	**2.3367**	0.06	130.90	14.67

Notes: **Refer to Storm Drainage Area Plan (104161-SWM) for Drainage Areas**
2 Year Rain Fall Intensity =732.951/((Q11+6.199)^(0.81))
Depth of Swale = 1.1m Typical
Depth of Water in Swale = 0.8m Max (0.3m Freeboard)

NOVATECH ENGINEERING CONSULTANTS LTD.

SWALE AND ROADSIDE DITCH DESIGN SHEET

PROJECT: **Mississippi Mills Business Park (Job No. 104161)**
DEVELOPER: **Town ofMississippi Mills**

DESIGNED BY : MWB
CHECKED BY:

DATE: March 9, 2005
REVISION: April 25, 2005

5 YEAR STORM EVENT

LOCATION						AREA(ha)			INDIV	ACCUM	TIME OF	RAINFALL 100YR	PEAK FLOW	PROPOSED SWALE						
Street	Station			Ditch Elev		R=	Drainage Areas	2.78 AR	2.78AR	CONC	INTENSITY	NO CONTROL	Manning's	GRADE	LENGTH	CAPACITY	VELOCITY	TIME OF FLOW	Factor of Safety
	From	TO	Side	UP	DOWN	0.62				(min)	(mm/hr)	Q (m^3/s)	n	(m/m)	(m)	(m^3/s)	(m/s)	(min)	
Swale	5+000.00	5+086.05		139.63	139.46	1.29	7,8,9	2.22	2.22	20.00	70	**0.156**	0.035	0.0020	86.1	**2.0250**	0.06	24.97	12.96
Swale	5+235.86	5+086.05		139.76	139.46	2.02	10,11,12,13	3.48	3.48	20.00	70	**0.245**	0.035	0.0020	149.8	**2.0388**	0.09	27.77	8.34
Swale	4+000.00	4+108.69		139.46	139.26			0.00	5.71	47.77	39	**0.222**	0.035	0.0018	108.7	**1.9543**	0.08	22.19	8.80
Phase 3	3+339.44	3+310.60	L	139.46	139.26	0.40	14	0.69	0.69	20.00	70	**0.048**	0.035	0.0069	28.8	**2.3944**	0.03	19.05	49.44
Phase 3	3+225.80	3+310.60	L	139.83	139.26	0.87	5,6,41	1.50	1.50	20.00	70	**0.105**	0.035	0.0067	84.8	**2.3574**	0.05	25.76	22.38
900mm Culvert	4+108.69	4+125.73		139.26	139.23			0.00	7.89	69.96	29	**0.232**	0.035	0.0018	17.0	**1.9116**	0.09	3.33	8.24
Phase3	3+339.44	3+310.60	R	139.46	139.23			0.00	0.00	20.00	70	**0.000**	0.035	0.0080	28.8	**2.5678**	0.00	#DIV/0!	#DIV/0!
Phase 3	3+310.60	3+287.61	R	139.23	139.18			0.00	7.89	73.29	28	**0.224**	0.035	0.0022	23.0	**1.3409**	0.12	3.28	5.99
Phase 3	3+225.80	3+287.61	R	139.83	139.18	0.56	22,41	0.97	0.97	20.00	70	**0.068**	0.035	0.0105	61.8	**2.9486**	0.04	29.17	43.48
Swale	4+150.00	4+301.86		139.18	137.73	0.54	21b,20b, 19b	0.93	9.79	76.57	27	**0.269**	0.035	0.0095	151.9	**4.4519**	0.10	25.61	16.56
Phase 3	3+339.44	3+417.65	L	139.46	138.94	1.52	38,15,16	2.62	2.62	20.00	70	**0.184**	0.035	0.0066	78.2	**2.3445**	0.10	13.60	12.74
Phase 3	3+339.44	3+417.65	R	139.46	138.94	0.18	21a	0.31	0.31	20.00	70	**0.022**	0.035	0.0066	78.2	**2.3445**	0.01	114.83	107.57
Phase 3	3+417.65	3+529.50	L	138.94	137.87	0.83	17,18	1.43	4.05	33.60	50	**0.202**	0.035	0.0096	111.9	**2.8123**	0.11	17.71	13.91
Phase 3	3+417.65	3+529.50	R	138.94	137.85	0.36	19a,20a	0.62	0.93	134.83	18	**0.017**	0.035	0.0097	111.9	**2.8385**	0.01	216.25	171.50
Industrial	2+900.00	2+857.00	L	137.92	137.87	0.26	42	0.45	0.45	20.00	70	**0.031**	0.035	0.0012	43.0	**0.9805**	0.02	43.71	31.14
Industrial	2+900.00	2+857.00	R	137.92	137.87	0.26	42	0.45	0.45	20.00	70	**0.031**	0.035	0.0012	43.0	**0.9805**	0.02	43.71	31.14
600mm Culvert	2+857.00	2+838.50	L	137.87	137.85			0.00	4.50	63.71	32	**0.142**	0.035	0.0011	18.5	**0.9454**	0.07	4.18	6.67
	2+857.00	2+838.50	R	137.87	137.85			0.00	0.45	63.71	32	**0.014**	0.035	0.0011	18.5	**0.9454**	0.01	41.92	66.95

NOVATECH ENGINEERING CONSULTANTS LTD.

SWALE AND ROADSIDE DITCH DESIGN SHEET

PROJECT: **Mississippi Mills Business Park (Job No. 104161)**
DEVELOPER: **Town ofMississippi Mills**

DESIGNED BY: MWB
CHECKED BY:

DATE: March 9, 2005
REVISION: April 25, 2005

5 YEAR STORM EVENT

LOCATION						AREA(ha)							PROPOSED SWALE						
Street	Station			Ditch Elev		R=	Drainage Areas	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC	RAINFALL 100YR INTENSITY	PEAK FLOW NO CONTROL	Manning's	GRADE	LENGTH	CAPACITY	VELOCITY	TIME OF FLOW	Factor of Safety
	From	TO	Side	UP	DOWN	0.62				(min)	(mm/hr)	Q (m^3/s)	n	(m/m)	(m)	(m^3/s)	(m/s)	(min)	
Industrial	2+838.50	2+753.00	L	137.85	137.72	0.25	42	0.43	5.86	351.08	8	**0.049**	0.035	0.0015	85.5	**1.1212**	0.03	55.98	22.94
Industrial	2+838.50	2+753.00	R	137.85	137.72	0.25	42	0.43	0.88	105.63	21	**0.019**	0.035	0.0015	85.5	**1.1212**	0.01	144.88	59.37
Industrial	2+753.00	2+642.00	L	137.72	137.52	0.82	25,23	1.41	17.06	407.06	7	**0.126**	0.035	0.0018	111.0	**1.2205**	0.07	28.10	9.66
Industrial	2+753.00	2+642.00	R	137.68	137.47			0.00	0.88	250.51	11	**0.010**	0.035	0.0019	111.0	**1.2506**	0.00	370.16	130.33
Phase 3	3+225.80	3+050.00	L	139.83	137.78	1.51	2,3,4,40	2.60	2.60	20.00	70	**0.183**	0.035	0.0117	175.8	**3.1050**	0.10	30.77	16.98
Phase 3	3+225.80	3+050.00	R	139.83	137.69	1.06	24,26,40	1.83	1.83	20.00	70	**0.128**	0.035	0.0122	175.8	**3.1724**	0.07	43.83	24.72
Industrial	2+215.26	2+312.87	L	138.61	137.83			0.00	0.00	20.00	70	**0.000**	0.035	0.0080	97.6	**2.5703**	0.00	#DIV/0!	#DIV/0!
Industrial	2+215.26	2+312.87	R	138.61	137.83	0.94	1	1.62	1.62	20.00	70	**0.114**	0.035	0.0080	97.6	**2.5703**	0.06	27.44	22.58
Industrial	2+312.87	2+329.73	R	137.83	137.81	0.94	1	1.62	3.24	47.44	39	**0.127**	0.035	0.0012	16.9	**0.9903**	0.07	4.26	7.81
Phase 3	3+019.41	3+050.00	L	137.83	137.78			0.00	0.00	20.00	70	**0.000**	0.035	0.0016	30.6	**1.1625**	0.00	#DIV/0!	#DIV/0!
600mm Culvert		17.8		137.83	137.69			0.00	2.60	20.00	70	**0.183**	0.035	0.0079	17.8	**2.5500**	0.10	3.12	13.95
Phase 3	3+050.00	3+019.41	R	137.69	137.66			0.00	4.43	63.83	31	**0.139**	0.035	0.0010	30.6	**0.9004**	0.07	7.02	6.46
Industrial	2+329.73	2+460.89	L	137.66	137.49	1.15	28,29,39	1.98	6.41	70.85	29	**0.187**	0.035	0.0013	131.2	**1.0352**	0.10	22.49	5.55
Industrial	2+329.73	2+460.89	R	137.81	137.66	0.33	39	0.57	3.81	51.70	37	**0.140**	0.035	0.0011	131.2	**0.9724**	0.07	29.98	6.95
Industrial	2+460.89	2+635.00	L	137.49	137.30	1.14	27,30,39	1.96	8.38	93.34	24	**0.198**	0.035	0.0011	174.1	**0.9498**	0.10	28.16	4.80
Industrial	2+460.89	2+635.00	R	137.66	137.30	0.33	39	0.57	4.38	81.68	26	**0.114**	0.035	0.0021	174.1	**1.3075**	0.06	48.67	11.42
900mm Arch Crvt	4+415.00	4+433.00		137.25	137.15			0.00	25.44	435.16	7	**0.179**	0.035	0.0056	18.0	**3.3958**	0.07	4.57	19.01
Swale	4+433.00	4+893.00		137.15	135.94	7.63	31-37,43	13.15	43.85	439.73	7	**0.305**	0.035	0.0026	460.0	**2.3367**	0.11	68.30	7.65
						25.44													

Notes: **Refer to Storm Drainage Area Plan (104161-SWM) for Drainage Areas**
5 Year Rain Fall Intensity = 998.071/((Q11+6.053)^(0.814))
Depth of Swale = 1.1m Typical
Depth of Water in Swale = 0.8m Max (0.3m Freeboard)

NOVATECH ENGINEERING CONSULTANTS LTD.

SWALE AND ROADSIDE DITCH DESIGN SHEET

PROJECT: **Mississippi Mills Business Park (Job No. 104161)**
DEVELOPER: **Town ofMississippi Mills**

DESIGNED BY : MWB
CHECKED BY:

DATE: March 9, 2005
REVISION: April 25, 2005

100 YEAR STORM EVENT

LOCATION						AREA(ha)		INDIV	ACCUM	TIME OF	RAINFALL 100YR	PEAK FLOW	PROPOSED SWALE						
Street	Station			Ditch Elev		R=	Drainage Areas	2.78 AR	2.78 AR	CONC	INTENSITY	NO CONTROL	Manning's	GRADE	LENCTH	**CAPACITY**	VELOCITY	TIME OF FLOW	Factor of Safety
	From	TO	Side	UP	DOWN	0.62				(min)	(mm/hr)	**Q (m^3/s)**	n	(m/m)	(m)	**(m^3/s)**	(m/s)	(min)	
Swale	5+000.00	5+086.05		139.63	139.46	1.29	7,8,9	2.22	2.22	20.00	141	**0.314**	0.035	0.0020	86.1	**2.0250**	0.12	12.43	6.45
Swale	5+235.86	5+086.05		139.76	139.46	2.02	10,11,12,13	3.48	3.48	20.00	141	**0.492**	0.035	0.0020	149.8	**2.0388**	0.18	13.82	4.15
Swale	4+000.00	4+108.69		139.46	139.26			0.00	5.71	33.82	102	**0.580**	0.035	0.0018	108.7	**1.9543**	0.21	8.49	3.37
Phase 3	3+339.44	3+310.60	L	139.46	139.26	0.40	14	0.69	0.69	20.00	141	**0.097**	0.035	0.0069	28.8	**2.3944**	0.05	9.48	24.60
Phase 3	3+225.80	3+310.60	L	139.83	139.26	0.87	5,6,41	1.50	1.50	20.00	141	**0.212**	0.035	0.0067	84.8	**2.3574**	0.11	12.82	11.14
900mm Culvert	4+108.69	4+125.73		139.26	139.23			0.00	7.89	42.31	88	**0.692**	0.035	0.0018	17.0	**1.9116**	0.25	1.12	2.76
Phase 3	3+339.44	3+310.60	R	139.46	139.23			0.00	0.00	20.00	141	**0.000**	0.035	0.0080	28.8	**2.5678**	0.00	#DIV/0!	#DIV/0!
Phase3	3+310.60	3+287.61	R	139.23	139.18			0.00	7.89	43.43	86	**0.680**	0.035	0.0022	23.0	**1.3409**	0.35	1.08	1.97
Phase3	3+225.80	3+287.61	R	139.83	139.18	0.56	22,41	0.97	0.97	20.00	141	**0.136**	0.035	0.0105	61.8	**2.9486**	0.07	14.52	21.64
Swale	4+150.00	4+301.86		139.18	137.73	0.54	21 b,20b, 19b	0.93	9.79	44.51	85	**0.829**	0.035	0.0095	151.9	**4.4519**	0.30	8.30	5.37
Phase 3	3+339.44	3+417.65	L	139.46	138.94	1.52	38,15,16	2.62	2.62	20.00	141	**0.370**	0.035	0.0066	78.2	**2.3445**	0.19	6.77	6.34
Phase 3	3+339.44	3+417.65	R	139.46	138.94	0.18	21a	0.31	0.31	20.00	141	**0.044**	0.035	0.0066	78.2	**2.3445**	0.02	57.14	53.53
Phase 3	3+417.65	3+529.50	L	138.94	137.87	0.83	17,18	1.43	4.05	26.77	118	**0.479**	0.035	0.0096	111.9	**2.8123**	0.25	7.48	5.88
Phase 3	3+417.65	3+529.50	R	138.94	137.85	0.36	19a,20a	0.62	0.93	77.14	58	**0.054**	0.035	0.0097	111.9	**2.8385**	0.03	66.65	52.86
Industrial	2+900.00	2+857.00	L	137.92	137.87	0.26	42	0.45	0.45	20.00	141	**0.063**	0.035	0.0012	43.0	**0.9805**	0.03	21.75	15.50
Industrial	2+900.00	2+857.00	R	137.92	137.87	0.26	42	0.45	0.45	20.00	141	**0.063**	0.035	0.0012	43.0	**0.9805**	0.03	21.75	15.50
600mm Culvert	2+857.00	2+838.50	L	137.87	137.85			0.00	4.50	41.75	88	**0.398**	0.035	0.0011	18.5	**0.9454**	0.21	1.49	2.38
	2+857.00	2+838.50	R	137.87	137.85			0.00	0.45	41.75	88	**0.040**	0.035	0.0011	18.5	**0.9454**	0.02	14.94	23.86

NOVATECH ENGINEERING CONSULTANTS LTD.

SWALE AND ROADSIDE DITCH DESIGN SHEET

PROJECT: **Mississippi Mills Business Park (Job No. 104161)**
DEVELOPER: **Town ofMississippi Mills**

DESIGNED BY : MWB
CHECKED BY:

DATE: March 9, 2005
REVISION: April 25, 2005

100 YEAR STORM EVENT

LOCATION						AREA(ha)		INDIV	ACCUM	TIME OF	RAINFALL 100YR	PEAK FLOW	PROPOSED SWALE						
Street	Station			Ditch Elev		R=	Drainage Areas	2.78AR	2.78AR	CONC	INTENSITY	NO CONTROL	Manning's	GRADE	LENGTH	CAPACITY	VELOCITY	TIME OF FLOW	Factor of Safety
	From	TO	Side	UP	DOWN	0.62				(min)	(mm/hr)	Q (m^3/s)	n	(m/m)	(m)	(m^3/s)	(m/s)	(min)	
Industrial	2+838.50	2+753.00	L	137.85	137.72	0.25	42	0.43	5.86	143.79	37	**0.215**	0.035	0.0015	85.5	**1.1212**	0.11	12.73	5.22
Industrial	2+838.50	2+753.00	R	137.85	137.72	0.25	42	0.43	0.88	56.69	72	**0.063**	0.035	0.0015	85.5	**1.1212**	0.03	43.41	17.79
Industrial	2+753.00	2+642.00	L	137.72	137.52	0.82	25,23	1.41	17.06	156.52	34	**0.588**	0.035	0.0018	111.0	**1.2205**	0.31	6.04	2.08
Industrial	2+753.00	2+642.00	R	137.68	137.47			0.00	0.88	100.10	48	**0.042**	0.035	0.0019	111.0	**1.2506**	0.02	84.49	29.75
Phase3	3+225.80	3+050.00	L	139.83	137.78	1.51	2,3,4,40	2.60	2.60	20.00	141	**0.367**	0.035	0.0117	175.8	**3.1050**	0.19	15.31	8.45
Phase 3	3+225.80	3+050.00	R	139.83	137.69	1.06	24,26,40	1.83	1.83	20.00	141	**0.258**	0.035	0.0122	175.8	**3.1724**	0.13	21.81	12.30
Industrial	2+215.26	2+312.87	L	138.61	137.83			0.00	0.00	20.00	141	**0.000**	0.035	0.0080	97.6	**2.5703**	0.00	#DIV/0!	#DIV/0!
Industrial	2+215.26	2+312.87	R	138.61	137.83	0.94	1	1.62	1.62	20.00	141	**0.229**	0.035	0.0080	97.6	**2.5703**	0.12	13.66	11.24
Industrial	2+312.87	2+329.73	R	137.83	137.81	0.94	1	1.62	3.24	33.66	102	**0.331**	0.035	0.0012	16.9	**0.9903**	0.17	1.63	3.00
Phase3	3+019.41	3+050.00	L	137.83	137.78			0.00	0.00	20.00	141	**0.000**	0.035	0.0016	30.6	**1.1625**	0.00	#DIV/0!	#DIV/0!
600mm Culvert		17.8		137.83	137.69			0.00	2.60	20.00	141	**0.367**	0.035	0.0079	17.8	**2.5500**	0.19	1.55	6.94
Phase 3	3+050.00	3+019.41	R	137.69	137.66			0.00	4.43	41.81	88	**0.391**	0.035	0.0010	30.6	**0.9004**	0.20	2.50	2.30
Industrial	2+329.73	2+460.89	L	137.66	137.49	1.15	28,29,39	1.98	6.41	44.31	85	**0.545**	0.035	0.0013	131.2	**1.0352**	0.28	7.71	1.90
Industrial	2+329.73	2+460.89	R	137.81	137.66	0.33	39	0.57	3.81	35.29	99	**0.377**	0.035	0.0011	131.2	**0.9724**	0.20	11.14	2.58
Industrial	2+460.89	2+635.00	L	137.49	137.30	1.14	27,30,39	1.96	8.38	52.02	76	**0.638**	0.035	0.0011	174.1	**0.9498**	0.33	8.74	1.49
Industrial	2+460.89	2+635.00	R	137.66	137.30	0.33	39	0.57	4.38	46.43	82	**0.360**	0.035	0.0021	174.1	**1.3075**	0.19	15.47	3.63
900mm Arch Crvt	4+415.00	4+433.00		137.25	137.15			0.00	25.44	162.57	33	**0.852**	0.035	0.0056	18.0	**3.3958**	0.31	0.96	3.99
Swale	4+433.00	4+893.00		137.15	135.94	7.63	31-37,43	13.15	43.85	163.52	33	**1.462**	0.035	0.0026	460.0	**2.3367**	0.54	14.27	1.60

Notes: **Refer to Storm Drainage Area Plan (104161-SWM) for Drainage Areas**
100 Year Rain Fall Intensity = 1735.688/((Q11+6.014)^(0.77))
Depth of Swale =1.1m Typical
Depth of Water in Swale = 0.8m Max (0.3m Freeboard)

APPENDIX D

Erosion and Sediment Control Requirements
(July 2000 Stormwater Drainage Report)

runoff bypasses the perforated pipe and is carried downstream via the storm sewer. To ensure the system functions correctly, soils with a high hydraulic conductivity and a deep groundwater table are required. Given these conditions the three pipe system is considered to be a suitable alternative.

4.4 Erosion and Sediment Control Measures

4.4.1 TEMPORARY MEASURES

Erosion and Sediment control measures will be implemented during construction in accordance with the "Guidelines on Erosion and Sediment Control for Urban Construction Sites" (Government of Ontario, May 1987). These measures include:

- Silt fences along property boundaries during the construction of individual sites and development of initial infrastructure works.
- Straw bale flow checks along the full width of roadside ditches as deemed necessary.
- Filter fabric under all catchbasins and manhole covers.
- Roads shall be swept once they have been paved.

Rock flow check dams using four to six inch rip rap placed in the main ditch to the south of the site will also help to reduce suspended solids and promote absorption. Rip rap will be placed at all erosion prone areas to help reduce the amount of suspended solids, entering the watercourse.

4.4.2 PERMANENT MEASURES

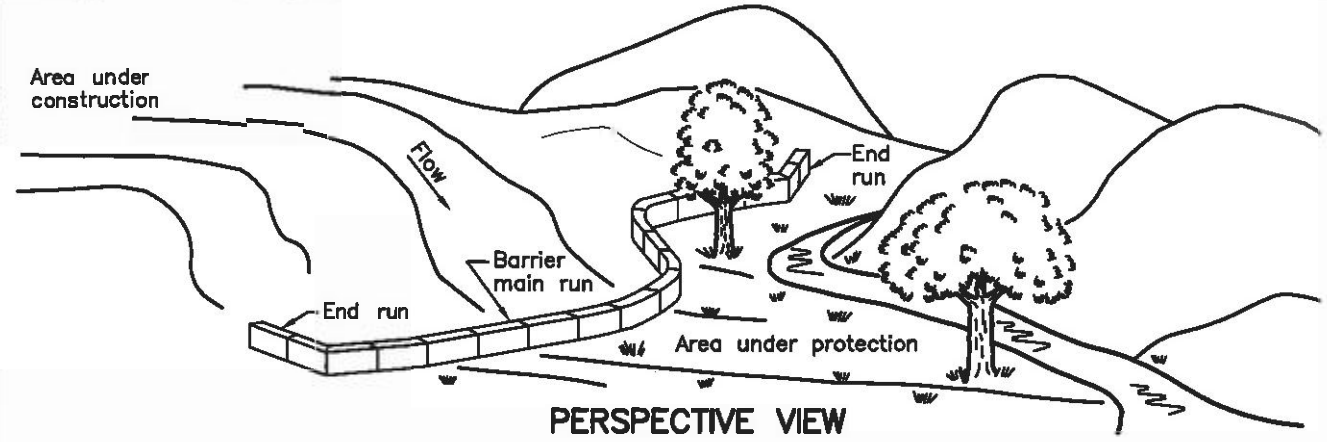
- Ditches and swales will be covered with topsoil and seed to establish vegetative cover.
- Rip-Rap will be placed at the intersection of drainage ditches and the inlets and outlets of culverts.

The proposed temporary erosion and sediment control measures will be implemented prior to construction and will remain in place during all phases of construction until vegetation is established. Regular inspection and maintenance is required to ensure their continued efficient operation. (Refer to Appendix B for Erosion and Sediment control details.)

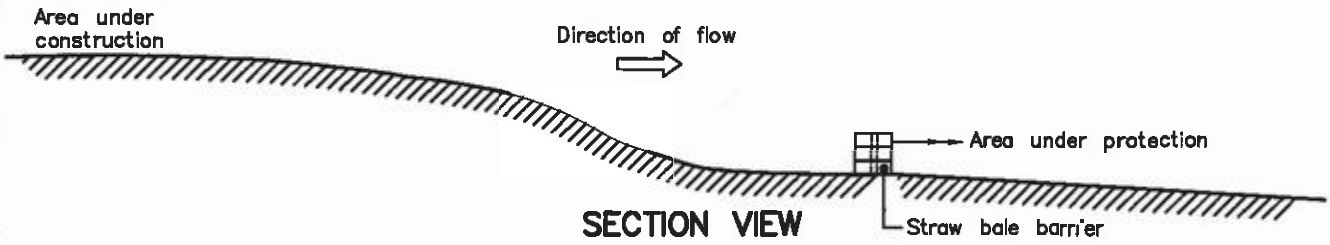
4.5 Operation and Maintenance

On-going maintenance will be required to ensure that the selected stormwater treatment measures function as intended. The Town will be responsible for such measures within the public road allowances and the main site outlet.

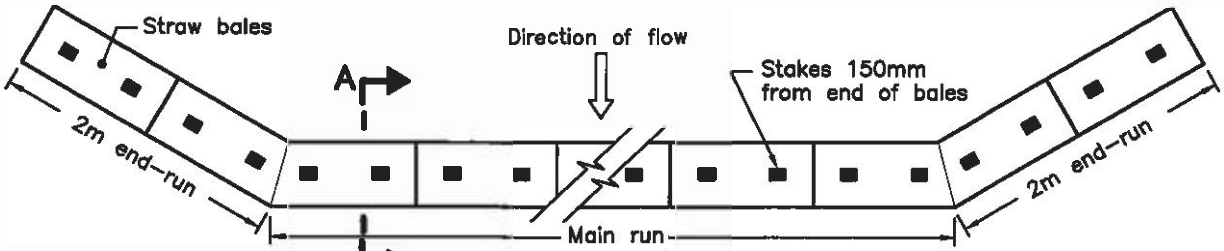
Site by site stormwater management facilities will require that the proper legal mechanisms are in place to ensure that the facilities are completed by the individual private landowners. Alternatively, in the event of the individual landowners failing to comply with these requirements, the Town should have the right to undertake corrective action at the landowner's expense.



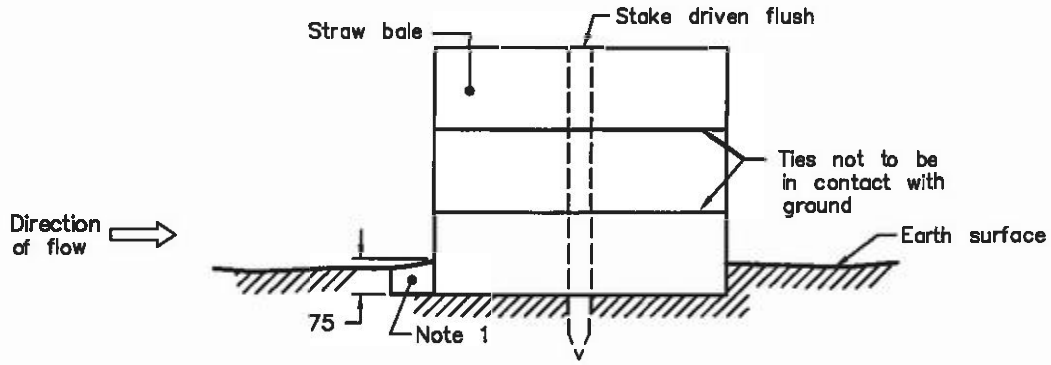
PERSPECTIVE VIEW



SECTION VIEW



PLAN VIEW



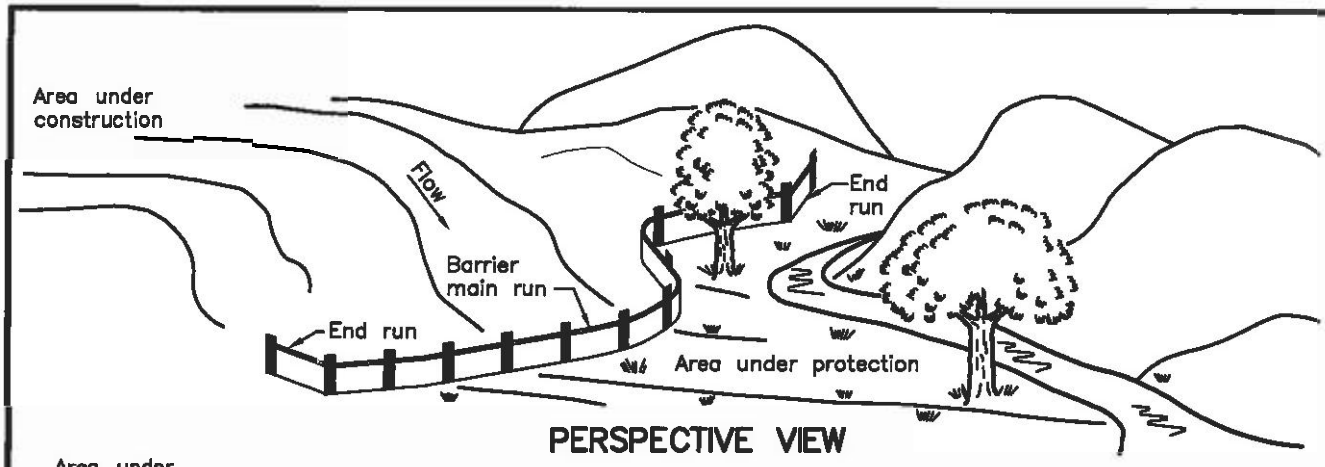
SECTION A–A

NOTES:

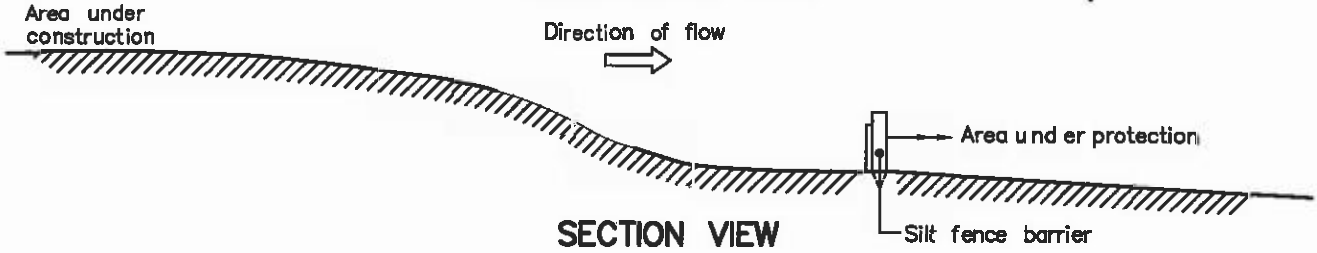
1 Balance of excavated trench to be backfilled following bale placement.

A All dimensions are in millimetres or metres unless otherwise shown.

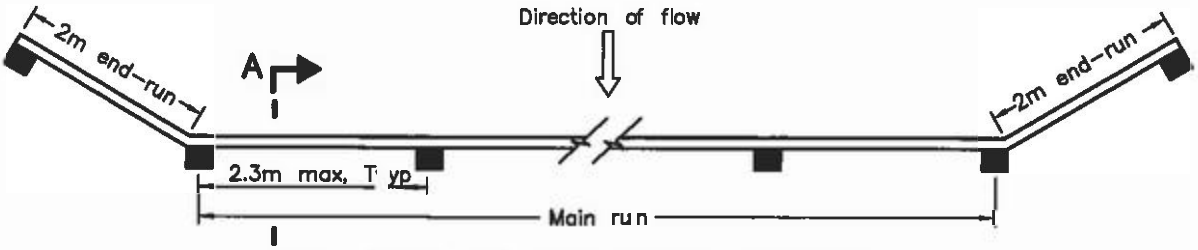
ONTARIO PROVINCIAL STANDARD DRAWING	1996 02 01	Rev	
LIGHT DUTY STRAW BALE BARRIER	Date _____		
	OPSD – 219.100		



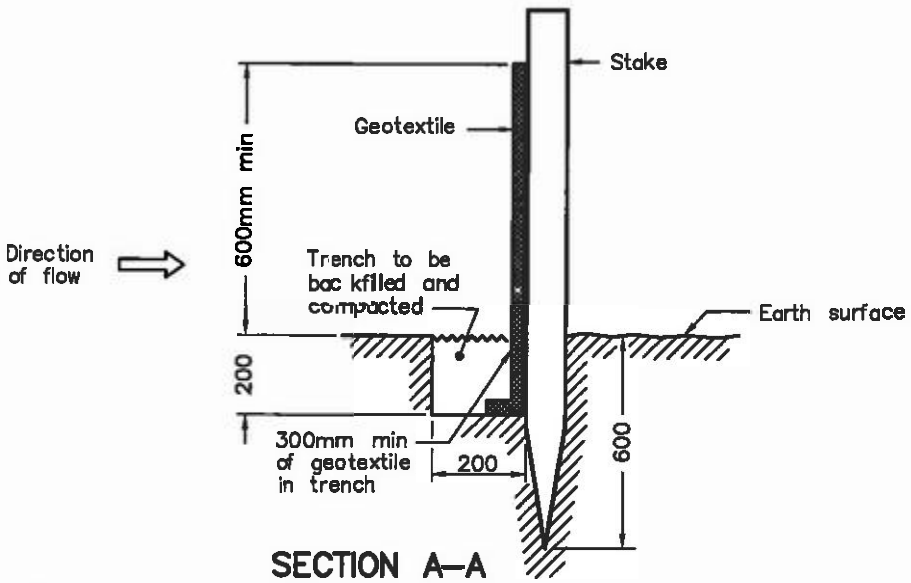
PERSPECTIVE VIEW



SECTION VIEW



PLAN OF SILT FENCE BARRIER

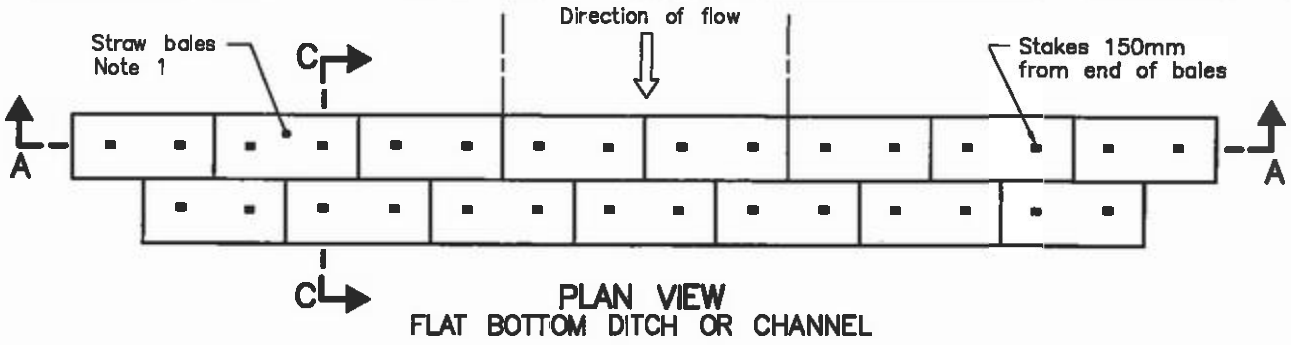


SECTION A–A

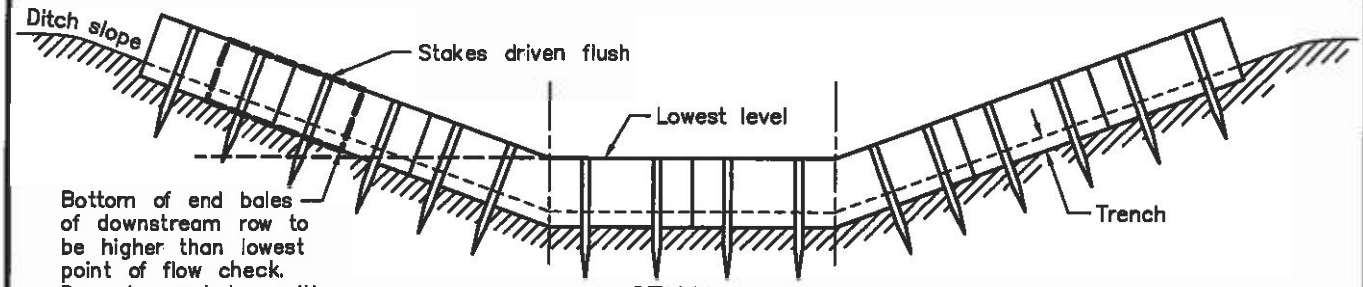
NOTE:

A All dimensions are in millimetres or metres unless otherwise shown.

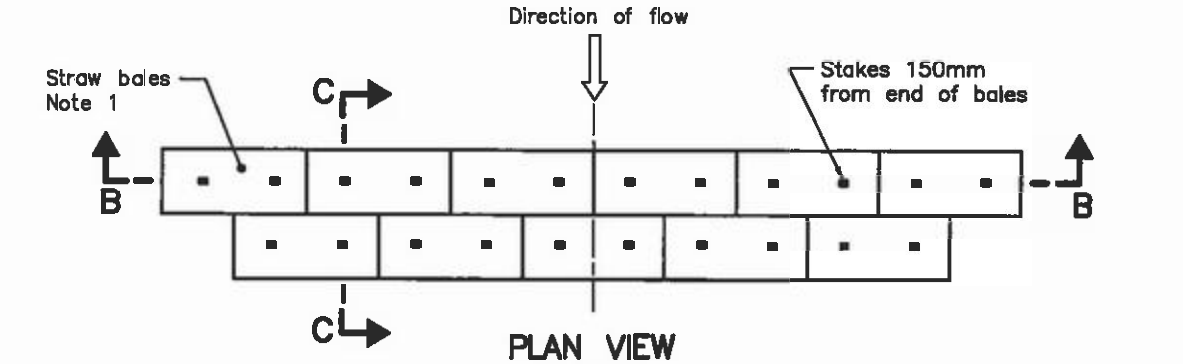
ONTARIO PROVINCIAL STANDARD DRAWING	1996 02 01	Rev	
LIGHT DUTY SILT FENCE BARRIER	Date _____		
	OPSD – 219.110		



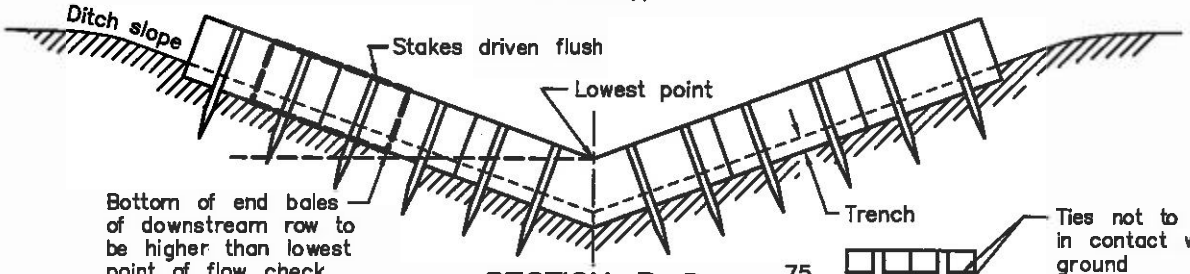
PLAN VIEW
FLAT BOTTOM DITCH OR CHANNEL



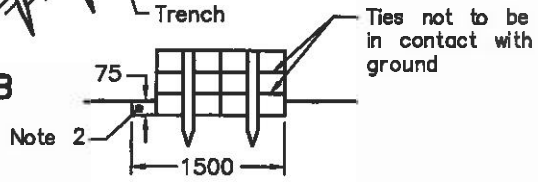
SECTION A–A



PLAN VIEW
V–DITCH



SECTION B–B



SECTION C–C

NOTES:

1 Number of bales varies to suit ditch or channel.

2 Balance of excavated trench to be backfilled following bale placement.

A All dimensions are in millimetres or metres unless otherwise shown.

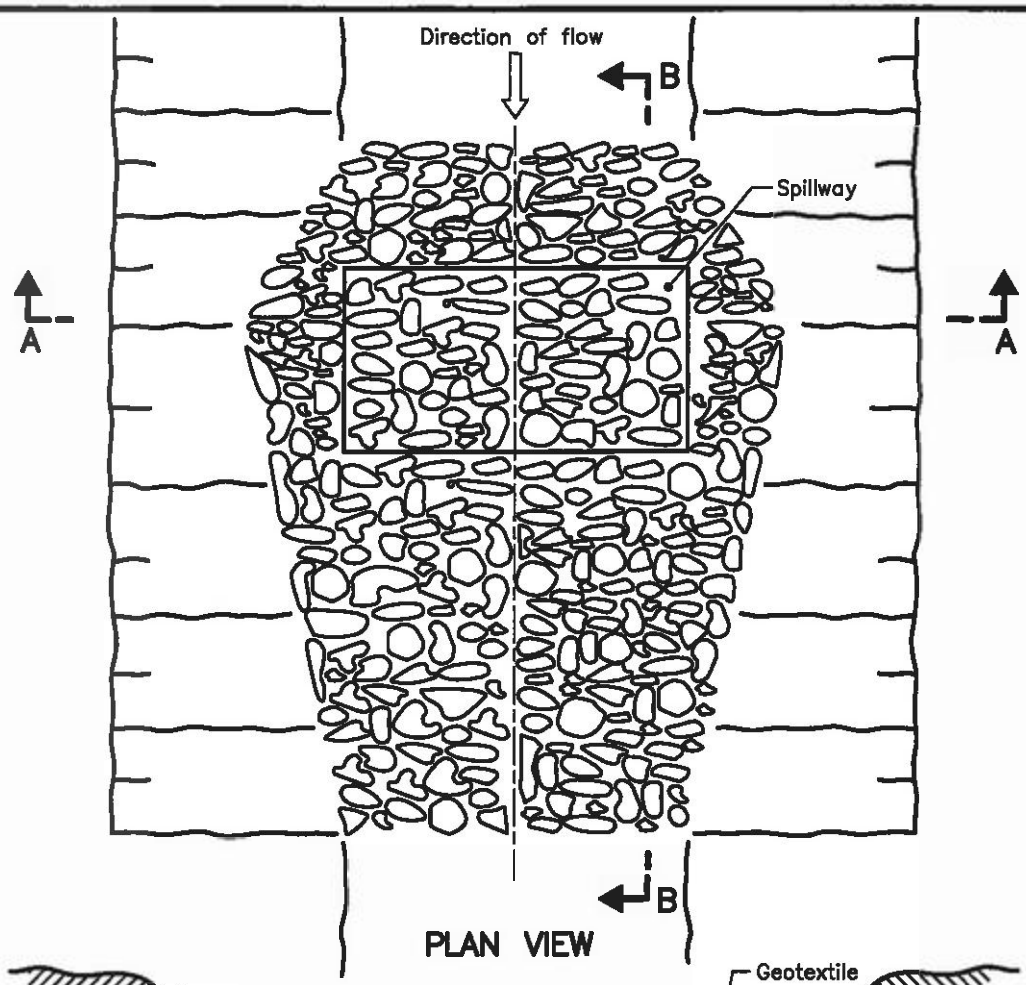
ONTARIO PROVINCIAL STANDARD DRAWING

1996 02 01 | Rev

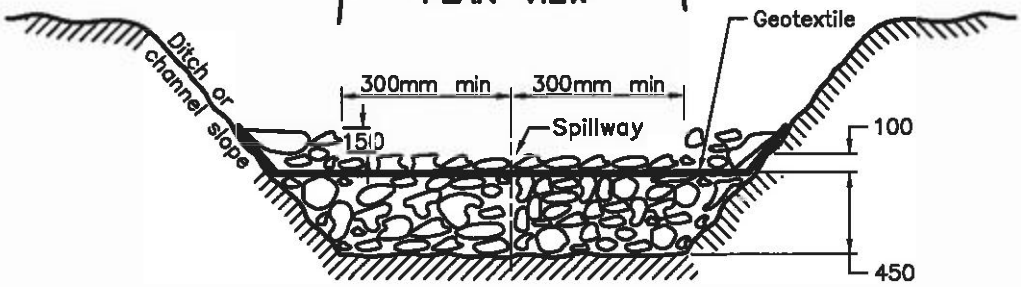
STRAW BALE FLOW CHECK

Date _____

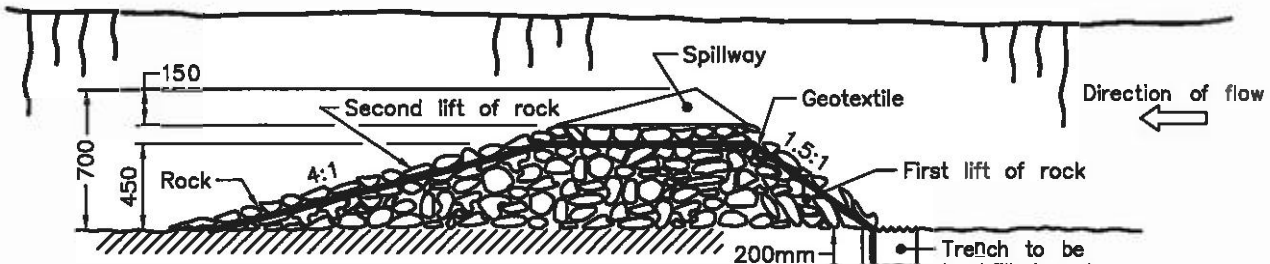
OPSD – 219.180



PLAN VIEW



SECTION A–A



SECTION B–B

NOTE:

A All dimensions are in millimetres or metres unless otherwise shown.

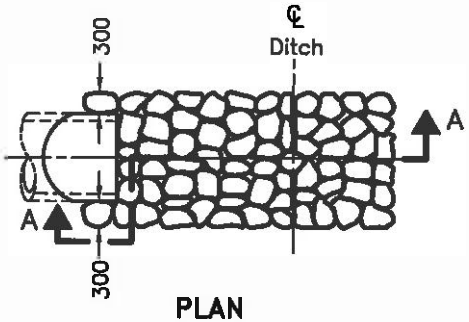
ONTARIO PROVINCIAL STANDARD DRAWING | 1996 02 01 | Rev

TEMPORARY ROCK FLOW CHECK

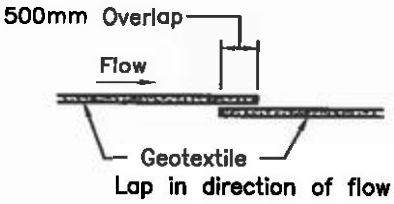
FLAT BOTTOM DITCH OR CHANNEL

Date _____

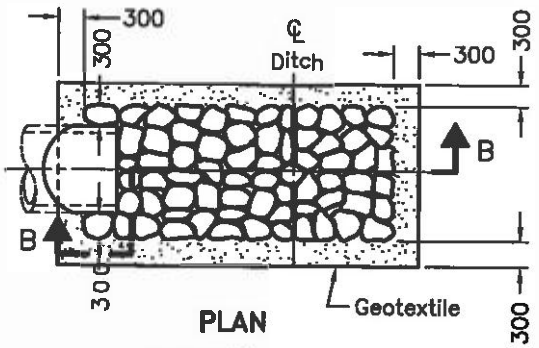
OPSD – 219.211



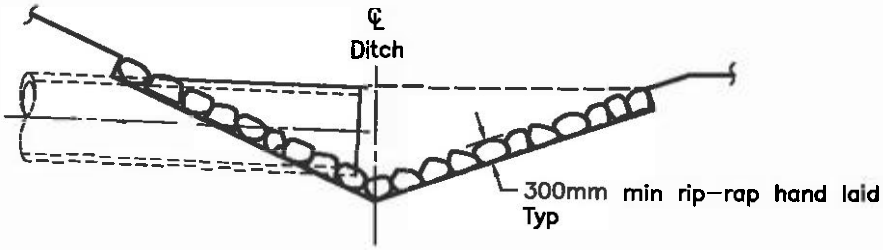
PLAN
CUT OR FILL



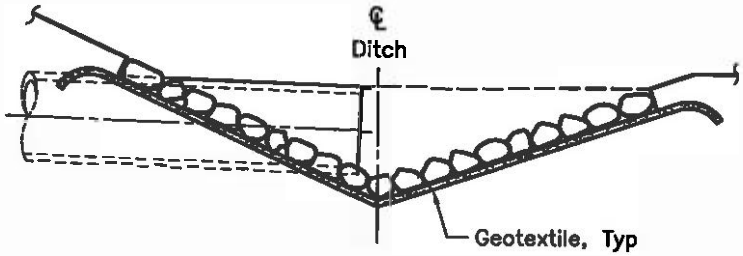
Lap in direction of flow



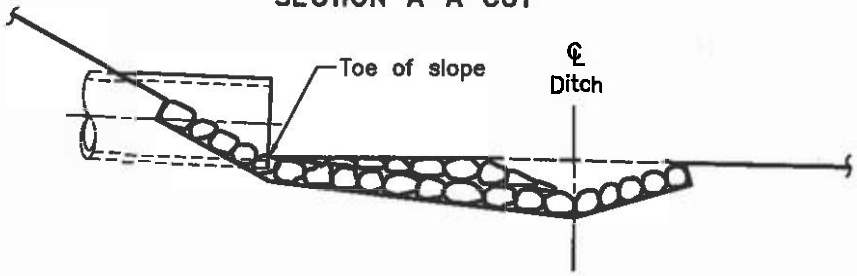
PLAN
CUT OR FILL



SECTION A–A CUT

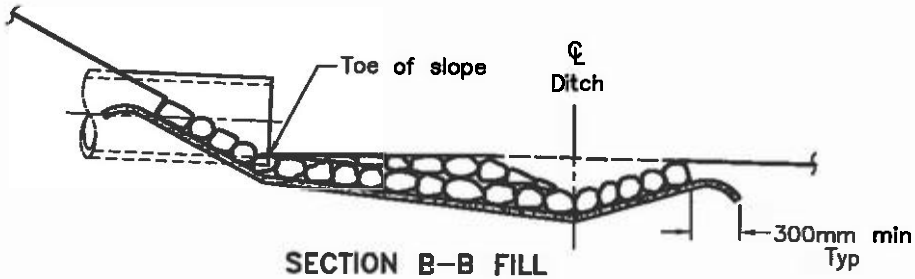


SECTION B–B CUT



SECTION A–A FILL

TYPE A – WITHOUT GEOTEXTILE



SECTION B–B FILL

TYPE B – WITH GEOTEXTILE

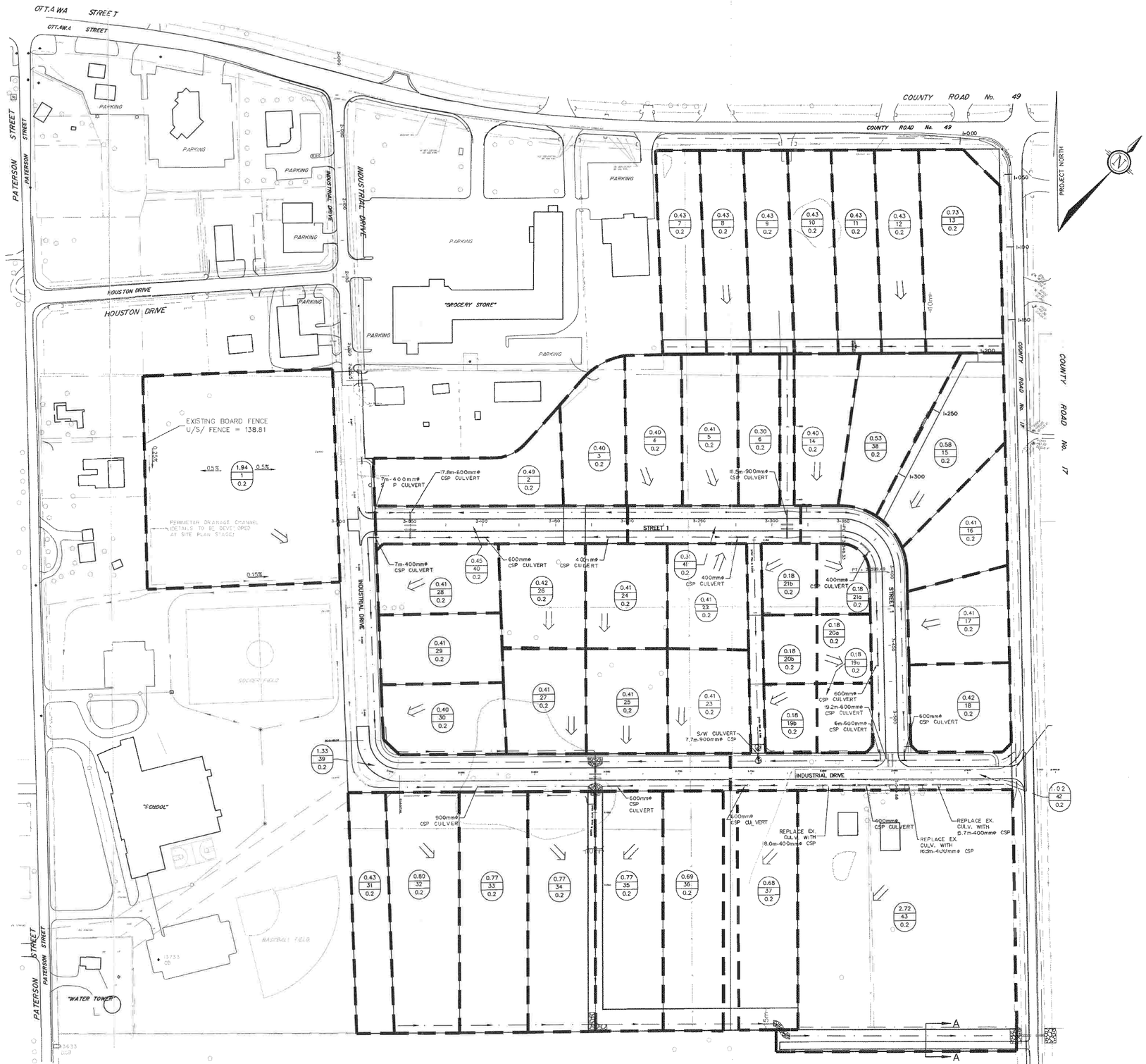
NOTES:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING

RIP–RAP TREATMENT
FOR SEWER AND CULVERT OUTLETS

Nov 2001 | Rev 0

OPSD – 810.010



LEGEND

- 1.49 / 13 / 0.2 — AREA IN HECTARES / DRAINAGE SECTION / RUNOFF COEFFICIENT
- DRAINAGE AREA BOUNDARY
- DIRECTION OF DRAINAGE
- DIRECTION OF DITCH DRAINAGE

ALLOWABLE RELEASE RATES	FLOW
5 YEAR STORM EVENT	21 L/s/ha
100 YEAR STORM EVENT	56 L/s/ha

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
1	ISSUED WITH SWM REPORT	APR 25/05	MWB

L.P. DESMARAIS — PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

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Email novatech@novatech-eng.com

DESIGN	MWB
CHECKED	LPD
DRAWN	MWB
CHECKED	LPD
APPROVED	LPD

SCALE: 1 : 1250

TOWN OF MISSISSIPPI MILLS
MISSISSIPPI MILLS BUSINESS PARK – PHASE 1,2,& 3
STORM DRAINAGE AREA PLAN

PROJECT No. 104161
DATE MARCH 2005
DRAWING No. 104161 – SWM

PLANB.DWG - 1000mm.TO.1mm

Apr 25, 2005 - 09:17:6 DWG Name: M:\2004\104161\CAD\design\104161-SWM.dwg Updated By: mbaker