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TECHNICAL MEMORANDUM

RE: Drainage and SWM City Centre BRT
OUR FILE: 7644
TO: Andrew Shea, Steve Schijns
PREPARED BY: Veronica Kroess
CC: File
DATE: February 9, 2010
PROJECT: City Centre BRT – Rathburn Road
SUBJECT: Drainage and Storm Water Management

BACKGROUND

The City of Mississauga Bus Rapid Transit (BRT) Project was approved through an Individual EA in 1993 and subsequent modifications to the plan were approved through an Addendum to the EA in 2004, and again in 2009/2010. The first phase of the Mississauga BRT is currently undergoing detailed design, with construction anticipated to begin in Spring 2010. This first phase does not include the section through the Mississauga City Centre. While the EA-approved Mississauga BRT alignment through the City Centre remains as the long-term plan, in order to accommodate and support the increased transit activity in the City Centre that will result from the first phase of the Mississauga BRT, the City has initiated a study to provide enhanced transit operations in the City Centre for the near term, that would not preclude the ability to implement the ultimate BRT alignment in the future.

The Study Area for this project therefore focuses on the section of Rathburn Road that connects the existing City Centre Transit Terminal to the proposed BRT East intersection with Rathburn Road, approximately 1 km east of the City Centre Transit Terminal.

The preferred design method is to convert two of the existing general traffic lanes into median Reserved Bus Lanes (RBLs). Two median island-type bus platforms are proposed to provide additional passenger loading/unloading capacity along the median RBLs. The majority of the works on Rathburn Road will occur within the existing curb lines, with only minor localized widenings at the Rathburn Road / Station Gate Road intersection. The existing southbound Hurontario Street to Rathburn Road ramp is to be realigned to divert traffic to the underused Centre View Drive, away from the busy Rathburn Road / Centre View Drive intersection. This would, in turn, provide general traffic with a convenient means of bypassing the constrained section of Rathburn Road and reduce traffic volumes on Rathburn Road in the study area. The realignment would, however, shift the ramp slightly closer to the adjacent Cooksville Creek.

The preliminary design of the realigned ramp generally maintains the existing profile, however, the low-point is raised slightly (approximately 10cm) and the ramp grades are improved. Exhibit 1 shows the proposed Rathburn Road widening and realignment of the ramp.

DRAINAGE AND STORM WATER MANAGEMENT STRATEGY

The drainage and storm water management strategy includes quality (Enhanced level) and quantity control for new pavement areas. Storm water management measures will be designed as per the 2003 Storm Water Management Planning and Design Manual, and the City of Mississauga design standards.

DRAINAGE AND STORM WATER MANAGEMENT DESIGN

Rathburn Road Widening Assessment

Under existing conditions, drainage from Rathburn Road discharges via catchbasins to the existing storm sewer system along Rathburn Road for events up to the 10-year storm. Flows from events in excess of the 10-year storm flow overland along Rathburn Road easterly and ultimately to the Cooksville Creek drainage system (see attached Exhibits 2a and 2b). Under proposed conditions, the increase in impervious area will result in a slight increase in flows to the existing drainage system, although the overall drainage scheme will remain unchanged.

The proposed works include the widening of Rathburn Road to accommodate additional turning lanes at Station Gate Road. The proposed widening of Rathburn Road will result in an increase in impervious area, which will discharge to the existing storm sewer system on Rathburn Road. An assessment was carried out to determine if the proposed road widening will have impacts on the existing storm sewer system. Existing storm sewer design calculations were provided by the City. These design calculations were replicated in a storm sewer design spreadsheet for existing conditions. These were then revised to reflect the proposed road widening conditions. The storm sewer design spreadsheets incorporated the City of Mississauga IDF parameters for the 10-year storm event, as well as the City of Mississauga's minimum time of concentration of 15 minutes.

Under existing conditions, two sections of the sewer system are slightly over capacity (see MH24 to MH25 and MH25 to MH30 in attached Table 1). Under proposed conditions, two lateral connections are over capacity (see 54 to Pipe and 70 to Pipe on attached Table 2). Since they are laterals, they do not need to be replaced.

The change in impervious area resulting from the proposed Rathburn Road widening results in a peak flow increase of only 2%, as shown on the attached storm sewer design calculations in Table 2. However, the main sewers have sufficient capacity to convey the slight increase in flow rate. A Stormceptor STC-750 or approved equivalent would be required to treat the total increase in impervious area of 0.298 ha prior to discharge to Cooksville Creek, based on an Enhanced level of treatment. This oil-grit separator would be installed in the 1350 mm sewer prior to discharging to the creek.

Storm sewer design information for the 300 mm diameter sewer east of Centre View Drive was not available. A storm sewer design spreadsheet was created for the 300 mm diameter pipe section, and the slope of the pipes were estimated based on the road profile. The analysis indicates that the existing storm sewer on Rathburn Road east of Centre View Drive has capacity to convey the additional flows (see attached Table 3).

Ramp Realignment Peak Flow Impact

A realignment of the existing Hurontario to Rathburn Road ramp is also proposed. Under existing conditions, drainage from Centre View Drive discharges via catchbasins to existing ditches along both sides of Centre View Drive. The ditches ultimately discharge via a culvert to Cooksville Creek. Runoff

from the majority of the ramp collects at a sag (low point) along the ramp. Catchbasins provide drainage to Cooksville Creek.

The proposed ramp realignment with Profile Alternative 1 from Hurontario to Centre View Drive will result in a minor increase in pavement area from the realigned ramp to Centre View Drive. A hydrological analysis was conducted to assess the peak flow impact on the existing drainage infrastructure along the realigned ramp from Hurontario to Centre View Drive. The Rational method was used in the analysis for a 10-year design storm as per the City of Mississauga standards. Table 4 summarizes the results generated for both existing and proposed conditions. The attached Exhibit 1 presents the location of the existing catchbasins as well as the drainage areas to each of the catchbasins.

Table 4

Catchbasin ID	Existing Condition		Proposed Condition		Actual Peak Flow Increase (cm/s)	% Increase
	Catchment Area (ha)	Peak Runoff (cm/s)	Catchment Area (ha)	Peak Runoff (cm/s)		
DCB 19	0.18	0.038	0.22	0.046	0.009	23%
CB 20	0.0767	0.016	0.0903	0.019	0.003	18%
CB 21	0.0465	0.010	0.0465	0.010	0.000	0%

It should be noted that although the percent increase in peak flow of 23% is high at DCB 19 as a result of the ramp realignment, the actual amount of increased runoff of 0.009 m³/s is insignificant. The increase in runoff at CB20 is also insignificant. Therefore, runoff generated from the proposed ramp realignment will not cause any impact to the existing hydraulic system.

Based on the above assessment, upgrade to the existing drainage infrastructure on Centre View Drive is not required.

Ramp Profile Discussion

As mentioned previously, the realigned ramp from Hurontario to Centre View Drive would largely maintain the existing ramp profile. This profile directs traffic to Centre View Drive, and allows traffic to merge into Rathburn Road. The low point of the ramp will increase by approximately 0.1m. The current drainage design for the Regional Storm considers that the Cooksville Creek twin culvert under Hurontario Street / Rathburn Road may back up and allows for overtopping of the ramp and overland flow via Rathburn Road to Cooksville Creek downstream of Rathburn Road. The proposed ramp profile would maintain the spill area from Cooksville Creek to Rathburn Road during the Regional Storm. The small increase in elevation would allow lesser spill from Cooksville Creek.

CONCLUSIONS AND RECOMMENDATIONS

Based on the storm sewer system assessment, the following is concluded:

1. The proposed road widening of Rathburn Road will not have any impacts to the existing storm sewer system on Rathburn Road. Although the peak flow increased by 2% the existing sewer system has adequate capacity. Due to the small increase in peak flow, quantity control is not required.
2. A Stormceptor STC-750 or approved equivalent would be required to treat the total increase in impervious area of 0.298 ha prior to discharge to Cooksville Creek, based on an Enhanced level of

treatment. This oil-grit separator would be installed in the 1350 mm sewer prior to discharging to the creek.

3. The proposed ramp alignment with Profile Alternative 1 will have no impacts to the existing storm sewer on Centre View Drive. The amount of increase in peak flow is insignificant.
4. The proposed ramp alignment with Profile Alternative 1 will maintain the existing ramp profile with a small increase in elevation of approximately 0.1 m at the sag. This will maintain the spill area but will allow a lesser spill from Cooksville Creek to Rathburn Road.

It is recommended that the assessments be confirmed during the detailed design stage.

Table 1
Rathburn Road Existing Conditions

Line & Location		From	To	Incremental Area	C	AC	AC	Accumulated AC	Concentration In Pipe	Concentration Total	Intensity min	Q	Pipe Size	Length	Slope	Fall	Capacity	Full Flow Velocity	Inverts	
Street				hectares		hectares	hectares	hectares	min	min	min	cm/s	mm	m	%	m	cm/s	m/s	Upper	Lower
		24	25	2.40	0.75	1.800	1.800	1.800	0.18	16.30	94.32	0.470	525	23.5	1.15%	0.270	0.461	2.130	158.09	157.820
		25	30	0.34	0.75	0.255	2.055	2.055	1.68	17.98	88.79	0.505	675	130	0.30%	0.390	0.460	1.287	157.720	157.200
		29	Pipe	1.79	0.75	1.343	1.343	1.343	0.14	18.12	88.37	0.329	525	23	2.00%	0.460	0.608	2.810	157.830	157.370
		30	40	0.60	0.75	0.450	3.848	3.848	1.15	19.28	85.02	0.906	900	108	0.30%	0.324	0.992	1.559	157.070	156.750
		39	40	1.46	0.75	1.095	1.095	1.095	0.18	19.46	84.51	0.256	525	22	1.00%	0.220	0.430	1.987	158.220	158.000
		40	48	0.42	0.75	0.315	5.258	5.258	1.08	20.54	81.65	1.189	975	107	0.30%	0.321	1.227	1.644	156.690	156.370
		46	48	2.02	0.75	1.515	1.515	1.515	0.19	20.73	81.18	0.341	525	22.5	1.00%	0.225	0.430	1.987	157.830	157.610
		54	Pipe	1.63	0.75	1.223	2.738	2.738	0.14	20.88	80.82	0.613	525	21	1.50%	0.315	0.527	2.433	158.000	157.690
		48	62	0.68	0.75	0.510	8.505	8.505	1.68	22.56	76.89	1.811	1200	174	0.25%	0.435	1.949	1.724	156.240	155.800
		60	62	1.35	0.75	1.013	1.013	1.013	0.19	22.75	76.48	0.214	525	22.5	1.02%	0.230	0.434	2.006	157.280	157.050
		70	Pipe	2.58	0.75	1.935	2.948	2.948	0.14	22.89	76.17	0.622	525	24	2.00%	0.480	0.608	2.810	157.000	156.520
		62	73	0.68	0.75	0.510	11.963	11.963	1.25	24.14	73.57	2.438	1200	168	0.42%	0.706	2.527	2.234	155.780	155.070
		171	73	2.55	0.75	1.913	1.913	1.913	0.28	24.42	73.01	0.387	675	25	0.40%	0.100	0.532	1.486	156.680	155.580
		73	HDWL	2.02	0.75	1.515	15.390	15.390	1.23	25.65	70.68	3.013	1350	163	0.35%	0.571	3.158	2.206	154.990	154.420

Computed by: VK City of Mississauga Date: 9-Feb-10

Checked by: _____ City of Toronto
 n = 0.013
 k = 0.00277
 return interval = 10 years
 A = 1010
 B = 4.6
 C = 0.78

7644 - Storm Sewer Check - Rathburn Road BRT
 Existing Conditions - Spreadsheet Calculations

Table 2
Rathburn Road Proposed Conditions

Computed by: VK Date: 9-Feb-10
 Checked by: _____
 City of Mississauga
 n = 0.013
 k = 0.00277
 return interval = 10 years
 A = 1010
 B = 4.6
 C = 0.78

7644 - Storm Sewer Check - Rathburn Road BRT
 Proposed Conditions

Street	Line & Location	To	Incremental Area	C	AC	Accumulated AC	Concentration In Pipe	Time	Intensity	Q	Pipe Size	Length	Slope	Fall	Capacity	Full Flow Velocity	Inverts	
	From		hectares		hectares	hectares	min	min	min	cm/s	mm	m	%	m	cm/s	m/s	Upper	Lower
Rathburn Rd	24	25	2.40	0.75	1.800	1.800	0.18	16.30	94.32	0.470	525	23.5	1.15%	0.270	0.461	2.130	158.09	157.820
	25	30	0.34	0.75	0.255	2.055	1.68	17.98	88.79	0.505	675	130	0.30%	0.390	0.460	1.287	157.720	157.200
Rathburn Rd	29	Pipe	1.79	0.75	1.343	1.343	0.14	18.12	88.37	0.329	525	23	2.00%	0.460	0.608	2.810	157.830	157.370
	30	40	0.60	0.75	0.450	3.848	1.15	19.28	85.02	0.906	900	108	0.30%	0.324	0.992	1.559	157.070	156.750
Rathburn Rd	39	40	1.46	0.75	1.095	1.095	0.18	19.46	84.51	0.256	525	22	1.00%	0.220	0.430	1.987	158.220	158.000
@Station Galt	40	48	0.58	0.75	0.435	5.378	1.08	20.54	81.65	1.216	975	107	0.30%	0.321	1.227	1.644	156.690	156.370
Rathburn Rd	46	48	2.02	0.75	1.515	1.515	0.19	20.73	81.18	0.341	525	22.5	1.00%	0.225	0.430	1.987	157.830	157.610
	54	Pipe	1.63	0.75	1.223	2.738	0.14	20.88	80.82	0.613	525	21	1.50%	0.315	0.527	2.433	158.000	157.690
	48	62	0.68	0.75	0.510	8.625	1.68	22.56	76.89	1.837	1200	174	0.25%	0.435	1.949	1.724	156.240	155.800
Rathburn Rd	60	62	1.35	0.75	1.013	1.013	0.19	22.75	76.48	0.214	525	22.5	1.02%	0.230	0.434	2.006	157.280	157.060
	70	Pipe	2.58	0.75	1.935	2.948	0.14	22.89	76.17	0.622	525	24	2.00%	0.480	0.608	2.810	157.000	156.520
@Centre View	62	73	0.82	0.75	0.614	12.186	1.25	24.14	73.57	2.483	1200	168	0.42%	0.706	2.527	2.234	155.780	155.070
Rathburn Rd	171	73	2.55	0.75	1.913	1.913	0.28	24.42	73.01	0.387	675	25	0.40%	0.100	0.532	1.486	156.680	155.580
	73	HDWL	2.02	0.75	1.515	15.614	1.23	25.65	70.68	3.057	1350	163	0.35%	0.571	3.158	2.206	154.990	154.420

Table 3
Rathburn Road East of Centre View

Computed by: VK

Checked by: _____

7644 - Storm Sewer Check - Rathburn Road BRT
Proposed Conditions - Ramp

City of Mississauga

n = 0.013

k = 0.00277

return interval = 10 years

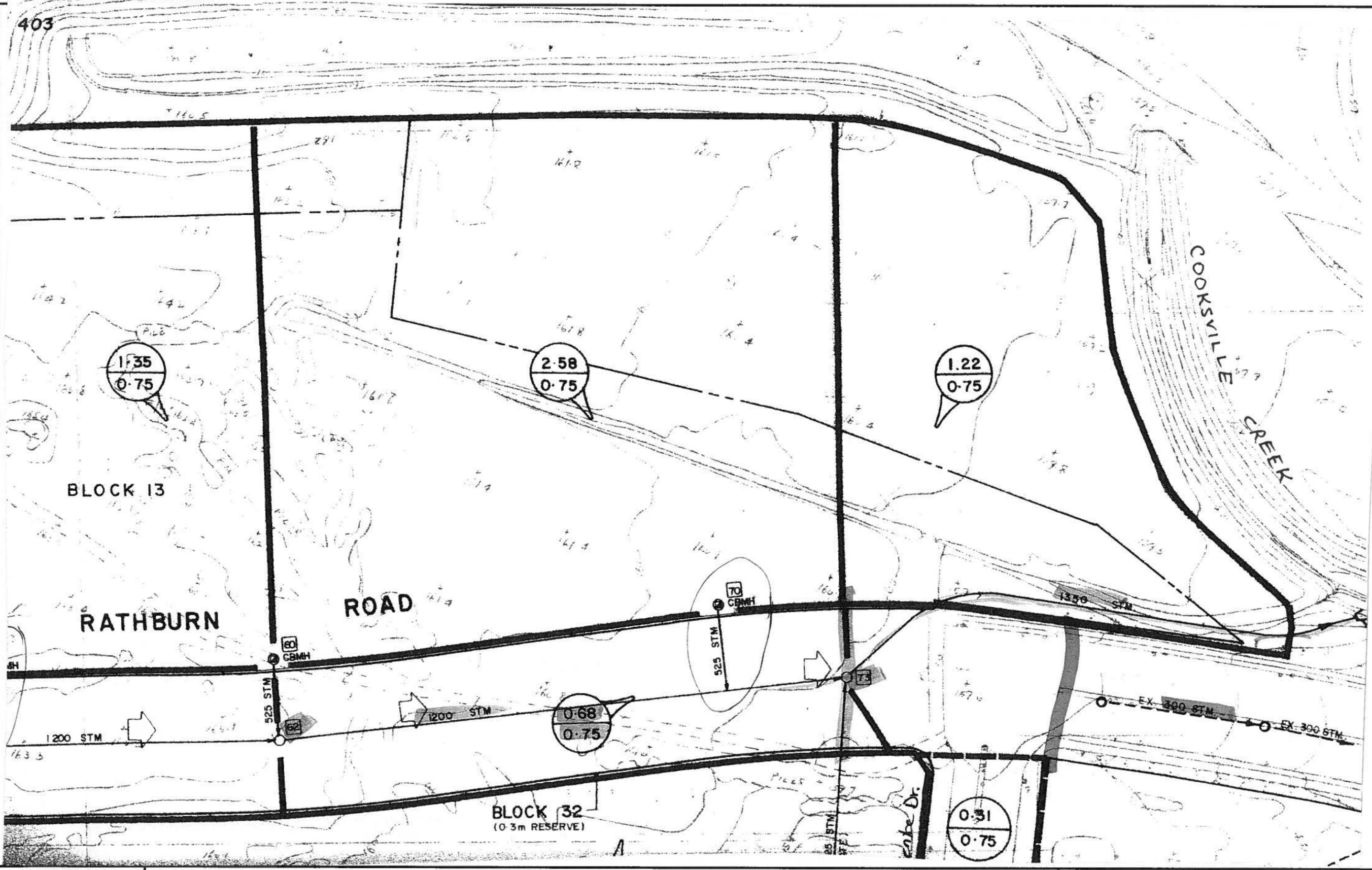
A = 1010

B = 4.6

C = 0.78

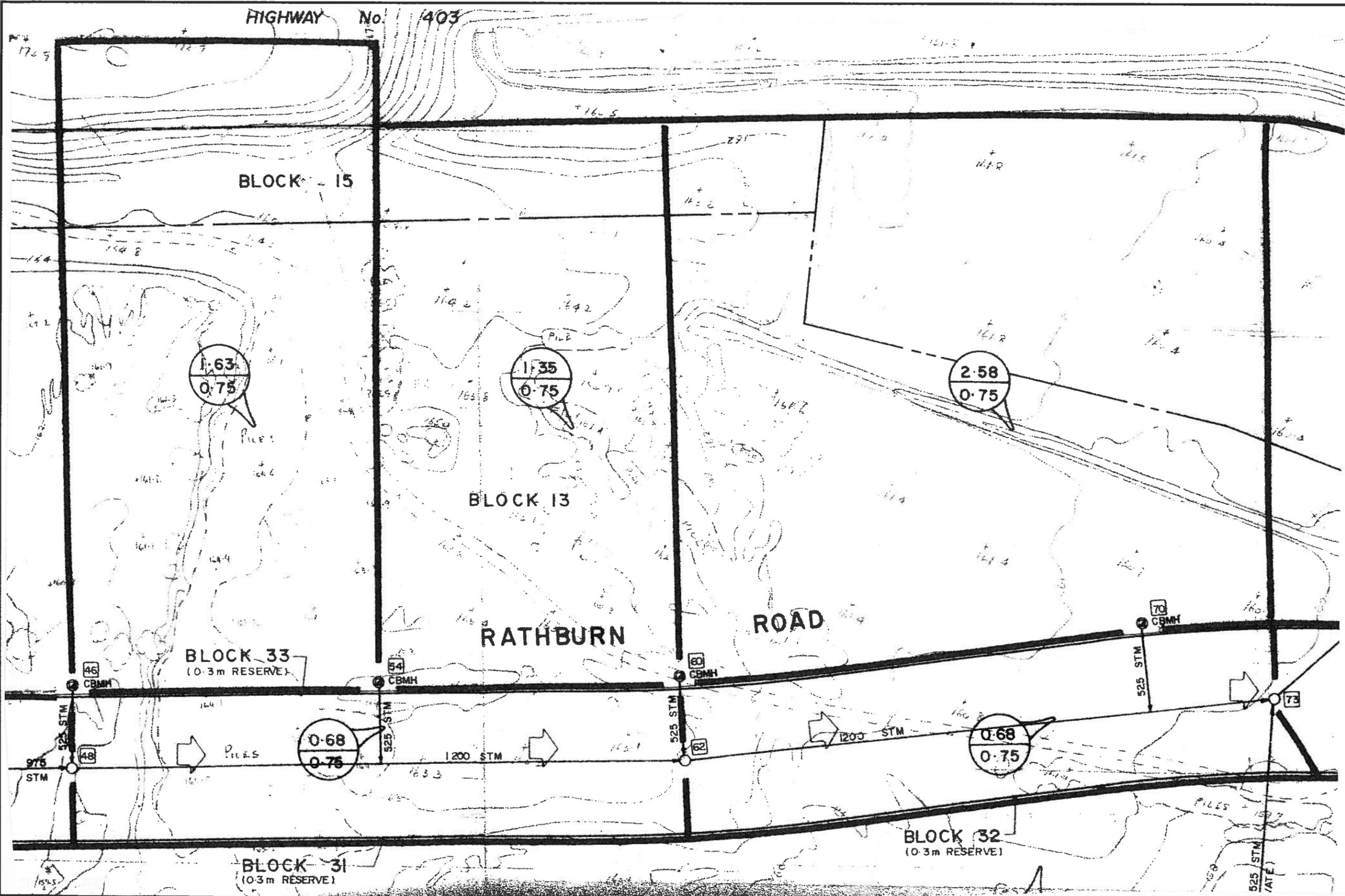
Date: 9-Feb-10

Street	Line & Location	From	To	Incremental Area	AC	AC	Accumulated AC	In Pipe	Concentration	Total	Intensity	Q	Pipe Size	Length	Slope	Fall	Capacity	Full Flow Velocity	Inverts	
				hectares	hectares	hectares	hectares	min	min	min	min	cm/s	mm	m	%	m	cm/s	m/s	Upper	Lower
Rathburn east of Centre View		0	1	0.52	0.75	0.393	0.393	1.00	15	16.00	95.39	0.104	300	160	3.80%	6.080	0.189	2.667	158.58	152.500
		1	2	0.11	0.75	0.079	0.472	0.35		16.35	94.14	0.123	450	41.5	1.20%	0.498	0.312	1.964	152.500	152.000



RATHBURN ROAD STORM SEWER SYSTEM

CITY CENTRE BRT - RATHBURN ROAD



RATHBURN ROAD STORM SEWER SYSTEM

CITY CENTRE BRT - RATHBURN ROAD

EXHIBIT

2b