HALIFAX
REGIONAL MUNICIPALITY

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M E M O R A N D U M

To: Chair and Members of Halifax Watershed Advisory Board

From: Jillian MacLellan, Planner

Date: June 20, 2012

Subject: **Case 17002: Application by W.M. Fares Group on behalf of Sobeys Land Holding Limited for a rezoning of 69 Tremont Drive and the parcels identified by PIDs 00292722 and 40832057 from R-1 (Single Family Dwelling), R-2 (Two-Family Dwelling) and I-2 (Radio Transmitter) to Schedule K, and for the further consideration of a Stage I Development Agreement to permit a comprehensive mixed use residential and commercial development on the said lands.**

Synopsis of Proposal:
W.M. Fares Group has submitted an application on behalf of Sobeys Land Holding Limited to rezone 69 Tremont Drive and PID 00292722 to the Schedule K Zone and for the further consideration of a Stage I Development Agreement to permit a comprehensive mixed use residential and commercial development on the said lands. The mixed use proposal includes:

- 48 single family dwellings;
- 98 townhouse dwelling units;
- 10 mixed use residential and commercial buildings containing a total of 829 multi-residential units;
- 2 commercial buildings along Dunbrack Street;
- Connection to the local street network at the Farnham Gate/Dunbrack intersection, as well as connections at Knightsridge Drive and Wentworth Drive; and,
- Parkland dedication focused on the existing Tremont Park.

Site Features:

- The subject site is comprised of two properties. Both properties are presently vacant.
- The properties have a combined lot area exceeding 55 acres.
- The proposed development is to be serviced by Municipal Water and Sewer.
- Surrounding uses are mainly residential. There is a commercial area located south of the development.
- The property slopes towards the north

- There are various wetlands located on the properties. The applicant has received approval from the Nova Scotia Department of Environment to alter the majority of the wetlands (Please see Attachments E and F) Two wet areas are to be retained.

Planning Process:
The site is located in the Halifax Planning Area. The properties are designated Residential Environments under the Municipal Planning Strategy for Halifax. 69 Tremont Drive is zoned I-2 (Radio Transmitter Zone) and PID 00292722 is zoned R-1 (Single Family Dwelling Zone) under the Land Use By-law for Halifax Mainland.

The applicant is proposing to rezone both properties to the Schedule K Zone. The schedule K Zone allows for the consideration of mixed use developments through a Stage I and Stage II Development Agreement. The Stage I Development Agreement provides an overall concept of the development. It lays out the types of uses that are to be permitted and where they are to be located. It also determines the layout of the road network and the phasing of the development. The Stage II Development Agreement provides a more detailed plan for a portion or phase of the development. It includes specific height and setback requirements for specific portions of the development. It further lays out the detailed design of specific buildings and landscaping requirements.

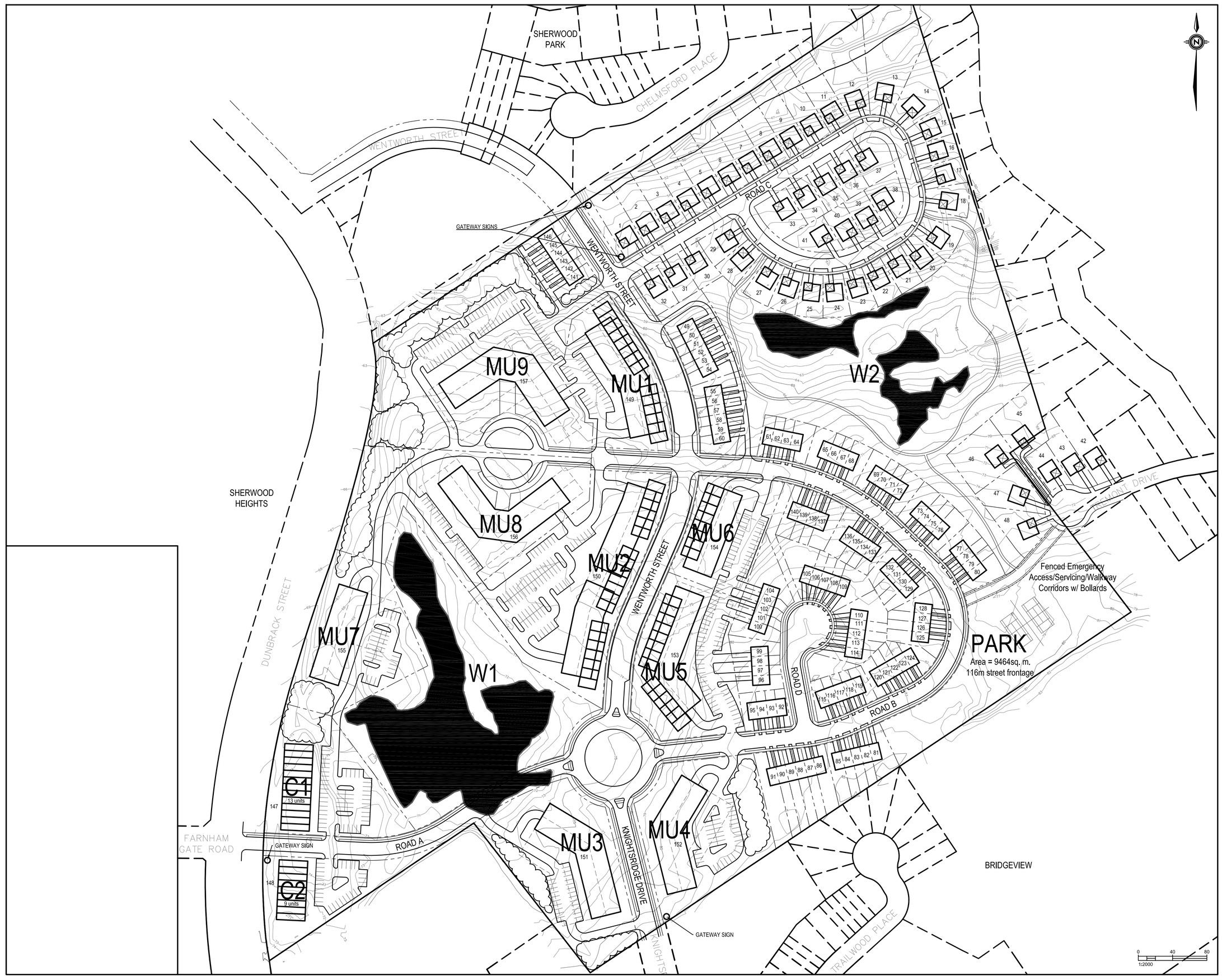
A public information meeting was held March 21, 2012. Staff are currently undertaking a detailed review of the application and are negotiating a development agreement with the applicant. Once complete staff will provide recommendation on the application to the Chebucto Community Council.

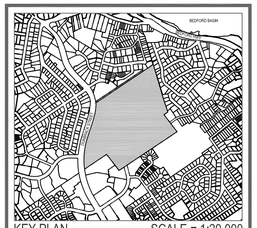
It is important to note that on February 28, 2012, Regional Council initiated a high-level review of potential servicing capacity issues which will in turn relate to this application. Please see the initiation report for more information. (http://www.halifax.ca/council/agendasc/documents/120228ca1021.pdf)

Input Sought from the Halifax Watershed Advisory Board:
Pursuant to the Board's terms of reference, the Board's input with respect to the potential impact of this development on the retained wetlands on the subject property and the associated watershed in relation to the proposed Stormwater Management. Technical information related to this watercourse and the associated watershed is provided through attachments to this memorandum. HWAB's recommendation and specific comments will be included with the staff report to Chebucto Community Council.

Attachments:

Attachment A:	Proposed Site Plan;
Attachment B:	Proposed Site/Stormwater Management Plan;
Attachment C:	Proposed Servicing Schematic;
Attachment D:	Downstream Sanitary Review
Attachment E:	Wetland Alteration Proposal – Rockingham South
Attachment F:	January 28, 2011 – Correspondence from Nova Scotia Department of Environment and Labour Concerning Approval of Wetland Alteration
Attachment G:	Air Photo





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1 STARR LANE, DARTMOUTH, NOVA SCOTIA
T: (902)461-2525 W: WWW.EKISTICS.NET
Landscape Architecture
Engineering
Environmental Planning
Visual Impact Assessment
Golf Architecture

NO.	REVISION	DATE

CLIENT

WM FARES GROUP

PROJECT

ROCKINGHAM SOUTH
OWNED BY SOBEYS LAND HOLDINGS LIMITED
2009 DEED: # 94167484

BEDFORD, NOVA SCOTIA

DRAWING

MASTERPLAN

SCALE	DATE
1:2000	2012/05/17

DRAWN BY	CHECKED	REVIEWED
DH	RTL	

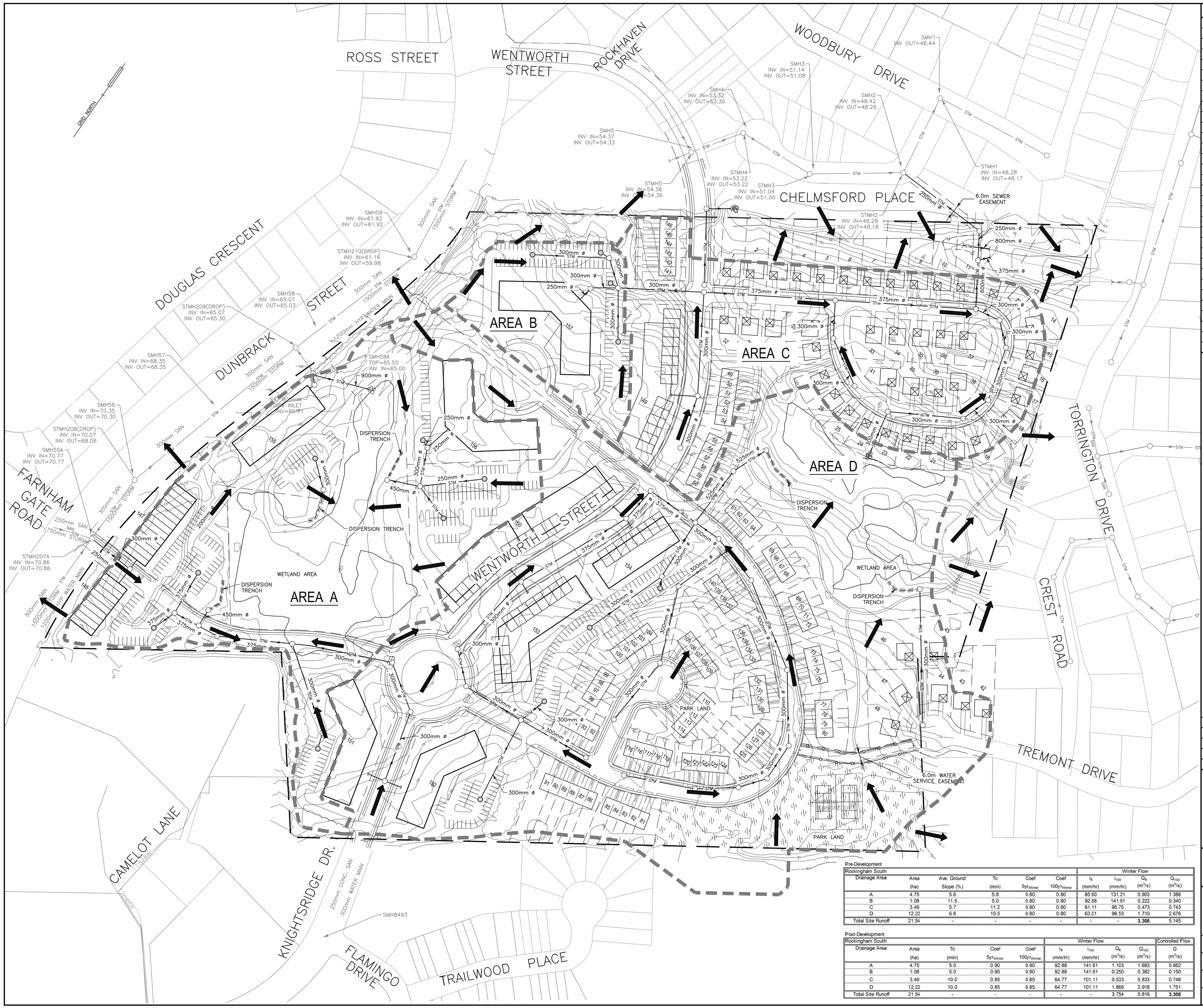
APPROVED	DEPT. APPROVAL
CS	

SEAL

NOT FOR CONSTRUCTION

DEPT. PROJECT NO.	DRAWING NO.
CONSULTANT'S NO.	L100
TENDER NO.	

May 17, 2012



Pre-Development

Rockingham South						Winter Flow			
Drainage Area	Area	Ave. Ground	Tc	Coef	Coef	I_5	I_{100}	Q_5	Q_{100}
	(ha)	Slope (%)	(min)	$5yr_{Winter}$	$100yr_{Winter}$	(mm/hr)	(mm/hr)	(m^3/s)	(m^3/s)
A	4.75	5.6	5.8	0.80	0.80	85.60	131.21	0.903	1.386
B	1.08	11.5	5.0	0.80	0.80	92.88	141.61	0.222	0.340
C	3.49	5.7	11.2	0.80	0.80	61.11	95.75	0.473	0.743
D	12.22	6.6	10.5	0.80	0.80	63.01	98.53	1.710	2.676
Total Site Runoff	21.54	-	-	-	-	-	-	**3.308**	5.145

Post-Development

Rockingham South					Winter Flow				Controlled Flow
Drainage Area	Area	Tc	Coef	Coef	I_5	I_{100}	Q_5	Q_{100}	Q
	(ha)	(min)	$5yr_{Winter}$	$100yr_{Winter}$	(mm/hr)	(mm/hr)	(m^3/s)	(m^3/s)	(m^3/s)
A	4.75	5.0	0.90	0.90	92.88	141.61	1.103	1.683	0.662
B	1.08	5.0	0.90	0.90	92.88	141.61	0.250	0.382	0.150
C	3.49	10.0	0.85	0.85	64.77	101.11	0.533	0.833	0.746
D	12.22	10.0	0.85	0.85	64.77	101.11	1.868	2.918	1.751
Total Site Runoff	21.54	-	-	-	-	-	3.754	5.816	**3.308**

LEGEND

EXISTING		PROPOSED
25.0	CONTOUR LINE	25.0
⊘/⊘BF	CURB STOP/GATE/BUTTERFLY VALVE	⊘/⊘BF
	FIRE HYDRANT	
	THRUST BLOCK	
	SIAMESE SPRINKLER CONNECTION	
	CATCH BASIN/PIT	
	CULVERT	
RD	ROCK LINING/DAM	RD
RW	ROCK WALL/RETAINING WALL	RW
	POWER POLE/LIGHT POLE	
	TREE	
	STREET SIGN	
×131.82	ELEVATION/GRADE	125.00 ×
S	DRAINAGE/SWALE FLOW DIRECTION	S
W	WATER MAIN/SERVICE	W
SAN	SANITARY MANHOLE & PIPE	SAN
STM	STORM MANHOLE & PIPE	STM
FM	FORCE MAIN	FM
RL	RIDGE LINE	RL
FL	100YR. FLOOD LIMIT	FL
SF	SILT FENCE	SF
C	UNDERGROUND CONDUIT	C
	OVERHEAD WIRES	
	PROPERTY LINE/BOUNDARY	
	FENCE	
	BUILDING	
	TOP OF SLOPE	
	TOE OF SLOPE	
	WETLAND AREA	
	DRAINAGE AREAS	
	STORMWATER FLOW ARROW	

NOTES:

1. ALL ELEVATIONS ARE IN METRES. CONTOURS ARE IN 1m INTERVALS.
2. EXISTING SERVICE INFORMATION PROVIDED BY HRM AND HW.
3. POST-DEVELOPMENT FLOW IS CONTROLLED TO 5YR PRE-DEVELOPMENT FLOW AS PER HRM MUNICIPAL DESIGN GUIDELINES (2009).

No.	Date	Revision Description	Appr'd
3	MAY.18/12	REVISED DEVELOPMENT LAYOUT & SERVICING	
2	APR.25/12	REVISED STORM AS PER HW COMMENTS	
1	MAY.06/11	REVISED DEVELOPMENT LAYOUT	
	FEB.18/11	ISSUED FOR REVIEW	

REGISTERED PROFESSIONAL ENGINEER — DATE: MAY18, 2012 — R. (A.) LANDRY 6647 — PROVINCE OF NOVA SCOTIA

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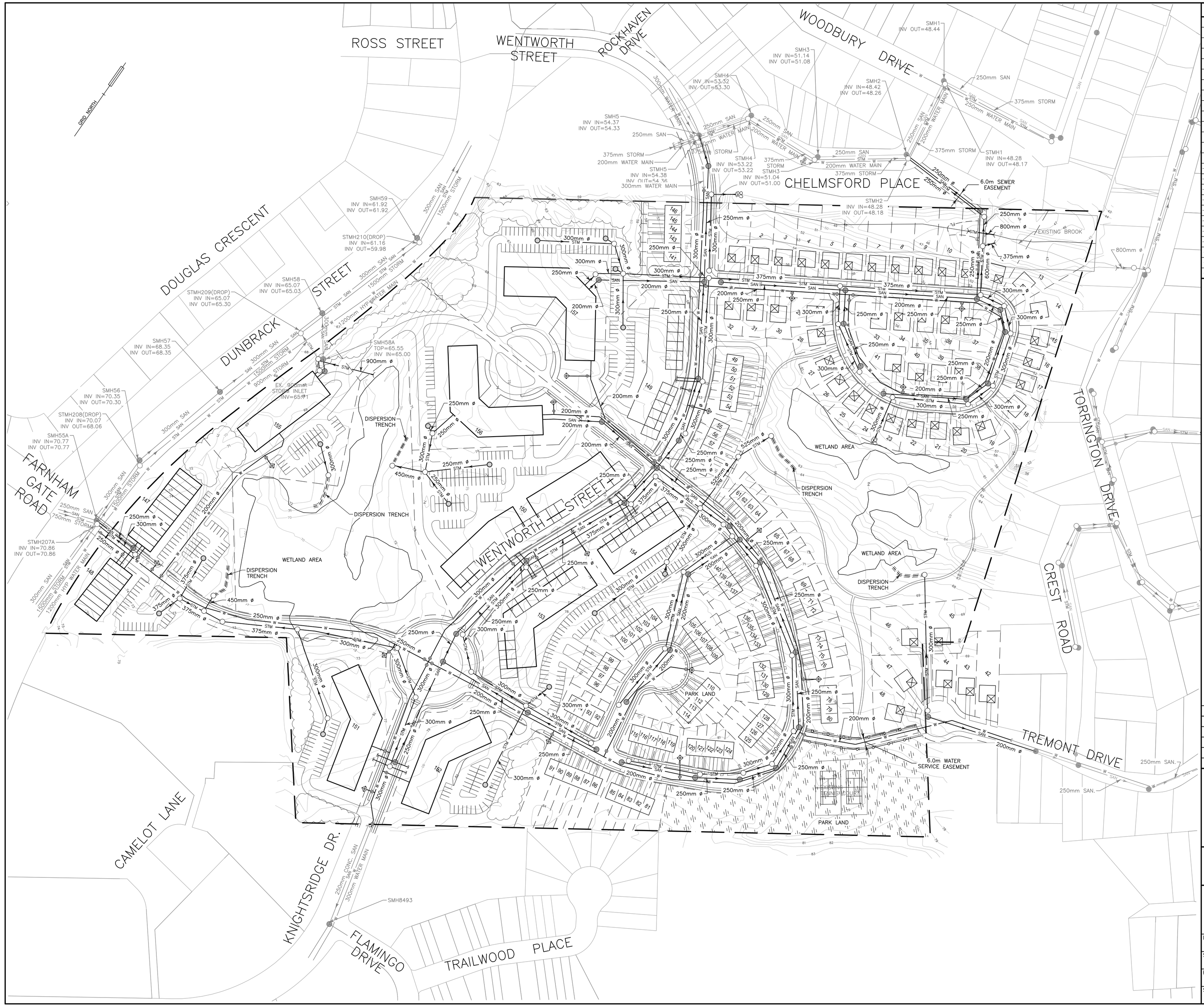
ROCKINGHAM SOUTH

HALIFAX NOVA SCOTIA

STORMWATER MANAGEMENT SCHEMATIC

Date: MAY 18, 2012	Drawn: E.E.H.	Project No.: FILE No.1-4-160 (28251)
Scale: 1:1250	Engineer: R. LANDRY	Plan No.: 16-907-3
Reference	Approved	HRM No.: C-2
Surveyed: TERRAIN GROUP	Sheet	



LEGEND

EXISTING		PROPOSED
⊗ / ⊗ BF	CURB STOP/GATE/BUTTERFLY VALVE	⊗ / ⊗ BF
	FIRE HYDRANT	
	THRUST BLOCK	
	SIAMESE SPRINKLER CONNECTION	
	CATCH BASIN/PIT	
	CULVERT	
RD	ROCK LINING/DAM	RD
	ROCK WALL	
	POWER POLE/LIGHT POLE	
	TREE	
	STREET SIGN	
× 131.82	ELEVATION/GRADE	125.00 / 125.00
S	DRAINAGE/SWALE FLOW DIRECTION	S
W	WATER MAIN/SERVICE	W
SAN	SANITARY MANHOLE & PIPE	SAN
STM	STORM MANHOLE & PIPE	STM
FM	FORCE MAIN	FM
RL	RIDGE LINE	RL
FL	100YR. FLOOD LIMIT	FL
SF	SILT FENCE	SF
C	UNDERGROUND CONDUIT	C
	OVERHEAD WIRES	
	PROPERTY LINE/BOUNDARY	
×	CHAINLINK FENCE	×

NOTES:

1. ALL ELEVATIONS ARE IN METERS. CONTOURS ARE 1m INTERVALS.
2. EXISTING SERVICE INFORMATION PROVIDED BY HRM AND HW.
3. ALL WATER, SANITARY & STORM SEWER SHALL BE DESIGNED IN ACCORDANCE WITH THE LATEST EDITION OF THE HALIFAX WATER DESIGN AND CONSTRUCTION SPECIFICATIONS.
4. SERVICE LATERALS NOT SHOWN ON RESIDENTIAL PROPERTIES FOR CLARITY.

No.	Date	Revision Description	Appr'd
4	MAY.18/12	REVISED DEVELOPMENT LAYOUT & SERVICING	
3	APR.20/12	REVISED SERVICING	
2	MAY.06/11	REVISED DEVELOPMENT LAYOUT	
1	FEB.18/11	REVISED DEVELOPMENT LAYOUT	
	JUL.20/11	ISSUED FOR REVIEW	

REGISTERED PROFESSIONAL ENGINEER — DATE: MAY18/2012 — R. (A) LANDRY — 6647 — PROVINCE OF NOVA SCOTIA

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HALIFAX NOVA SCOTIA

SERVICING SCHEMATIC

Date: MAY 18, 2012	Drawn: M.MIARI	Project No.: FILE No.1-4-160 (28251)
Scale: 1:1250	Engineer: R. LANDRY	Plan No.: 16-849-4
Reference	Approved	HRM No.: C-1
Surveyed: TERRAIN GROUP	Sheet	

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May 17, 2012

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Re: Rockingham South Development – Downstream Sanitary Sewer Review

Further to the development agreement process to develop the above lands we understand that HRM has requested a sewer capacity review to confirm that the existing sanitary sewer infrastructure in Rockingham/Clayton Park has sufficient capacity to support the proposed development. SDMM has been engaged by WMFares Group to review the existing downstream sanitary sewer capacity and report our findings.

The Rockingham South development property consists of approximately 25 hectares (ha) of land. The property is situated East of Dunbrack Street and Northwest of Tremont Plateau Park in Clayton Park, Halifax County. Development of the property includes the extension of both Wentworth Drive and Knightsridge Drive as well as an internal street system.

In developing our sanitary sewerage flows generated from the proposed development and to estimate the existing downstream sanitary flows, SDMM utilized the HRM Redbook section 4.2.1.3 to determine the existing sewershed flows. In addition SDMM obtained the following information;

- The latest HRM GIS sewer record data for the Rockingham/Clayton Park area.
- HRM sewer record drawings for Chelmsford Place, Woodbury Drive, Kearney Lake Road, Tremont Drive, Cascade Drive and Torrington Drive.
- 1:10,000 Provincial contour mapping of the Clayton Park area.
- Current HRM Land Use bylaw and zoning maps for the Rockingham/Clayton Park area.
- Current Service Nova Scotia Property ownership and mapping data.
- Mainland North Servicing Strategy Final Report (1982).

To begin our review, SDMM used a population density of 20 persons per acre (ppa) for the Rockingham South area. It is understood from HRM that the original sewer system design

allowance for Rockingham/Clayton Park was 20ppa. Based on this density and the 25ha development area, the population was calculated to be 1234 persons. In the remainder of this analysis, we review the capacity of the existing Rockingham/Clayton Park sanitary sewers and their ability to accommodate the zoned density of 20ppa (49.5ppha), as well as the 38.12ppa (94.36ppha) proposed by the Developer for Rockingham South. Using the a population of 1234 (based on 20ppa), the property area of 25ha, and Harman peaking factor we calculated the peak sewerage flow generated from Rockingham South using the HRM Redbook section 4.2.1.3 formula as follows;

$$Q = 2.5 \times [(a \times M) + b]$$
$$a = 0.33 m^3/d \times 1234$$
$$b = 11 m^3/d \times 25 ha$$
$$M = 1 + (14/(4 + 1.234^{(0.5)}))$$
$$Q = 52 \text{ L/s}$$

The peak sewerage flow generated from Rockingham South using the same method presented above, but with a population density of 38.12ppa (94.36ppha), was estimated to be 87 L/s.

To review the effects of the proposed development on the existing sanitary sewer infrastructure, we calculated design flows for 3 potential downstream sewer routes, each with three development scenarios including; the existing Rockingham/Clayton park development, the addition of 20ppa (49.5ppha) for Rockingham South, and the addition of 38.12ppa (94.36ppha) for Rockingham South. The sewer route options included;

1) Chelmsford Place to Kearney Lake Rd.
2) Tremont Drive to Bedford Highway.
3) Cascade/Torrington Drive to Bedford Highway.

Below is a summary of sewer reaches which exceed the existing pipe capacity under each option and scenario using a peak sanitary sewerage flow.

<u>Route Option 1 – Chelmsford Place to Kearney Lake Rd.</u>

.1 After modeling the existing sanitary sewer system, prior to adding Rockingham South development (see Chelmsford Option 1.1: Existing Conditions), we observed 2 sewer reaches which exceeded pipe capacities;

- A 53m section of 750mm at 0.49% on Kearney Lake Road.
- A 31m section of 750mm at 0.54% on Kearney Lake Road.

.2 The peak sanitary sewerage flow of 52 L/s was applied to existing infrastructure (see Chelmsford Option 1.2: Addition of 20ppa (49.5ppha) for Rockingham South). After reviewing the effects, we observed 6 sewer reaches which exceeded pipe capacities;

- A 66m section of 250mm at 1.30% on Kearney Lake Road.
- A 51m section of 250mm at 1.31% on Kearney Lake Road.
- An 8m section of 300mm at 0.81% on Kearney Lake Road.
- A 62m section of 750mm at 0.62% on Kearney Lake Road.
- A 53m section of 750mm at 0.49% on Kearney Lake Road.
- A 31m section of 750mm at 0.54% on Kearney Lake Road.

.3 Finally, the peak sanitary sewerage flow of 87 L/s was applied to existing infrastructure (see Chelmsford Option 1.3: Addition of 38.12ppa (94.36ppha) for Rockingham South). After reviewing the effects, we observed 8 sewer reaches which exceeded pipe capacities;

- A 42m section of 250mm at 3.70% on Kearney Lake Road.
- A 66m section of 250mm at 1.30% on Kearney Lake Road.
- A 51m section of 250mm at 1.31% on Kearney Lake Road.
- A 39m section of 300mm at 0.99% on Kearney Lake Road.
- An 8m section of 300mm at 0.81% on Kearney Lake Road.
- A 62m section of 750mm at 0.62% on Kearney Lake Road.
- A 53m section of 750mm at 0.49% on Kearney Lake Road.
- A 31m section of 750mm at 0.54% on Kearney Lake Road.

In this servicing option all capacity issues were observed to be in Kearney Lake Road prior to connection with Bedford Highway. By comparison, reviewing 20ppa (39.5ppha) we observed all the same capacity issues observed for the 38.12ppa (94.36ppha) except for the 42m section of 250mm at 3.70% and 39m section of 300mm at 0.99% on Kearney Lake Road. Based on our analysis, it appears that sections of the existing downstream sanitary sewer network must be upgraded to provide additional capacity for the existing, 20ppa (49.5ppha) or the 38.12ppa (94.36ppha). In order for the 38.12ppa (94.36ppha) to proceed approximately 352m of downstream sanitary sewer would need to be upgraded. Costs would be estimated at $285,000 capital and minimal operating/maintenance costs. Comparably the costs for the increase in density above 20ppa (49.5ppha) would be 81m of sanitary ($65,000).

Route Option 2 – Tremont Drive to Bedford Highway.

.1 Reviewing the existing conditions for Option 2, our model revealed 0 sewer reaches exceeding pipe capacities (see Tremont Option 2.1: Existing Conditions).

.2 Reviewing the addition of 20ppa (49.5ppha) for Option 2, our model revealed 0 sewer reaches exceeding pipe capacities (see Tremont Option 2.2: Addition of 20ppa (49.5ppha) for Rockingham South).

.3 Reviewing the 38.12ppa (94.36ppha) for Option 2, our model revealed 0 sewer reaches exceeding pipe capacities (see Tremont Option 2.3: Addition of 38.12ppa (94.36ppha) for Rockingham South).

Based on the model, the flows generated by Rockingham South at 38.12ppa (94.36ppha) can be accommodated by the existing sewer system in Option 2, however the top of Tremont Drive is located at a higher elevation than the majority of the Rockingham South and therefore would require that most of the Rockingham South sanitary system would need be pumped to Tremont. Providing a pumping station to collect sanitary sewer from the proposed development would require an approximate $500,000 capital investment along with annual operating/maintenance costs.

Route Option 3 – Cascade/Torrington Drive to Bedford Highway.

.1 After modeling the existing sanitary sewer system, prior to development we observed 0 sewer reaches which exceeded pipe capacities (see Cascade/Torrington Option 3.1: Existing Conditions).
.2 Next, the peak sewerage flow of 52 L/s was applied to existing infrastructure (see Cascade/Torrington Option 3.2: Addition of 20ppa (49.5ppha) for Rockingham South). After reviewing the effects, we observed 0 sewer reaches which exceeded pipe capacities.
.3 Finally, the peak sewerage flow of 87 L/s was applied to existing infrastructure (see Cascade/Torrington Option 3.3: Addition of 38.12ppa (94.36ppha) for Rockingham South). After reviewing the effects, we observed 1 sewer reach which exceeded pipe capacity;

- A 34m section of 250mm at 1.82% on Cascade Drive.

Based on the model, the flows generated by Rockingham South at 20ppa (49.5ppha) can be accommodated by the existing sewer system. An increase to 38.12ppa (94.36ppha) shows the required upgrade of a 34m section of 250mm at 1.82% on Cascade Drive for Option 3. Option 3 may require some of the development be pumped, but not to the extent of Option 2. It will also require obtaining an easement or other land agreement to cross land areas which are not part of the development. Providing a smaller pump station than Option 2 and acquiring a residential property on Torrington Dr. would amount to an approximate $500,000 capital cost (assuming the property could be resold after service easements were provided) plus annual operating/maintenance costs.

Although Option 1 which offers the only gravity sewer servicing option appears to have the most sewer upgrades required, the capital cost would be less than Options 2 and 3 and would not have annual pumping station operating and maintenance costs. As we understand that direct access to Chelmsford Place pipe systems is available we recommend proceeding with Option 1. Based on the proposed increase in density from 20ppa to 38.12ppa the sewer upgrade costs would be approximately $65,000. The remaining upgrades to accommodate 20ppa would be approximately $220,000.

For any additional discussion regarding the above please contact the undersigned.

Regards
Servant, Dunbrack, McKenzie & MacDonald Ltd.

Ray Landry, MASc., P.Eng.
Project Engineer

Chelmsford Option 1.1: Existing Conditions: Prior to adding development

Pipe Capacity

Design Flow Calculation

Comparison

Street	Pipe ID	START MH	END MH	TYPE	DIA (mm)	Inv Out (m)	Inv In (m)	Length (m)	Slope (%)	Qc (m^3/s)	Tributary Area (ha)	Tributary Area (acres)	Population Density (persons/acre)	Total Persons	a (m^3/day)	M	b (m^3/day)	a x M (m^3/day)	(a x M)+b (m^3/day)	Q, Flow (m^3/sec)	Qc (m^3/s)	Q, Flow (m^3/sec)	Check
Clayton Park Area											346.474	856.156	20	17123	5650.631	2.720	3811.215	15371.538	19182.753	0.555		0.555	
Clayton Park Area											97.509	240.949	30	7228	2385.395	3.093	1072.595	7378.312	8450.907	0.245		0.245	
Rockingham South																							
Chelmsford Place		MHS4	MHS3	CONC	250	53.3	51.14	56.65	3.81	0.116	1.500	3.706	20	74	24.457	4.277	16.496	104.602	121.097	0.004	0.116	0.004	OK
Chelmsford Place		MHS3	MHS2	CONC	250	51.08	48.42	65.4	4.06	0.120	1.656	4.093	20	82	27.011	4.266	18.218	115.239	133.457	0.004	0.120	0.004	OK
Chelmsford Place		MHS2	MHS1	CONC	250	48.26	46.44	58.5	3.28	0.108	2.211	5.464	20	109	36.062	4.233	24.323	152.646	176.969	0.005	0.108	0.005	OK
Woodbury Drive	119572	MH7587	MH7589	CONC	250	45.616	40.959	91.118	5.11	0.134	4.448	10.992	20	220	72.545	4.133	48.930	299.815	348.745	0.010	0.134	0.010	OK
Woodbury Drive	119368	MH7589	MH7592	CONC	250	40.615	40.051	8.338	6.76	0.155	4.625	11.428	20	229	75.426	4.126	50.873	311.232	362.105	0.010	0.155	0.010	OK
Woodbury Drive	119575	MH7592	MH7594	AC	250	37.250	32.193	80.246	6.30	0.149	5.344	13.205	20	264	87.152	4.102	58.782	357.456	416.237	0.012	0.149	0.012	OK
Woodbury Drive	119577	MH7594	MH7602	AC	250	31.919	23.863	68.999	11.68	0.203	13.775	34.039	20	681	224.658	3.901	151.526	876.501	1028.027	0.030	0.203	0.030	OK
Woodbury Drive	119623	MH7602	MH7604	AC	250	22.945	20.275	31.859	8.38	0.172	16.036	39.625	20	793	261.527	3.863	176.394	1010.241	1186.635	0.034	0.172	0.034	OK
Woodbury Drive	123813	MH7604	MH7614	AC	250	17.596	12.332	57.991	9.08	0.179	16.106	39.799	20	796	262.670	3.862	177.165	1014.358	1191.523	0.034	0.179	0.034	OK
Woodbury Drive	117949	MH7614	MH7616	CONC	250	12.107	11.643	8.319	5.58	0.140	16.437	40.616	20	812	268.064	3.856	180.803	1033.760	1214.562	0.035	0.140	0.035	OK
Kearney Lake Road	115903	MH7616	MH7620	CONC	250	9.013	7.477	41.517	3.70	0.114	16.801	41.517	20	830	274.010	3.851	184.813	1055.106	1239.919	0.036	0.114	0.036	OK
Kearney Lake Road	115905	MH7620	MH7622	CONC	250	7.468	6.605	66.284	1.30	0.068	17.508	43.262	20	865	285.529	3.840	192.583	1096.332	1288.915	0.037	0.068	0.037	OK
Kearney Lake Road	115907	MH7622	MH7630	CONC	250	6.511	5.846	50.836	1.31	0.068	18.084	44.688	20	894	294.938	3.831	198.928	1129.884	1328.812	0.038	0.068	0.038	OK
Kearney Lake Road	115891	MH7630	MH7624	CONC	300	5.749	5.364	39.002	0.99	0.096	18.324	45.278	20	906	298.837	3.827	201.559	1143.758	1345.316	0.039	0.096	0.039	OK
Kearney Lake Road	117698	MH7624	MH7625	CONC	300	4.639	4.572	8.321	0.81	0.087	18.455	45.603	20	912	300.977	3.825	203.002	1151.363	1354.365	0.039	0.087	0.039	OK
Kearney Lake Road	115894	MH7625	MH9621	CONC	750	3.810	3.429	61.934	0.62	0.873											0.873	0.839	OK
Kearney Lake Road	117458	MH9621	MH9623	CONC	750	3.399	3.139	52.887	0.49	0.781											0.781	0.839	not OK
Kearney Lake Road	117428	MH9623	MH9624	CONC	750	3.124	2.957	31.006	0.54	0.817											0.817	0.839	not OK

Area No.	Drainage Area (m^2)	Drainage Area (ha)
1	2391	0.239
2	5769	0.577
3	7063	0.706
4	3646	0.365
5	3307	0.331
6	20813	2.081
7	77087	7.709
8	14723	1.472
9	7647	0.765
10	1766	0.177
11	7190	0.719
12	4724	0.472
13	2502	0.250
14	1794	0.179
15	701	0.070
16	5550	0.555
17	5814	0.581
18	14996	1.500
19	1566	0.157
20	239648	23.965
21	3464741	346.474
22	1312	0.1312
42	975086	97.5086

Chelmsford Option 1.2: Addition of 20 persons/acre for Rockingham South

Pipe Capacity

Street	Pipe ID	START MH	END MH	TYPE	DIA (mm)	Inv Out (m)	Inv In (m)	Length (m)	Slope (%)	Qc (m^3/s)
Clayton Park Area										
Clayton Park Area										
Rockingham South										
Chelmsford Place		MHS4	MHS3	CONC	250	53.3	51.14	56.65	3.81	0.116
Chelmsford Place		MHS3	MHS2	CONC	250	51.08	48.42	65.4	4.06	0.120
Chelmsford Place		MHS2	MHS1	CONC	250	48.26	46.44	58.5	3.28	0.108
Woodbury Drive	119572	MH7587	MH7589	CONC	250	45.616	40.959	91.118	5.11	0.134
Woodbury Drive	119368	MH7589	MH7592	CONC	250	40.615	40.051	8.338	6.76	0.155
Woodbury Drive	119575	MH7592	MH7594	AC	250	37.250	32.193	80.246	6.30	0.149
Woodbury Drive	119577	MH7594	MH7602	AC	250	31.919	23.863	68.999	11.68	0.203
Woodbury Drive	119623	MH7602	MH7604	AC	250	22.945	20.275	31.859	8.38	0.172
Woodbury Drive	123813	MH7604	MH7614	AC	250	17.596	12.332	57.991	9.08	0.179
Woodbury Drive	117949	MH7614	MH7616	CONC	250	12.107	11.643	8.319	5.58	0.140
Kearney Lake Road	115903	MH7616	MH7620	CONC	250	9.013	7.477	41.517	3.70	0.114
Kearney Lake Road	115905	MH7620	MH7622	CONC	250	7.468	6.605	66.284	1.30	0.068
Kearney Lake Road	115907	MH7622	MH7630	CONC	250	6.511	5.846	50.836	1.31	0.068
Kearney Lake Road	115891	MH7630	MH7624	CONC	300	5.749	5.364	39.002	0.99	0.096
Kearney Lake Road	117698	MH7624	MH7625	CONC	300	4.639	3.840	7.606	0.81	0.087
Kearney Lake Road	115894	MH7625	MH9621	CONC	750	3.810	3.429	61.934	0.62	0.873
Kearney Lake Road	117458	MH9621	MH9623	CONC	750	3.399	3.139	52.887	0.49	0.781
Kearney Lake Road	117428	MH9623	MH9624	CONC	750	3.124	2.957	31.006	0.54	0.817

Design Flow Calculation

Tributary Area (ha)	Tributary Area (acres)	Population Density (persons/acre)	Total Persons	a (m^3/day)	M	b (m^3/day)	a x M (m^3/day)	(a x M)+b (m^3/day)	Q, Flow (m^3/sec)
346.474	856.156	20	17123	5650.631	2.720	3811.215	15371.538	19182.753	0.555
97.509	240.949	30	7228	2385.395	3.093	1072.595	7378.312	8450.907	0.245
24.973	61.710	20	1234	407.286	3.739	274.705	1522.932	1797.636	0.052
1.500	3.706	20	74	24.457	4.277	16.496	104.602	121.097	0.056
1.656	4.093	20	82	27.011	4.266	18.218	115.239	133.457	0.056
2.211	5.464	20	109	36.062	4.233	24.323	152.646	176.969	0.057
4.448	10.992	20	220	72.545	4.133	48.930	299.815	348.745	0.062
4.625	11.428	20	229	75.426	4.126	50.873	311.232	362.105	0.062
5.344	13.205	20	264	87.152	4.102	58.782	357.456	416.237	0.064
13.775	34.039	20	681	224.658	3.901	151.526	876.501	1028.027	0.082
16.036	39.625	20	793	261.527	3.863	176.394	1010.241	1186.635	0.086
16.106	39.799	20	796	262.670	3.862	177.165	1014.358	1191.523	0.086
16.437	40.616	20	812	268.064	3.856	180.803	1033.760	1214.562	0.087
16.801	41.517	20	830	274.010	3.851	184.813	1055.106	1239.919	0.088
17.508	43.262	20	865	285.529	3.840	192.583	1096.332	1288.915	0.089
18.084	44.688	20	894	294.938	3.831	198.928	1129.884	1328.812	0.090
18.324	45.278	20	906	298.837	3.827	201.559	1143.758	1345.316	0.091
18.455	45.603	20	912	300.977	3.825	203.002	1151.363	1354.365	0.091

Comparison

Qc (m^3/s)	Q, Flow (m^3/sec)	Check
	0.555	
	0.245	
	0.052	
0.116	0.056	OK
0.120	0.056	OK
0.108	0.057	OK
0.134	0.062	OK
0.155	0.062	OK
0.149	0.064	OK
0.203	0.082	OK
0.172	0.086	OK
0.179	0.086	OK
0.140	0.087	OK
0.114	0.088	OK
0.068	0.089	not OK
0.068	0.090	not OK
0.096	0.091	OK
0.087	0.091	not OK
0.873	0.891	not OK
0.781	0.891	not OK
0.817	0.891	not OK

Area No.	Drainage Area (m^2)	Drainage Area (ha)
1	2391	0.239
2	5769	0.577
3	7063	0.706
4	3646	0.365
5	3307	0.331
6	20813	2.081
7	77087	7.709
8	14723	1.472
9	7647	0.765
10	1766	0.177
11	7190	0.719
12	4724	0.472
13	2502	0.250
14	1794	0.179
15	701	0.070
16	5550	0.555
17	5814	0.581
18	14996	1.500
19	1566	0.157
20	239648	23.965
21	3464741	346.474
22	1312	0.1312
42	975086	97.5086

Chelmsford Option 1.3: Addition of 38.12 persons/acre for Rockingham South

Pipe Capacity

Design Flow Calculation

Comparison

Street	Pipe ID	START MH	END MH	TYPE	DIA (mm	Inv Out (m)	Inv In (m)	Length (m)	Slope (%)	Qc (m^3/s)	Tributary Area (ha)	Tributary Area (acres)	Population Density (persons/acre)	Total Persons	a (m^3/day)	M	b (m^3/day)	a x M (m^3/day)	(a x M)+b (m^3/day)	Q. Flow (m^3/sec)	Qc (m^3/s)	Q. Flow (m^3/sec)	Check
Clayton Park Area											346.474	856.156	20	17123	5650.631	2.720	3811.215	15371.538	19182.753	0.555		0.555	
Clayton Park Area											97.509	240.949	30	7228	2385.395	3.093	1072.595	7378.312	8450.907	0.245		0.245	
Rockingham South											24.973	61.710	38.12	2352	776.287	3.530	274.705	2740.240	3014.944	0.087		0.087	
Chelmsford Place		MHS4	MHS3	CONC	250	53.3	51.14	56.65	3.81	0.116	1.500	3.706	20	74	24.457	4.277	16.496	104.602	121.097	0.091	0.116	0.091	OK
Chelmsford Place		MHS3	MHS2	CONC	250	51.08	48.42	65.4	4.06	0.120	1.656	4.093	20	82	27.011	4.266	18.218	115.239	133.457	0.091	0.120	0.091	OK
Chelmsford Place		MHS2	MHS1	CONC	250	48.26	46.44	58.5	3.28	0.108	2.211	5.464	20	109	36.062	4.233	24.323	152.646	176.969	0.092	0.108	0.092	OK
Woodbury Drive	119572	MH7587	MH7589	CONC	250	45.616	40.959	91.118	5.11	0.134	4.448	10.992	20	220	72.545	4.133	48.930	299.815	348.745	0.097	0.134	0.097	OK
Woodbury Drive	119368	MH7589	MH7592	CONC	250	40.615	40.051	8.338	6.76	0.155	4.625	11.428	20	229	75.426	4.126	50.873	311.232	362.105	0.098	0.155	0.098	OK
Woodbury Drive	119575	MH7592	MH7594	AC	250	37.250	32.193	80.246	6.30	0.149	5.344	13.205	20	264	87.152	4.102	58.782	357.456	416.237	0.099	0.149	0.099	OK
Woodbury Drive	119577	MH7594	MH7602	AC	250	31.919	23.863	68.999	11.68	0.203	13.775	34.039	20	681	224.658	3.901	151.526	876.501	1028.027	0.117	0.203	0.117	OK
Woodbury Drive	119623	MH7602	MH7604	AC	250	22.945	20.275	31.859	8.38	0.172	16.036	39.625	20	793	261.527	3.863	176.394	1010.241	1186.635	0.122	0.172	0.122	OK
Woodbury Drive	123813	MH7604	MH7614	AC	250	17.596	12.332	57.991	9.08	0.179	16.106	39.799	20	796	262.670	3.862	177.165	1014.358	1191.523	0.122	0.179	0.122	OK
Woodbury Drive	117949	MH7614	MH7616	CONC	250	12.107	11.643	8.319	5.58	0.140	16.437	40.616	20	812	268.064	3.856	180.803	1033.760	1214.562	0.122	0.140	0.122	OK
Kearney Lake Road	115903	MH7616	MH7620	CONC	250	9.013	7.477	41.517	3.70	0.114	16.801	41.517	20	830	274.010	3.851	184.813	1055.106	1239.919	0.123	0.114	0.123	not OK
Kearney Lake Road	115905	MH7620	MH7622	CONC	250	7.468	6.605	66.284	1.30	0.068	17.508	43.262	20	865	285.529	3.840	192.583	1096.332	1288.915	0.125	0.068	0.125	not OK
Kearney Lake Road	115907	MH7622	MH7630	CONC	250	6.511	5.846	50.836	1.31	0.068	18.084	44.688	20	894	294.938	3.831	198.928	1129.884	1328.812	0.126	0.068	0.126	not OK
Kearney Lake Road	115891	MH7630	MH7624	CONC	300	5.749	5.364	39.002	0.99	0.096	18.324	45.278	20	906	298.837	3.827	201.559	1143.758	1345.316	0.126	0.096	0.126	not OK
Kearney Lake Road	117698	MH7624	MH7625	CONC	300	4.639	3.840	7.606	0.81	0.087	18.455	45.603	20	912	300.977	3.825	203.002	1151.363	1354.365	0.126	0.087	0.126	not OK
Kearney Lake Road	115894	MH7625	MH9621	CONC	750	3.810	3.429	61.934	0.62	0.873											0.873	0.926	not OK
Kearney Lake Road	117458	MH9621	MH9623	CONC	750	3.399	3.139	52.887	0.49	0.781											0.781	0.926	not OK
Kearney Lake Road	117428	MH9623	MH9624	CONC	750	3.124	2.957	31.006	0.54	0.817											0.817	0.926	not OK

Area No.	Drainage Area (m^2)	Drainage Area (ha)
1	2391	0.239
2	5769	0.577
3	7063	0.706
4	3646	0.365
5	3307	0.331
6	20813	2.081
7	77087	7.709
8	14723	1.472
9	7647	0.765
10	1766	0.177
11	7190	0.719
12	4724	0.472
13	2502	0.250
14	1794	0.179
15	701	0.070
16	5550	0.555
17	5814	0.581
18	14996	1.500
19	1566	0.157
20	239648	23.965
21	3464741	346.474
22	1312	0.1312
42	975086	97.5086

Tremont Option 2.1: Existing Conditions: Prior to adding development

Pipe Capacity

Design Flow Calculation

Comparison

Street	Pipe ID	START MH	END MH	TYPE	DIA (mm)	Inv Out (m)	Inv In (m)	Length (m)	Slope (%)	Qc (m^3/s)	Tributary Area (ha)	Tributary Area (acres)	Population Density (persons/acre)	Total Persons	a (m^3/day)	M	b (m^3/day)	a x M (m^3/day)	(a x M)+b (m^3/day)	Q, Flow (m^3/sec)	Qc (m^3/s)	Q, Flow (m^3/sec)	Check
Rockingham South																							
Tremont Drive	116978	MH9104	MH9105	CONC	250	66.748	63.118	32.049	11.326	0.200	1.335	3.298	20	66	21.768	4.289	14.682	93.357	108.039	0.003	0.200	0.003	OK
Tremont Drive	116973	MH9105	MH9106	CONC	250	63.118	54.901	53.626	15.323	0.233	1.914	4.730	20	95	31.215	4.250	21.054	132.668	153.722	0.004	**0.233**	0.004	OK
Tremont Drive	116964	MH9106	MH9107	CONC	250	54.760	46.159	58.014	14.826	0.229	2.499	6.175	20	124	40.758	4.217	27.490	171.889	199.379	0.006	0.229	**0.006**	OK
Tremont Drive	116937	MH9107	MH9109	CONC	250	46.016	38.313	51.189	15.048	0.231	3.004	7.422	20	148	48.987	4.192	33.041	205.379	238.419	0.007	0.231	0.007	OK
Tremont Drive	116728	MH9109	MH9110	CONC	250	37.746	33.138	51.932	8.873	0.177	3.932	9.717	20	194	64.132	4.153	43.255	266.311	309.566	0.009	0.177	0.009	OK
Tremont Drive	116716	MH9110	MH9111	CONC	250	33.071	26.978	79.179	7.695	0.165	4.509	11.141	20	223	73.532	4.131	49.596	303.729	353.325	0.010	0.165	0.010	OK
Tremont Drive	115947	MH9111	MH9112	CONC	250	26.932	23.509	35.155	9.737	0.186	4.956	12.246	20	245	80.821	4.115	54.512	332.549	387.060	0.011	0.186	0.011	OK
Tremont Drive	115950	MH9113	MH9114	CONC	250	16.441	14.399	28.751	7.102	0.158	6.744	16.664	20	333	109.979	4.059	74.179	446.360	520.538	0.015	0.158	0.015	OK
Tremont Drive	116436	MH9114	MH9115	CONC	250	14.399	11.384	45.936	6.564	0.152	7.065	17.458	20	349	115.224	4.050	77.716	466.602	544.318	0.016	0.152	0.016	OK
Tremont Drive	115951	MH9115	MH9178	CONC	250	11.375	9.193	39.881	5.471	0.139	7.506	18.549	20	371	122.422	4.037	82.570	494.275	576.846	0.017	**0.139**	**0.017**	OK

Area No.	Drainage Area (m^2)	Drainage Area (ha)
20	239648	23.965
22	13347	1.335
23	5793	0.579
24	5851	0.585
25	5046	0.505
26	9286	0.929
27	5764	0.576
28	4469	0.447
29	9074	0.907
30	8805	0.881
31	3216	0.322
32	4413	0.441

Tremont Option 2.2: Addition of 20 persons/acre for Rockingham South

Pipe Capacity | **Design Flow Calculation** | **Comparison**

Street	Pipe ID	START MH	END MH	TYPE	DIA (mm)	Inv Out (m)	Inv In (m)	Length (m)	Slope (%)	Qc (m^3/s)	Tributary Area (ha)	Tributary Area (acres)	Population Density (persons/acre)	Total Persons	a (m^3/day)	M	b (m^3/day)	a x M (m^3/day)	(a x M)+b (m^3/day)	Q, Flow (m^3/sec)	Qc (m^3/s)	Q, Flow (m^3/sec)	Check
Rockingham South											24.973	61.710	20	1234	407.286	3.739	274.705	1522.932	1797.636	0.052		0.052	
Tremont Drive	116978	MH9104	MH9105	CONC	250	66.748	63.118	32.049	11.326	0.200	1.335	3.298	20	66	21.768	4.289	14.682	93.357	108.039	0.055	0.200	0.055	OK
Tremont Drive	116973	MH9105	MH9106	CONC	250	63.118	54.901	53.626	15.323	0.233	1.914	4.730	20	95	31.215	4.250	21.054	132.668	153.722	0.056	0.233	0.056	OK
Tremont Drive	116964	MH9106	MH9107	CONC	250	54.760	46.159	58.014	14.826	0.229	2.499	6.175	20	124	40.758	4.217	27.490	171.889	199.379	0.058	0.229	0.058	OK
Tremont Drive	116937	MH9107	MH9109	CONC	250	46.016	38.313	51.189	15.048	0.231	3.004	7.422	20	148	48.987	4.192	33.041	205.379	238.419	0.059	0.231	0.059	OK
Tremont Drive	116728	MH9109	MH9110	CONC	250	37.746	33.138	51.932	8.873	0.177	3.932	9.717	20	194	64.132	4.153	43.255	266.311	309.566	0.061	0.177	0.061	OK
Tremont Drive	116716	MH9110	MH9111	CONC	250	33.071	26.978	79.179	7.695	0.165	4.509	11.141	20	223	73.532	4.131	49.596	303.729	353.325	0.062	0.165	0.062	OK
Tremont Drive	115947	MH9111	MH9112	CONC	250	26.932	23.509	35.155	9.737	0.186	4.956	12.246	20	245	80.821	4.115	54.512	332.549	387.060	0.063	0.186	0.063	OK
Tremont Drive	115950	MH9113	MH9114	CONC	250	16.441	14.399	28.751	7.102	0.158	6.744	16.664	20	333	109.979	4.059	74.179	446.360	520.538	0.067	0.158	0.067	OK
Tremont Drive	116436	MH9114	MH9115	CONC	250	14.399	11.384	45.936	6.564	0.152	7.065	17.458	20	349	115.224	4.050	77.716	466.602	544.318	0.068	0.152	0.068	OK
Tremont Drive	115951	MH9115	MH9178	CONC	250	11.375	9.193	39.881	5.471	0.139	7.506	18.549	20	371	122.422	4.037	82.570	494.275	576.846	0.069	0.139	0.069	OK

Area No.	Drainage Area (m^2)	Drainage Area (ha)
20	239648	23.965
22	13347	1.335
23	5793	0.579
24	5851	0.585
25	5046	0.505
26	9286	0.929
27	5764	0.576
28	4469	0.447
29	9074	0.907
30	8805	0.881
31	3216	0.322
32	4413	0.441

Tremont Option 2.3: Addition of 38.12 persons/acre for Rockingham South

Pipe Capacity

Design Flow Calculation

Comparison

Street	Pipe ID	START MH	END MH	TYPE	DIA (mm)	Inv Out (m)	Inv In (m)	Length (m)	Slope (%)	Qc (m^3/s)	Tributary Area (ha)	Tributary Area (acres)	Population Density (persons/acre)	Total Persons	a (m^3/day)	M	b (m^3/day)	a x M (m^3/day)	(a x M)+b (m^3/day)	Q, Flow (m^3/sec)	Qc (m^3/s)	Q, Flow (m^3/sec)	Check
Rockingham South											24.973	61.710	38.12	2352	776.287	3.530	274.705	2740.240	3014.944	0.087		0.087	
Tremont Drive	116978	MH9104	MH9105	CONC	250	66.748	63.118	32.049	11.326	0.200	1.335	3.298	20	66	21.768	4.289	14.682	93.357	108.039	0.090	0.200	0.090	OK
Tremont Drive	116973	MH9105	MH9106	CONC	250	63.118	54.901	53.626	15.323	0.233	1.914	4.730	20	95	31.215	4.250	21.054	132.668	153.722	0.092	0.233	0.092	OK
Tremont Drive	116964	MH9106	MH9107	CONC	250	54.760	46.159	58.014	14.826	0.229	2.499	6.175	20	124	40.758	4.217	27.490	171.889	199.379	0.093	0.229	0.093	OK
Tremont Drive	116937	MH9107	MH9109	CONC	250	46.016	38.313	51.189	15.048	0.231	3.004	7.422	20	148	48.987	4.192	33.041	205.379	238.419	0.094	0.231	0.094	OK
Tremont Drive	116728	MH9109	MH9110	CONC	250	37.746	33.138	51.932	8.873	0.177	3.932	9.717	20	194	64.132	4.153	43.255	266.311	309.566	0.096	0.177	0.096	OK
Tremont Drive	116716	MH9110	MH9111	CONC	250	33.071	26.978	79.179	7.695	0.165	4.509	11.141	20	223	73.532	4.131	49.596	303.729	353.325	0.097	0.165	0.097	OK
Tremont Drive	115947	MH9111	MH9112	CONC	250	26.932	23.509	35.155	9.737	0.186	4.956	12.246	20	245	80.821	4.115	54.512	332.549	387.060	0.098	0.186	0.098	OK
Tremont Drive	115950	MH9113	MH9114	CONC	250	16.441	14.399	28.751	7.102	0.158	6.744	16.664	20	333	109.979	4.059	74.179	446.360	520.538	0.102	0.158	0.102	OK
Tremont Drive	116436	MH9114	MH9115	CONC	250	14.399	11.384	45.936	6.564	0.152	7.065	17.458	20	349	115.224	4.050	77.716	466.602	544.318	0.103	0.152	0.103	OK
Tremont Drive	115951	MH9115	MH9178	CONC	250	11.375	9.193	39.881	5.471	0.139	7.506	18.549	20	371	122.422	4.037	82.570	494.275	576.846	0.104	0.139	0.104	OK

Area No.	Drainage Area (m^2)	Drainage Area (ha)
20	239648	23.965
22	13347	1.335
23	5793	0.579
24	5851	0.585
25	5046	0.505
26	9286	0.929
27	5764	0.576
28	4469	0.447
29	9074	0.907
30	8805	0.881
31	3216	0.322
32	4413	0.441

Cascade/Torrington Option 3.1: Existing Conditions: Prior to adding developmen

Pipe Capacity

Design Flow Calculation

Comparison

Street	Pipe ID	START MH	END MH	TYPE	DIA (mm)	Inv Out (m)	Inv In (m)	Length (m)	Slope (%)	Qc (m^3/s)	Tributary Area (ha)	Tributary Area (acres)	Population Density (persons/acre)	Total Persons	a (m^3/day)	M	b (m^3/day)	a x M (m^3/day)	(a x M)+b (m^3/day)	Q, Flow (m^3/sec)	Qc (m^3/s)	Q, Flow (m^3/sec)	Check
Torrington Drive	115709	MH9239	MH9236	CONC	250	44.028	36.936	58.682	12.085	0.207	1.335	3.298	20	66	21.768	4.289	14.682	93.357	108.039	0.003	0.207	0.003	OK
Torrington Drive	115706	MH9236	MH7633	AC	250	37.051	33.924	91.963	3.400	0.110	1.914	4.730	20	95	31.215	4.250	21.054	132.668	153.722	0.004	0.110	0.004	OK
Torrington Drive	115704	MH7633	MH7636	AC	250	33.879	33.177	22.615	3.104	0.105	2.499	6.175	20	124	40.758	4.217	27.490	171.889	199.379	0.006	0.105	0.006	OK
Cascade Drive	115700	MH7636	MH9240	CONC	250	31.016	27.502	60.610	5.798	0.143	3.004	7.422	20	148	48.987	4.192	33.041	205.379	238.419	0.007	0.143	0.007	OK
Cascade Drive	116154	MH9240	MH9241	CONC	250	24.149	23.528	34.201	1.816	0.080	3.932	9.717	20	194	64.132	4.153	43.255	266.311	309.566	0.009	0.080	0.009	OK
Cascade Drive	115698	MH9241	MH9242	CONC	250	19.842	18.194	37.812	4.358	0.124	3.174	7.843	20	157	51.765	4.185	34.914	216.618	251.532	0.007	0.124	0.007	OK
Cascade Drive	115696	MH9242	MH9243	CONC	250	15.734	13.375	49.963	4.721	0.129	4.509	11.141	20	223	73.532	4.131	49.596	303.729	353.325	0.010	0.129	0.010	OK
Cascade Drive	115693	MH9243	MH9244	CONC	250	12.396	9.577	60.811	4.636	0.128	4.956	12.246	20	245	80.821	4.115	54.512	332.549	387.060	0.011	0.128	0.011	OK
Cascade Drive	115690	MH9244	MH9245	CONC	250	9.248	-999.000	42.954			5.545	13.702	20	274	90.432	4.095	60.994	370.313	431.307	0.012		0.012	OK
Cascade Drive	115684	MH9245	MH9191	CONC	250	-999.000	6.218	17.920			5.545	13.702	20	274	90.432	4.095	60.994	370.313	431.307	0.012		0.012	OK

Area No.	Drainage Area (m^2)	Drainage Area (ha)
20	239648	23.965
33	13347	1.335
34	5793	0.579
35	5851	0.585
36	5046	0.505
37	9286	0.929
38	5764	0.576
39	4469	0.447
40	5893	0.589
41	8805	0.881

Cascade/Torrington Option 3.2: Addition of 20 persons/acre for Rockingham South

Pipe Capacity

Design Flow Calculation

Comparison

Street	Pipe ID	START MH	END MH	TYPE	DIA (mm	Inv Out (m)	Inv In (m)	Length (m)	Slope (%)	Qc (m^3/s)	Tributary Area (ha)	Tributary Area (acres)	Population Density (persons/acre)	Total Persons	a (m^3/day)	M	b (m^3/day)	a x M (m^3/day)	(a x M)+b (m^3/day)	Q, Flow (m^3/sec)	Qc (m^3/s)	Q, Flow (m^3/sec)	Check
Rockingham South											24.973	61.710	20	1234	407.286	3.739	274.705	1522.932	1797.636	0.052		0.052	
Torrington Drive	115709	MH9239	MH9236	CONC	250	44.028	36.936	58.682	12.085	0.207	1.335	3.298	20	66	21.768	4.289	14.682	93.357	108.039	0.055	0.207	0.055	OK
Torrington Drive	115706	MH9236	MH7633	AC	250	37.051	33.924	91.963	3.400	0.110	1.914	4.730	20	95	31.215	4.250	21.054	132.668	153.722	0.056	0.110	0.056	OK
Torrington Drive	115704	MH7633	MH7636	AC	250	33.879	33.177	22.615	3.104	0.105	2.499	6.175	20	124	40.758	4.217	27.490	171.889	199.379	0.058	0.105	0.058	OK
Cascade Drive	115700	MH7636	MH9240	CONC	250	31.016	27.502	60.610	5.798	0.143	3.004	7.422	20	148	48.987	4.192	33.041	205.379	238.419	0.059	0.143	0.059	OK
Cascade Drive	116154	MH9240	MH9241	CONC	250	24.149	23.528	34.201	1.816	0.080	3.932	9.717	20	194	64.132	4.153	43.255	266.311	309.566	0.061	0.080	0.061	OK
Cascade Drive	115698	MH9241	MH9242	CONC	250	19.842	18.194	37.812	4.358	0.124	3.174	7.843	20	157	51.765	4.185	34.914	216.618	251.532	0.059	0.124	0.059	OK
Cascade Drive	115696	MH9242	MH9243	CONC	250	15.734	13.375	49.963	4.721	0.129	4.509	11.141	20	223	73.532	4.131	49.596	303.729	353.325	0.062	0.129	0.062	OK
Cascade Drive	115693	MH9243	MH9244	CONC	250	12.396	9.577	60.811	4.636	0.128	4.956	12.246	20	245	80.821	4.115	54.512	332.549	387.060	0.063	0.128	0.063	OK
Cascade Drive	115690	MH9244	MH9245	CONC	250	9.248	-999.000	42.954			5.545	13.702	20	274	90.432	4.095	60.994	370.313	431.307	0.064		0.064	OK
Cascade Drive	115684	MH9245	MH9191	CONC	250	-999.000	6.218	17.920			5.545	13.702	20	274	90.432	4.095	60.994	370.313	431.307	0.064		0.064	OK

Area No.	Drainage Area (m^2)	Drainage Area (ha)
20	239648	23.965
33	13347	1.335
34	5793	0.579
35	5851	0.585
36	5046	0.505
37	9286	0.929
38	5764	0.576
39	4469	0.447
40	5893	0.589
41	8805	0.881

Cascade/Torrington Option 3.3: Addition of 38.12 persons/acre for Rockingham South

Pipe Capacity												**Design Flow Calculation**										**Comparison**		
Street	Pipe ID	START MH	END MH	TYPE	DIA (mm)	Inv Out (m)	Inv In (m)	Length (m)	Slope (%)	Qc (m^3/s)		Tributary Area (ha)	Tributary Area (acres)	Population Density (persons/acre)	Total Persons	a (m^3/day)	M	b (m^3/day)	a x M (m^3/day)	(a x M)+b (m^3/day)	Q, Flow (m^3/sec)	Qc (m^3/s)	Q, Flow (m^3/sec)	Check
Rockingham South												24.973	61.710	38.12	2352	776.287	3.530	274.705	2740.240	3014.944	0.087		0.087	
Torrington Drive	115709	MH9239	MH9236	CONC	250	44.028	36.936	58.682	12.085	0.207		1.335	3.298	20	66	21.768	4.289	14.682	93.357	108.039	0.090	0.207	0.090	OK
Torrington Drive	115706	MH9236	MH7633	AC	250	37.051	33.924	91.963	3.400	0.110		1.914	4.730	20	95	31.215	4.250	21.054	132.668	153.722	0.092	0.110	0.092	OK
Torrington Drive	115704	MH7633	MH7636	AC	250	33.879	33.177	22.615	3.104	0.105		2.499	6.175	20	124	40.758	4.217	27.490	171.889	199.379	0.093	0.105	0.093	OK
Cascade Drive	115700	MH7636	MH9240	CONC	250	31.016	27.502	60.610	5.798	0.143		3.004	7.422	20	148	48.987	4.192	33.041	205.379	238.419	0.094	0.143	0.094	OK
Cascade Drive	116154	MH9240	MH9241	CONC	250	24.149	23.528	34.201	1.816	0.080		3.932	9.717	20	194	64.132	4.153	43.255	266.311	309.566	0.096	0.080	0.096	not OK
Cascade Drive	115698	MH9241	MH9242	CONC	250	19.842	18.194	37.812	4.358	0.124		3.174	7.843	20	157	51.765	4.185	34.914	216.618	251.532	0.095	0.124	0.095	OK
Cascade Drive	115696	MH9242	MH9243	CONC	250	15.734	13.375	49.963	4.721	0.129		4.509	11.141	20	223	73.532	4.131	49.596	303.729	353.325	0.097	0.129	0.097	OK
Cascade Drive	115693	MH9243	MH9244	CONC	250	12.396	9.577	60.811	4.636	0.128		4.956	12.246	20	245	80.821	4.115	54.512	332.549	387.060	0.098	0.128	0.098	OK
Cascade Drive	115690	MH9244	MH9245	CONC	250	9.248	-999.000	42.954				5.545	13.702	20	274	90.432	4.095	60.994	370.313	431.307	0.100		0.100	OK
Cascade Drive	115684	MH9245	MH9191	CONC	250	-999.000	6.218	17.920				5.545	13.702	20	274	90.432	4.095	60.994	370.313	431.307	0.100		0.100	OK

Area No.	Drainage Area (m^2)	Drainage Area (ha)
20	239648	23.965
33	13347	1.335
34	5793	0.579
35	5851	0.585
36	5046	0.505
37	9286	0.929
38	5764	0.576
39	4469	0.447
40	5893	0.589
41	8805	0.881

Wetland Alteration Proposal
Rockingham South Residential Development

W. M. Fares Group
480 Parkland Drive, Suite 205
Halifax, NS B3S 1P9

File: 121510469

October 2010

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LIST OF APPENDICES

LIST OF TABLES

1.0 Introduction

W. M. Fares Group (W. M. Fares; the Proponent) proposes to develop a property located in Halifax, Nova Scotia (Figure 1, Appendix A). The Project is named Rockingham South, and is approximately 22.3 hectares (ha) in size.

1.1 APPLICATION CONTACT INFORMATION

Name of the Proponent: W. M. Fares
Postal Address: 480 Park Drive, Suite 205
Halifax, NS B3S 1P9
Tel.: (902) 457-6676
Fax: (902) 457-4686

This report provides information to support a wetland alteration proposal for unavoidable impacts resulting from a residential development. W. M. Fares has retained Stantec Consulting Ltd (Stantec) to assess the wetlands, and review, interpret and report this data to support an application for a Wetland Alteration Approval. Field investigations determined the presence of 23 wetlands within the development area. After a site design process intended to minimize impacts to wetlands, the current proposal involves alteration to 19 of the identified wetlands, which will cause 1.48 ha of disturbed wetland area to accommodate the development. Four wetlands have been preserved in the site planning process to preserve green space and ecological values.

This report follows the requirements for a Wetland Alteration Approval specified by Nova Scotia Environment (NSE) in the Operational Bulletin Respecting Alteration of Wetlands (2006), and is consistent with the information requirements of A Proponent's Guide to Wetland Conservation – Draft for Consultation (Nova Scotia Environment, 2009). Section 2.0 of this report provides a description of the local environment surrounding the wetlands. Section 3.0 provides a detailed description of the wetlands and their hydrological, ecological, and social functions. Section 4.0 provides a detailed description of the Project alternatives, the proposed wetland alterations, potential impacts to the wetlands and their functions, and opportunities to mitigate and compensate for the Project impacts.

2.0 Description of Local Environment

2.1 GEOLOGICAL SETTING

The local underlying bedrock is characterized as the Goldenville Formation, comprised of sandstone turbidites and slate formed in the Cambrian Period, some 510 to 544 million years ago. The bedrock is typically overlain by a thin, discontinuous veneer of glacial till. Shallow bedrock is fractured and exposed in areas, and soils and surficial geology are frequently confining and acidic. The topography, shallow bedrock, boulder-rich terrain, and clay-rich surficial materials result in conditions that are highly favourable to the formation of many small wetlands along drainage channels and in topographical depressions.

2.2 PROJECT LOCATION AND SURROUNDING LAND USE

The Project is located in Halifax Regional Municipality, Nova Scotia. The site is undeveloped and situated between Dunbrack Street and the Bedford Highway. The property is surrounded by roads and residential development, and Tremont Plateau Park is situated to the south-east of the property. There are some green belt areas bordering and nearby the site, but the majority of the surrounding land has been developed.

Site Name:	Rockingham South
Civic/Street Address:	69 Tremont Drive
Community:	Halifax
County:	Halifax County
Property Identification:	00292730
Property Owner	Sobeys Land Holdings Limited (letter of authorization from the property owner available on request)
1:50 000 Topographic Map #:	MAP:11D12

3.0 Wetland Descriptions

Stantec conducted a survey of the property for wetland habitat. Initial field surveys were conducted by professional terrestrial ecologists in May, 2009. Wetlands found were delineated to assess their size and locations. The survey determined the presence of 23 wetlands within the Project boundary (Figure 1, Appendix A). Note that the wetlands are numbered up to 25, as two areas of potential wetland habitat (Wetlands 11 and 16) were classed as non-wetland upon further analysis. Functional assessments of the wetlands proposed for alteration were completed by terrestrial ecologists in June, July, and August, 2010.

For wetlands that are directly impacted by the development, inventories of vascular plants and animals encountered in the wetlands were completed in June and July 2010. The results from these inventories are presented in the following sections. The functional assessments collected a variety of information about the impacted wetlands, including: wetland classification and a description of hydrology; substrate type; any evidence of anthropogenic use of the wetland; and any evidence of impact to the wetland as a result of anthropogenic activities.

Additional information was gained through topographic maps, bedrock and surficial geology maps, and land use maps. These studies were conducted by professional terrestrial ecologists and wetland scientists, who are experienced in wetland classification, characterization and delineation.

3.1 WETLAND LOCATION, SIZE AND TYPE

The locations and approximate sizes of the 23 wetlands are dispersed across the property and are shown in Figure 1, Appendix A. The wetland types and sizes are described in Table 3.1.

Table 3.1 Approximate Sizes and Types of Wetlands Found Within the Site

Wetland ID	Wetland type	Approximate Wetland Area (ha)
1	Deciduous treed basin swamp	0.02
2	Graminoid basin spring marsh	0.03
3	Mixed treed basin swamp / Low shrub basin swamp	0.95
4	Graminoid basin marsh	0.04
5	Submerged aquatic shallow water wetland / Graminoid basin marsh / Deciduous treed basin swamp	0.11
6	Graminoid basin marsh	0.03
7	Graminoid basin marsh	0.03
8	Graminoid basin fen-marsh / Deciduous treed basin swamp	0.12
9	Low shrub basin marsh	0.01
10	Tall shrub basin swamp	0.02
12	Deciduous treed riparian swamp	0.07
13	Deciduous treed drainageway swamp	0.08

Table 3.1 Approximate Sizes and Types of Wetlands Found Within the Site

Wetland ID	Wetland type	Approximate Wetland Area (ha)
14	Graminoid spring marsh / Graminoid stream marsh	0.17
15	Graminoid spring marsh	0.04
17	Deciduous treed swamp / Low shrub swamp	0.18
18	Graminoid basin marsh / Low shrub basin swamp	0.18
19	Graminoid basin marsh / Low shrub basin swamp	0.06
20	Graminoid spring fen / Tall shrub drainageway swamp	0.16
21	Graminoid basin marsh / Mixed treed basin swamp	0.04
22	Graminoid basin marsh	0.08
23	Low shrub basin swamp / Graminoid basin fen	0.26
24	Graminoid spring marsh / Low shrub drainageway swamp / Moss slope fen	0.10
25	Low shrub basin swamp / Graminoid basin marsh	0.03
	Total	**2.83**

Many wetlands found were relatively small, with 15 less than 0.10 ha in size (Wetlands 1, 2, 4, 6, 7, 9, 10, 12, 13, 15, 19, 21, 22, 24, and 25). Wetland 3 is the largest, at 0.95 ha. The majority of wetlands are classed as either a swamp or marsh, and in many cases both. There are also four fens and one shallow water wetland present on the Project site. There are 12 wetland complexes consisting of two or three classes of wetland. Further details about the wetlands that will be affected by the development are described in Sections 3.3 to 3.10.

The status of these wetlands was confirmed using US Army Corps of Engineers (ACoE) protocols (1987) which include confirmation of vegetation, soils, and hydrology both inside and outside wetland boundaries. ACoE wetland protocols are the standard used throughout North America.

3.2 WATERSHED AND SUB-WATERSHED

The Project site is situated within the Nine Mile River watershed (1EJ) and sub-watershed 11D12_404 (NSGC and NSDNR). The watershed is also commonly referred to as the “Sackville Watershed”. This sub-watershed discharges into the Bedford Basin.

3.3 HYDROLOGICAL AND HYDROGEOLOGICAL CHARACTER

The following is a description of the hydrology and potential hydrological and biogeochemical functions and services provided by wetlands proposed to be altered.

Swamps and marshes are the most abundant wetlands throughout the Project area. Swamp types include basin, riparian, and drainageway forms, as identified in the Canadian Wetland Classification System (Warner and Rubec, 1997). Basin swamps (Wetlands 1, 3, 5, 8, 10, 18, 19, 21, 23 25) occur in topographically defined basins where the water is derived locally and by drainage from other parts of the watershed. Wetland 12 is a riparian swamp, as it is situated along a small stream. The water level of the wetland will fluctuate with high and low flows that

occur within the steam. Drainageway swamps (Wetlands 13, 20, and 24) are found in confined drainage ways or water tracks. Water movement is typically unilateral sheet flow, but intermittent channels are often present and will flow during periods of high precipitation.

Surface water within the swamps was variable but generally low (< 5%) and confined to small pools (approximately 1 m^2 or less), such as may be found at the base of trees and along intermittent drainage channels. Sparsely vegetated concaved areas, water marks, water stained leaves, and drainage patterns all indicate that the amount of surface water varies throughout the year and is often much greater than was observed. Peat depths within the swamps were generally 5- 20 cm towards their edges and 10-40 cm closer to their centers.

Marsh types include riparian, spring, and basin forms. A portion of Wetland 14 is a riparian marsh, which is influenced by a watercourse in the south-western portion of the wetland. Spring marshes (Wetlands 2, 14, 15, and 24) are characterized by drainageway tracks, channels or small pools that have water sourced from groundwater discharges. Basin marshes (Wetlands 4, 5, 6, 7, 8, 9, 18, 19, 21, 22, and 25) are found in topographically defined depressions. As with the swamps, there was common evidence of a fluctuating water level within the marshes.

There is one shallow water wetland located within Wetland 5. The shallow water wetland is characterized by a permanent pool of water, confined by surrounding slopes and a non-permeable underlying layer of either sediment or bedrock. Fens were also present, in the form of basin, spring, and slope fens. Basin fens (Wetlands 8 and 23) are confined to a topographic depression. The spring fen (Wetland 20) sources water from a groundwater discharge, while the slope fen (Wetland 24) sources hydrology from seepage tracks.

The wetlands observed on site have various water sources. All wetlands receive water from precipitation, and the majority of wetlands receive water from upslope runoff (in particular, Wetlands 2, 7, 8, 10, 12, 13, 14, 15, 20, 21, and 22). Some receive inflow from ground water sources (notably Wetlands 1, 2, 8, 12, 13, and 24), and a few have watercourse or ditching inflow (Wetlands 12, 14, and 20). Some of the wetlands will be affected by subterranean flows due to the bedrock type, which is predisposed to fissures that allow groundwater flow. Therefore some of the wetlands will be also be providing groundwater recharge, particularly those without obvious outflow channels (Wetlands 1, 9, 19, 20, 21, 22, 23, 24, and 25).

Wetlands found onsite are moderately important for the provision of hydrological and biogeochemical functions. They contribute to surface water flow regulation by slowly releasing their stored water during dry periods, thereby augmenting the flow of water to down slope areas. However this function is limited by the surrounding residential and building infrastructure, which will intercept this flow. The wetlands may help to reduce flooding by acting as a reservoir and by slowing surface flow during periods of high precipitation. Although wetlands are known to be quite efficient at removing sediment and metals from surface water, they are generally poor at retaining hydrocarbons, sodium and chloride ions. Many of the wetlands may help improve local water quality, though this is limited to their size and form. The majority of wetlands within

the Project site are small, and therefore will have minimal hydrological functions individually, but may provide beneficial hydrological services as a landscape.

3.4 DOMINANT VEGETATION IN THE WETLANDS

The Project area supports a number of wetland habitat types, which is likely due to their anthropogenic disturbance over the last 30 years. The majority of the wetland types found on-site are deciduous treed swamps, graminoid basin marshes, and low shrub swamps (Table 3.1).

Graminoid basin marshes (Wetlands 2, 4, 5, 6, 7, 18, 19, 21, 22, and 25) are the most abundant type of wetland on the property. They are characterized by low and tall graminoids, and are dominated by cottongrass bulrush (*Scirpus cyperinus*), broad-leaf cattail (*Typha latifolia*), tussock sedge (*Carex stricta*), pointed broom sedge (*Carex scoparia*), soft rush (*Juncus effusus*), and little prickly sedge (*Carex echinata*). Sphagnum mosses, rough-leaf goldenrod (*Solidago rugosa*), and sensitive fern (*Onoclea sensibilis*) are also common ground cover species in these wetlands.

There are a large number of low shrub swamps (Wetlands 3, 17, 18, 19, 23, 24, and 25) present. They are characterized by low shrubs and young trees, and are dominated by rhodora (*Rhododendron canadense*), narrow-leaved meadow-sweet (*Spiraea alba*), black huckleberry (*Gaylussacia baccata*), mountain holly (*Nemopanthus mucronatus*), and young gray birch (*Betula populifolia*). Sphagnum mosses and cinnamon fern (*Osmunda cinnamomea*) are frequently the dominant ground cover species in these wetlands.

Deciduous treed swamps (Wetlands 1, 5, 8, 12, 13, and 17) are also common. These wetlands are characterized by a tree canopy dominated by red maple (*Acer rubrum*), heart-leaved paper birch (*Betula cordifolia*), paper birch (*Betula papyrifera*), quaking aspen (*Populus tremuloides*), and red spruce (*Picea rubens*). These species also contribute to a moderately developed shrub layer, along with speckled alder (*Alnus incana)*, and Bebb's willow (*Salix bebbiana*). Cinnamon fern (*Osmunda cinnamomea*) is the most abundant herbaceous species, though rough-leaf goldenrod, American mannagrass (*Glyceria grandis*), cottongrass bulrush, a sedge (*Carex gynandra*), interrupted fern (*Osmunda claytoniana*), New York fern (*Thelypteris noveboracensis*), and soft rush are also prominent, and sphagnum moss coverage is extensive. Mixed treed swamps were present in Wetlands 3 and 21, which had similar dominant vegetation to the deciduous treed swamps, with the exception of balsam fir (*Abies balsamea*) being present in the tree canopy.

The graminoid basin fen-marsh (Wetland 8) and graminoid basin fen (Wetland 23) are characterized by low and tall graminoids, and in particular were dominated by cottongrass bulrush, thread rush (*Juncus filiformis*), little prickly sedge, thread rush, brown beakrush (*Rhynchospora fusca*), and large cranberry (*Vaccinium macrocarpon*). Sphagnum mosses also are dominant ground cover.

The graminoid spring marshes (Wetlands 14, 15, and 24) and the graminoid stream marsh (Wetland 14) are characterized by low and tall graminoids, and are dominated by sedges,

American mannagrass, and cotton bulrush. These wetlands also had some areas of shrub, which typically consist of speckled alder, paper birch, and heart-leaved paper birch.

Wetland 9 is a low shrub marsh basin marsh, dominated by black huckleberry and sheep-laurel (*Kalmia angustifolia*) in the shrub layer, and large cranberry and various sedge species in the ground cover layer. A tall shrub basin swamp (Wetland 10) and a tall shrub drainageway swamp (Wetland 20) are dominated by gray birch, red maple, black huckleberry, mountain holly, and rhodora in the shrub layer, and sphagnum mosses and American mannagrass in the ground cover layer. A graminoid spring fen (Wetland 20) and a moss slope fen (Wetland 24) are dominated by ground cover species, including little prickly sedge, black sedge (*Carex nigra*), narrow-leaved meadow-sweet, large cranberry, narrow-panicled rush (*Juncus brevicaudatus*) and sphagnum mosses. A submerged aquatic shallow water wetland (in Wetland 5) is dominated by floating plants, predominantly American water-lily (*Nymphaea odorata*) and Najas species (*Najas* spp.).

Table B.1 in Appendix B presents the plant species observed in each of the wetlands that are proposed for alteration, which lists their rarity status as recorded by Nova Scotia Department of Natural Resources (NSDNR) and the Atlantic Canada Conservation Data Center (ACCDC).

3.5 WILDLIFE ASSESSMENT

During the field surveys, information was collected regarding the presence of birds, mammals and herpetiles (amphibians and reptiles).

Wildlife observations were recorded during surveys of the wetlands. Wildlife species were detected on the basis of visual sightings, vocalizations, tracks, feces, skeletal remains, and distinctive spoor such as characteristic bite marks or dens. Tables 3.2 to 3.4 list the wildlife species observed within and immediately adjacent to the wetlands. There were 18 bird species, three herpetile species, and three mammal species observed. There is one watercourse on-site, though the likelihood that it is fish bearing was determined to be highly unlikely, as it is not connected to any larger bodies of water up or down stream.

Table 3.2 Birds Encountered Within and Nearby Wetlands

Scientific Name	Common Name	ACCDC Ranking	NSDNR Ranking
Bombycilla cedrorum	Cedar Waxwing	S5B	GREEN
Carduelis tristis	American Goldfinch	S5	GREEN
Colaptes auratus	Northern Flicker	S5B	GREEN
Corvus brachyrhynchos	American Crow	S5	GREEN
Cyanocitta cristata	Blue Jay	S5	GREEN
Dendroica petechia	Yellow Warbler	S5B	GREEN
Empidonax alnorum	Alder Flycatcher	S5B	GREEN
Geothlypis trichas	Common Yellowthroat	S5B	GREEN
Junco hyemalis	Dark-eyed Junco	S4S5	GREEN
Melospiza melodia	Song Sparrow	S5B	GREEN
Parus atricapillus	Black-capped Chickadee	S5	GREEN
Quiscalus quiscula	Common Grackle	S5B	GREEN
Sitta canadensis	Red-breasted Nuthatch	S4S5	GREEN
Sturnus vulgaris	European Starling	SNA	Exotic
Turdus migratorius	American Robin	S5B	GREEN
Zenaida macroura	Mourning Dove	S5	GREEN

Table 3.2 Birds Encountered Within and Nearby Wetlands

Scientific Name	Common Name	ACCDC Ranking	NSDNR Ranking
Zonotrichia albicollis	White-throated Sparrow	S5B	GREEN
Zonotrichia leucophrys	White-crowned Sparrow	SNA	GREEN

S5: Secure. **S4**: Usually widespread, fairly common. **SB**: Breeding. **SNA**: Not applicable, exotic species. **GREEN**: Not believed to be sensitive or at risk. **Exotic**: Exotic species.

Table 3.3 Herpetiles Encountered Within and Nearby Wetlands

Scientific Name	Common Name	ACCDC Ranking	NSDNR Ranking
Pseudacris crucifer crucifer	Northern spring peeper	S5	GREEN
Rana clamitans melanota	Green frog	S5	GREEN
Thamnophis sirtalis pallidula	Maritime garter snake	S5	GREEN

S5: Secure. **GREEN**: Not believed to be sensitive or at risk.

Table 3.4 Mammals Encountered Within and Nearby Wetlands

Scientific Name	Common Name	ACCDC Ranking	NSDNR Ranking
Microtus pennsylvanicus	Meadow vole	S5	GREEN
Odocoileus virginianus	White-tailed deer	S5	GREEN
Tamiasciursus hudsonicus	American red squirrel	S5	GREEN

S5: Secure. **GREEN**: Not believed to be sensitive or at risk.

3.6 SPECIES AT RISK

The vascular plant and wildlife surveys did not find any rare or threatened species present within the wetlands, with the exception of Kalm's hawkweed (*Hieracium kalmii*). Kalm's hawkweed is ranked as "S2?" by the ACCDC (2010), indicating that it is expected to be rare within the province but that there is considerable uncertainty regarding their population status. Similarly, NSDNR has assigned an "undetermined" status to these species. Kalm's hawkweed was found in Wetlands 5 and 24. Although the current lack of information regarding the distribution and abundance of this species may reflect their uncommonness within the province, it is easily confused with others species in its respective taxonomic grouping, and as such, may be more abundant within the province than is currently documented.

Of the animal species identified during wetland surveys, none are listed as having conservation concern by the ACCDC or NSDNR.

3.7 OTHER FUNCTIONS AND VALUES TO THE LOCAL COMMUNITY

There was a relatively high amount of anthropogenic use observed within, and around the wetlands. Some of the wetlands have been polluted with garbage (Wetlands 1, 2, 3, 4, 5, 17, 18 and 19), and a few had obvious trails beside, or through them (Wetlands 2, 3, 5, 10, and 24). It appeared that children played in some wetlands (Wetlands 5, 22, 23, and 24), as there were bike trails, small forts, and a stone jetty found in these wetlands. These are predominantly recreational uses, and this activity can be attributed to the close proximity of the wetlands to the residential area.

3.8 HISTORIC IMPACTS ON THE WETLAND

Anthropogenic factors have had an important influence on the character of several of the wetlands. The majority of wetlands have been clear cut, as few tall trees remain in the wetlands. Many appear to have been clear cut as recently as five years ago (Wetlands 1, 2, 3, 4, 5, 6, 12, 14, 15, 22, 23, 24, and 25). Skidder tracks are visible in many of the wetlands. Vegetation has been maintained to a short level around the cell towers in the middle of the property.

Many of the wetlands have been altered historically by the development of infrastructure around the property, and this likely has indirect impacts on the hydrological regimes of the wetlands. For instance, there may have been excavation within Wetland 5, which could have caused the shallow water pool to form. Wetland 5 also appears to receive drainage flow from the large paved area to the south-east of the wetland. Wetland 21 may have been created, or influenced by the development of the adjacent tennis courts.

3.9 LOCAL OCCURRENCE AND RARITY OF ECOSYSTEMS

The glacially scoured topography of the local area is known to have a high density of wetlands. The bedrock and thin layer of till over the bedrock typically create poorly drained areas and can confine water to low elevation areas allowing wetland formation. The local occurrence of wetlands is high and the ecosystems observed in the study area are not considered rare.

The proposed alteration to 19 wetlands through the proposed construction of the residential development and associated access roads are not anticipated to significantly impact the local occurrence of swamps, marshes, fens and shallow water wetlands. These wetlands are relatively common in the local environment, and throughout Nova Scotia, therefore the Project is not anticipated to affecting a rare or uncommon ecosystem.

3.10 SUMMARY OF KEY FUNCTIONS AND VALUES FOR THE WETLAND

The wetlands proposed for alteration are moderately important for providing hydrological and biogeochemical functions, though these functions are limited by their small size. Water quality improvement is not a major function provided by the natural wetlands on site. Peat accumulation suggests that the wetlands maintain low oxygen levels that depress decomposition, and therefore the breakdown of Biological Oxygen Demand (BOD), petroleum hydrocarbon and the oxidation precipitation of certain metals is low.

Wetlands that form peat and woody biomass are considered to be “carbon sinks” in that they remove carbon from the atmosphere and store it for long periods of time (50 – 1000+ years). This function is valued for the role it plays in mitigating and delaying global climate change. The majority of the wetlands proposed to be altered have some association with this role, however considering the size of the wetlands and the shallowness of peat this function is not significant.

The wetlands perform stormwater modification functions, as the observed dry overflow channels provide evidence that the wetlands have a capacity for water retention. While they are small,

the wetlands collectively will slow the movement of water during heavy precipitation events. The ability of the wetlands to augment flows down slope are limited due to the predominant surrounding infrastructure altering the surrounding natural environment. .

The field surveys did not find any rare or threatened plant or animal species, with the exception of Kalm's hawkweed, which has an uncertain status within the province due to a history of taxonomic classification issues associated with this species. Overall, the wetlands proposed for alteration are not considered to be valuable in terms of the physical, hydrological and biogeochemical functions they provide. These values are considered relatively low, due to their small size, as the largest wetland to be altered is Wetland 23 at 0.30 ha, and 15 wetlands are less than 0.10 ha in size. The key environmental, ecological and social functions and values supported by the wetlands are summarized in Table 3.5.

Table 3.5 Summary of Likely Key Functions of the Proposed Altered Wetlands

	Likely Functions	Summary of Information Sources
Biogeochemical	• Carbon storage/sequestration • Potential water quality improvement	Based on site visits, professional understanding of wetland systems, and site hydrology
Hydrological	• Some storm water moderation and storage • Groundwater infiltration	Based on site visits and desktop studies of geology, topography, site hydrology, and predictions of watershed hydrology
Ecological	• No rare or threatened species of concern were found	Based on site visits, literature and professional understanding of wetland systems
Social	• Recreational use of some wetlands	Based on site visit observations

The table indicates there are some functions that the wetlands currently perform, most notably the hydrological functioning, which include storm water moderation and storage, and some groundwater infiltration. There is also a relatively high recreational usage in and nearby the wetlands, mostly like due to the close proximity of the wetlands to the surrounding residential areas.

4.0 Proposed Alteration and Mitigation Measures

4.1 DESCRIPTION OF THE PROPOSED ALTERATION

W. M. Fares proposes to construct a residential development, with associated road access and park amenities (Figure 2, Appendix A). The Project is currently anticipated to involve the construction 115 single-family homes, 77 townhouses and 580 other residential units in six buildings ranging from three to 11 storeys high. The development is expected to house around 2,200 people.

The purpose of the Project is to provide more residential accommodation for the expanding city of Halifax. The Halifax Regional Municipality (HRM) has a mandate under their city planning to reverse the trend of urban sprawl. Promoting high density residential and commercial development within the serviceable boundary reduces negative environmental impacts from installation of further water and sewer services, as well as electricity and gas lines. The development aims to retain 31% of the property in a green state, through dedication to non-disturbance of wetlands, and creation of community park land and nature trails.

The proposed construction of the development will require, in general, the following activities:

- Clearing and grubbing;
- Bedrock blasting, ripping and grading to achieve grades required for residential community development, and to create trenches for subsurface services;
- Installation of subsurface piped services (water, wastewater and storm);
- Extension and installation of culverts;
- Residential and commercial building construction;
- Installation of appropriate erosion and sediment control measures;
- Infilling of wetland habitat and where necessary and approved, excavation of wetland substrate to be used in creating new wetland habitat on-site; and
- Surface finishing (concrete pouring, asphalt, and re-vegetation).

Table 4.1 outlines the impact the development will have on the 23 wetlands found on-site. A total of 19 wetlands will be affected by Project construction. The total area of potential alteration (direct infilling) to wetland habitat is predicted to be 1.48 ha, which is approximately 50% of the total wetland area (2.94 ha). Provided appropriate mitigative measures are implemented, there is unlikely to be any significant residual alteration (indirect impacts) as a result of the Project. Note that two potential wetlands areas, Wetlands 11 and 16 were determined as non-wetland areas upon further field investigations and have therefore been excluded from this report.

Table 4.1 Summary of Proposed Wetland Alterations

Wetland	Wetland type	Wetland Area (ha)	Proposed Direct Alteration	
			Area (ha)	Percent (%)
1	Deciduous treed basin swamp	0.02	0.02	100%
2	Graminoid basin spring marsh	0.03	0.03	100%
3	Mixed treed basin swamp / Low shrub basin swamp	0.95	-	-
4	Graminoid basin marsh	0.04	-	-
5	Submerged aquatic shallow water wetland / Graminoid basin marsh / Deciduous treed basin swamp	0.11	0.11	100%
6	Graminoid basin marsh	0.03	0.03	100%
7	Graminoid basin marsh	0.03	0.03	100%
8	Graminoid basin fen-marsh / Deciduous treed basin swamp	0.12	0.12	100%
9	Low shrub basin marsh	0.01	0.01	100%
10	Tall shrub basin swamp	0.02	0.02	100%
12	Deciduous treed riparian swamp	0.07	0.07	100%
13	Deciduous treed drainageway swamp	0.08	0.08	100%
14	Graminoid spring marsh / Graminoid stream marsh	0.17	0.17	100%
15	Graminoid spring marsh	0.04	0.04	100%
17	Deciduous treed swamp / Low shrub swamp	0.18	-	-
18	Graminoid basin marsh / Low shrub basin swamp	0.18	-	-
19	Graminoid basin marsh / Low shrub basin swamp	0.06	0.06	100%
20	Graminoid spring fen / Tall shrub drainageway swamp	0.16	0.16	100%
21	Graminoid basin marsh / Mixed treed basin swamp	0.04	0.04	100%
22	Graminoid basin marsh	0.08	0.08	100%
23	Low shrub basin swamp / Graminoid basin fen	0.26	0.26	100%
24	Graminoid spring marsh / Low shrub drainageway swamp / Moss slope fen	0.10	0.10	100%
25	Low shrub basin swamp / Graminoid basin marsh	0.03	0.03	100%
	Total	**2.83**	**1.48**	**52%**

Mitigation is proposed to reduce the potential for indirect effects to wetlands that will not be directly affected by the Project.

4.2 MITIGATION SEQUENCE FOR DECISION MAKING

The mitigative sequence for decision making is the foundation for achieving wetland conservation in Nova Scotia. The sequence – avoidance, minimization, compensation – assists proponents in planning and designing project proposals that will be acceptable to NSE. “Avoidance” is the priority, and requires consideration of Project alternatives that would have less adverse impact on the wetland. “Minimization” requires that the Project be designed and implemented using techniques, materials and site locations that reduce or remediate the Project impacts on the wetland. “Compensation” requires that the residual impacts on the wetland functions are compensated for by the enhancement, restoration or creation of wetland ecosystem at an area ratio commensurate with the loss. In the case of the Rockingham South development, this process involves the following key stakeholders:

- Proponent, W. M. Fares;
- Regional Planning Authority, Halifax Regional Municipality;

- Local residents;
- Consultants, Stantec; and
- The regulatory agency, NSE.

4.2.1 Options for Avoidance of Wetland Alterations

The property is surrounded by residential and commercial buildings, and is one of the few sites in the area available for development. Given the directive of the HRM to develop within the serviceable boundary in order to be environmentally sustainable, the Project site chosen is ideally situated.

The location of mapped wetlands was taken into account to minimize wetland alteration on the site. While a high number of wetlands are proposed for alteration, the larger wetlands have been set aside for preservation. The original design involved alteration to the majority of wetland habitat, but with considered re-design, approximately half the wetland habitat can now be preserved. The proposed location is believed to be the optimal location for minimizing overall environmental risk and wetland alteration, while still achieving Project goals.

The Project is subject to review and approval by the Halifax Regional Municipality through the Development Agreement process. Requirements for density, as well as working with existing road and service alignments, provide constraints for site layout and developable areas. Further, the concerns of the community must be addressed sufficiently in order to obtain an approval to proceed with the development. The local community has expressed concerns about traffic congestion resulting from this Project, and is requesting additional road access to the site through an extension of Farnham Gate Road. This would result in a significant alteration to Wetland 3 (provincially mapped wetland, 0.95 ha in size). The proponent has prioritized Wetland 3 for preservation and enhancement and is continuing to work with the local community to avoid this alteration.

4.3 OPPORTUNITIES FOR MINIMIZATION OF IMPACTS TO WETLAND FUNCTION AND VALUES

The proposed direct impacts to wetland habitat have been avoided to the extent possible, as discussed in Section 4.2. The functions and values for the wetland affected by the Project are presented in Table 3.1. Minimization of the impacts to most of these functions (general habitat functions, flood storage and recreational use) will help protect the wetlands and minimize the overall impact footprint. Several mitigative measures are discussed in Section 4.3.1 to minimize the potential indirect effects of the Project on wetland functions arising from general Project impacts.

4.3.1 Minimization of Project impacts

Best management practices and guidelines will be followed during the construction and operational phases in order to minimize potential impacts. There are a number of planning, design and construction strategies intended to minimize potential alteration to the wetlands

preserved onsite. Mitigation measures include designing the development to best manage site runoff, soil erosion, and vegetation management. This section describes several ways to minimize indirect impacts to wetlands.

4.3.2 General Mitigation

To minimize the indirect impacts to avoided wetlands during the construction phase of work, all wetland boundaries have been field flagged for contractor awareness. Contractors will be made aware of the presence of wetlands and the practices to use when working in or near wetlands *that have been identified for avoidance*, including:

- No fuelling of vehicles or equipment within 30 m of an avoided wetland or watercourse;
- No use of equipment or vehicles in or adjacent to an avoided wetland or watercourse;
- Contractors will notify project manager if there are reasons why it is not possible to adhere to site specific erosion, sediment and runoff control plans prior to diversions from these plans;
- No grubbing in an avoided wetland or watercourse;
- Maintaining as much buffer vegetation as practical surrounding avoided wetlands and watercourses;
- Maintaining clean construction sites, free of debris, waste and construction materials that may accumulate in avoided wetlands; and
- Frequent communication with the project manager on construction progress and mitigation success when working near avoided wetlands.

4.3.3 Erosion and Sedimentation

To manage erosion and sedimentation during construction and operation phases of the Project, erosion control systems will be in place to manage runoff from the construction areas. The preferred approach to erosion and sedimentation control is to emphasize the prevention of erosion, rather than capture of sediment prior to release to watercourses and wetlands. This can be achieved through minimizing the time, slope and area of exposed soil. Best management practices implemented will include the use of erosion control fencing, mulch (possibly from shrubs and trees removed during clearing) and, if necessary, sedimentation control ponds. Siltation fences will be installed where feasible and appropriate.

Sediment and erosion control will be carried out according to all applicable standards, regulations, and site specific terms and conditions of regulatory approvals, authorizations and letters of advice.

4.3.4 Minimization of Hydrological and Hydrochemical Impacts

When altering the topography of an area adjacent to a wetland, there is the potential for an interruption of water flow. Flow interruptions may result in a drier wetland or deeper or more prolonged inundation in the wetland. In order to maintain a similar hydro-period in the wetlands and minimize the indirect impacts of the road and residential construction, some general

guidelines are provided for all wetlands that will be preserved following Project construction. It is recommended that:

- Any drainage ditches are graded such that they do not directly discharge into wetlands;
- Post-construction stormwater will be managed such that stormwater is not directly discharged into the preserved wetlands; and
- Machinery and personnel do not enter portions of the wetland that are outside of the Project footprint.

Decreasing or increasing hydrological inputs to wetlands can have negative impacts on the condition of the wetland. Water resources will be carefully managed through planning and adhering to permitting terms and conditions.

4.4 PROPOSED MONITORING

No monitoring will be conducted for the altered wetlands, as the proposed alterations involve complete alteration to 19 wetlands. However, monitoring will be involved in the proposed compensation plan, outlined in Section 4.5.

4.5 OPPORTUNITIES FOR COMPENSATION

The proposed Project will result in the complete of 19 wetlands located within the Project area. In Nova Scotia, wetlands are protected under the Activities Designation Regulations made pursuant to the provincial *Environment Act*. Any loss of wetland habitat, either through direct infilling or indirectly through alteration of wetland hydrology, requires compensation to replace the wetland functions lost as a result of the wetland alterations.

The Project will cause approximately 1.48 ha of direct wetland alteration. The proposed compensation will involve three approaches to compensation, all on site.

The first approach is wetland creation around the wetlands that will be preserved onsite. Field investigations determined that there are suitable hydrology and surficial materials for wetland creation. Organic material from the altered wetlands can be salvaged and be used to establish these created wetland areas. This material will provide a seed bank of wetland vegetation, as well as providing an excellent substrate for wetland vegetation to establish itself in. Integrative stormwater management will be used to ensure there is sufficient hydrological supply to the wetlands. The designs will ensure that no stormwater directly enters the wetland areas, through the use of vegetated swales and catch basins. Further baseline studies to determine the exact extent, location and character of wetland creation opportunities will be implemented upon approval of the proposed wetland alterations.

The second approach involves restoration of impacted areas in Wetlands 3, 4, 17, and 18. These wetlands have been degraded over time, through dumping of garbage, alteration to vegetation, and uncontrolled access through the wetlands by walking or biking. Specifically:

- Wetland 3 has been partially infilled with a corduroy road and storage of timber harvested after Hurricane Juan (2003);

- Wetland 4 has been affected by up-stream hydrological modifications resulting from infilling and stormwater management on an adjacent property. This wetland is in a highly degraded condition, with high vegetation mortality and soil erosion; and

- Wetlands 17 and 18 have been disturbed by skidders and tree cutting and garbage disposal. These wetlands have potential value as high-quality herpetile habitat, despite the current degraded state.

W.M. Fares proposes to restore, enhance and protect these wetlands by removing garbage from the wetlands, and enhancing the ecology of the wetlands through targeted planting and removal of fill, and potentially implementing minor hydrological modifications through the integrated stormwater management plan. The combined area of these wetlands is 1.46 ha. The opportunities for expansion of the wetlands by the removal of fill amounts to an additional 0.42 ha of wetland area.

The third approach to compensation will involve enhancement of these wetlands through the provision of boardwalks and educational signage. This will increase the social functioning of these wetlands, and boardwalks will also help protect the wetlands from trampling by providing controlled access in the urban setting. The educational signage will increase awareness about the importance of wetland functions, the need to protect them, and the responsibility of contacting NSE whenever there are potential impacts to wetlands. Boardwalks will be established in the created wetland areas so as not to interfere with avoided wetland areas.

Monitoring of ecological and hydrological parameters over multiple seasons is essential to ensure the successful establishment of wetland habitat. The objectives of monitoring for the proposed development are:

- Confirm the extent of wetland creation areas;
- Assess the hydrological and ecological functioning of the created wetlands; and
- Guide adaptive management as required.

The ecological characterizations of the existing wetlands to be preserved (Wetlands 3, 4, 17, and 18), as well as information collected from the altered wetlands, will be used a baseline data for the monitoring studies. The establishment of vascular plant communities, and their varying composition, distribution and richness following construction will yield meaningful results as to the success of the habitat creation. Observations of hydrology through soil saturation, presence of surface water, and evidence of inundation will also be monitored to ensure the successful establishment of wetland habitat. All monitoring will be conducted and interpreted by experienced terrestrial ecologists, and it is proposed that site visits be conducted three times a year for the first three years, and then once annually for the fourth and fifth year.

5.0 Closing Comments

This report has been prepared for the sole benefit of the W. M. Fares for submission to Nova Scotia Environment. This report may not be used by any other person or entity without the express written consent of Stantec and W. M. Fares.

Any use that a third party makes of this report, or any reliance on decisions made based on it, is the responsibility of such third parties. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made, or actions taken, based on this report.

The information presented in this report represents the best technical judgment of Stantec based on the data obtained from the work. The conclusions are based on the site conditions observed by Stantec at the time the work was performed at the specific testing and/or sampling locations, and can only be extrapolated to an undefined limited area around these locations.

This assessment was prepared by Hamish Aubrey and reviewed by Robert Federico. We trust that the above meets your requirements at this time. Please contact Hamish Aubrey at (902) 468-7777 if there are any questions respecting this report.

6.0 References

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7.0 Appendices

Appendix A Figures
Appendix B Plant Species Encountered in Wetlands

APPENDIX A
Figures

AUTHOR: G. MESHEAU	DATE: October 6, 2010	ROCKINGHAM SOUTH WETLAND FEATURES	FIGURE NO.: Figure 1
APPROVED BY: G. Mesheau	SCALE: 1:3,500		
	COORDINATE SYSTEM: UTM NAD 83 ZONE 20		Stantec

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AUTHOR: G. MESHEAU	DATE: August 13, 2010	ROCKINGHAM SOUTH	FIGURE NO.: Figure 2
APPROVED BY: E. Kennedy	SCALE:		
	COORDINATE SYSTEM:		Stantec

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APPENDIX B
Plant Species Encountered in Wetlands

Table B.1 Vascular plants recorded within the proposed altered wetland

Scientific Name	Common Name	ACCDC Rank	NSDNR Rank	Wetland																		
				01	02	05	06	07	08	09	10	12	13	14	15	19	20	21	22	23	24	25
Abies balsamea	Balsam Fir	S5	GREEN	Y	Y							Y										Y
Acer rubrum	Red Maple	S5	GREEN	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y
Agrostis hyemalis	Rough Bentgrass	S5	GREEN	Y															Y			
Agrostis scabra	Rough Bentgrass	S5	GREEN				Y	Y														
Agrostis stolonifera	Spreading Bentgrass	S5	GREEN											Y								
Alisma triviale	Broad-Leaved Water-Plantain	S5	GREEN			Y																
Alnus incana	Speckled Alder	S5	GREEN			Y						Y	Y	Y								
Alnus viridis	Green Alder	S5	GREEN			Y											Y					
Anthoxanthum odoratum	Sweet Vernal Grass	SNA	Exotic																Y			
Aralia hispida	Bristly Sarsaparilla	S5	GREEN	Y	Y									Y	Y					Y	Y	
Aralia nudicaulis	Wild Sarsaparilla	S5	GREEN									Y		Y			Y					
Aronia arbutifolia	Red Chokeberry	S4?	GREEN													Y				Y	Y	Y
Aronia melanocarpa	Black Chokeberry	S5	GREEN										Y				Y					
Aster acuminatus	Whorled Aster	S5	GREEN			Y							Y	Y	Y		Y					
Aster novi-belgii	New Belgium American-Aster	S5	GREEN	Y		Y						Y	Y	Y	Y		Y		Y	Y		
Aster radula	Rough-Leaved Aster	S5	GREEN		Y																	
Aster umbellatus	Parasol White-Top	S5	GREEN	Y								Y					Y	Y	Y			Y
Betula alleghaniensis	Yellow Birch	S5	GREEN	Y		Y								Y			Y					
Betula cordifolia	Heart-Leaved Paper Birch	S5	GREEN	Y	Y						Y			Y					Y	Y	Y	Y
Betula papyrifera	Paper Birch	S5	GREEN		Y	Y	Y	Y	Y			Y		Y			Y		Y		Y	Y
Betula populifolia	Gray Birch	S5	GREEN		Y		Y	Y	Y	Y	Y		Y	Y		Y	Y		Y	Y	Y	Y
Bidens frondosa	Devil's Beggar-Ticks	S5	GREEN			Y																
Calamagrostis canadensis	Blue-Joint Reedgrass	S5	GREEN	Y		Y																
Calopogon tuberosus	Tuberous Grass-Pink	S4	GREEN														Y					
Carex aquatilis	Water Sedge	S5	GREEN													Y						
Carex arctata	Black Sedge	S5	GREEN		Y																	
Carex brunnescens	Brownish Sedge	S5	GREEN		Y	Y	Y	Y				Y		Y		Y				Y	Y	Y
Carex canescens	Hoary Sedge	S5	GREEN						Y			Y		Y					Y	Y		Y
Carex debilis	White-Edge Sedge	S5	GREEN	Y	Y																Y	
Carex echinata	Little Prickly Sedge	S5	GREEN			Y			Y			Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
Carex folliculata	Long Sedge	S5	GREEN			Y																
Carex gracillima	Graceful Sedge	S4S5	GREEN	Y			Y	Y		Y	Y	Y	Y	Y					Y	Y	Y	Y
Carex gynandra	A Sedge	S5	GREEN			Y						Y	Y	Y	Y		Y		Y		Y	
Carex lurida	Shallow Sedge	S5	GREEN			Y	Y							Y					Y		Y	Y
Carex nigra	Black Sedge	S5	GREEN														Y					
Carex paupercula var. irrigua	A Sedge	S5	GREEN																	Y	Y	
Carex scoparia	Pointed Broom Sedge	S5	GREEN	Y			Y	Y				Y	Y	Y			Y		Y		Y	
Carex stipata	Stalk-Grain Sedge	S5	GREEN									Y		Y					Y		Y	
Carex stricta	Tussock Sedge	S5	GREEN									Y				Y	Y					
Carex trisperma	Three-Seed Sedge	S5	GREEN			Y	Y	Y				Y	Y							Y	Y	Y
Comptonia peregrina	Sweet Fern	S5	GREEN											Y								
Coptis trifolia	Goldthread	S5	GREEN									Y										Y
Cornus canadensis	Dwarf Dogwood	S5	GREEN						Y				Y				Y					Y
Cypripedium acaule	Pink Lady's-Slipper	S5	GREEN							Y												
Danthonia spicata	Poverty Oat-Grass	S5	GREEN				Y						Y				Y			Y		
Diervilla lonicera	Northern Bush-Honeysuckle	S5	GREEN										Y	Y			Y		Y		Y	
Doellingeria umbellata var. umbellata	a Parasol White-Top	S5	GREEN				Y															
Drosera rotundifolia	Roundleaf Sundew	S5	GREEN				Y		Y	Y										Y	Y	
Dryopteris carthusiana	Spinulose Shield Fern	S5	GREEN	Y																		
Dryopteris cristata	Crested Shield-Fern	S5	GREEN															Y				
Eleocharis acicularis	Least Spike-Rush	S5	GREEN	Y			Y				Y		Y				Y		Y	Y	Y	Y
Eleocharis obtusa	Blunt Spike-Rush	S5	GREEN							Y												
Eleocharis tenuis	Slender Spike-Rush	S5	GREEN											Y								Y
Epigaea repens	Trailing Arbutus	S5	GREEN			Y							Y							Y	Y	Y
Epilobium ciliatum	Hairy Willow-Herb	S5	GREEN	Y																		

Table B.1 Vascular plants recorded within the proposed altered wetland

Scientific Name	Common Name	ACCDC Rank	NSDNR Rank	Wetland																	
				01	02	05	06	07	08	09	10	12	13	14	15	19	20	21	22	23	24	25
Equisetum arvense	Field Horsetail	S5	GREEN			Y											Y					
Eriophorum angustifolium ssp. scabriusculum	Narrowleaf Cotton-Grass	SNA	Unknown						Y													
Eriophorum virginicum	Tawny Cotton-Grass	S5	GREEN			Y					Y	Y	Y	Y			Y			Y	Y	Y
Eriophorum viridicarinatum	Green Keeled Cottongrass	S4	GREEN									Y										
Euthamia graminifolia	Flat-Top Fragrant-Golden-Rod	S5	GREEN				Y	Y				Y	Y	Y	Y				Y		Y	
Fagus grandifolia	American Beech	S5	GREEN	Y	Y	Y							Y	Y	Y		Y					Y
Festuca filiformis	Hair Fescue	SNA	Exotic	Y										Y			Y		Y	Y	Y	
Gaultheria hispidula	Creeping Snowberry	S5	GREEN	Y	Y		Y		Y			Y										Y
Gaultheria procumbens	Teaberry	S5	GREEN				Y		Y	Y	Y		Y			Y				Y	Y	
Gaylussacia baccata	Black Huckleberry	S5	GREEN	Y	Y		Y		Y		Y		Y				Y		Y	Y	Y	Y
Glyceria canadensis	Canada Manna-Grass	S5	GREEN														Y					Y
Glyceria grandis	American Mannagrass	S4S5	GREEN			Y						Y		Y	Y		Y					
Gymnocarpium dryopteris	Northern Oak Fern	S5	GREEN	Y																		
Hamamelis virginiana	American Witch-Hazel	S5	GREEN																			Y
Hieracium kalmii	Kalm's Hawkweed	S2?	Undetermined			Y															Y	
Hieracium pilosella	Mouseear	SNA	Exotic												Y							
Hieracium x floribundum	Smoothish Hawkweed	S5	Exotic																		Y	
Hypericum boreale	Northern St. John's-Wort	S5	GREEN				Y															
Hypericum canadense	Canadian St. John's-Wort	S5	GREEN					Y					Y	Y							Y	
Ilex verticillata	Black Holly	S5	GREEN	Y		Y						Y				Y	Y		Y			Y
Iris versicolor	Blueflag	S5	GREEN													Y		Y				
Juncus brevicaudatus	Narrow-Panicled Rush	S5	GREEN					Y			Y	Y	Y	Y					Y	Y	Y	Y
Juncus canadensis	Canada Rush	S5	GREEN		Y	Y	Y		Y					Y		Y		Y				
Juncus effusus	Soft Rush	S5	GREEN		Y	Y	Y	Y	Y		Y	Y	Y	Y		Y	Y		Y	Y	Y	Y
Juncus filiformis	Thread Rush	S5	GREEN						Y								Y			Y		
Juncus tenuis	Slender Rush	S5	GREEN	Y											Y							
Juniperus communis var. depressa	Dwarf Juniper	S5	GREEN						Y				Y			Y	Y					
Kalmia angustifolia	Sheep-Laurel	S5	GREEN		Y		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y	Y
Larix laricina	American Larch	S5	GREEN		Y									Y			Y			Y		
Ledum groenlandicum	Common Labrador Tea	S5	GREEN						Y		Y		Y							Y		Y
Luzula multiflora	Common Woodrush	S5	GREEN											Y								
Lycopodiella inundata	Bog Clubmoss	S5	GREEN							Y												
Lycopodium obscurum	Tree Clubmoss	S4S5	GREEN																			Y
Maianthemum canadense	Wild Lily-of-The-Valley	S5	GREEN					Y						Y								Y
Morella pensylvanica	Northern Bayberry	S5	GREEN						Y													
Muhlenbergia uniflora	Fall Dropseed Muhly	S5	GREEN																			Y
Myrica pensylvanica	Northern Bayberry	S5	GREEN										Y							Y	Y	
Nemopanthus mucronatus	Mountain Holly	S5	GREEN	Y	Y	Y			Y	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y	
Nymphaea odorata	American Water-Lily	S5	GREEN			Y																
Onoclea sensibilis	Sensitive Fern	S5	GREEN	Y		Y											Y					
Osmunda cinnamomea	Cinnamon Fern	S5	GREEN	Y	Y	Y			Y		Y	Y	Y	Y	Y	Y	Y			Y	Y	Y
Osmunda claytoniana	Interrupted Fern	S5	GREEN	Y																		
Osmunda regalis	Royal Fern	S5	GREEN			Y										Y						
Photinia melanocarpa	Black Chokeberry	S5	GREEN						Y													
Photinia pyrifolia	Red Chokeberry	S4?	GREEN						Y													
Picea glauca	White Spruce	S5	GREEN			Y											Y					
Picea mariana	Black Spruce	S5	GREEN						Y	Y	Y	Y		Y		Y	Y			Y	Y	Y
Picea rubens	Red Spruce	S5	GREEN	Y		Y						Y	Y	Y								
Pinus resinosa	Red Pine	S4S5	GREEN																	Y		Y
Pinus strobus	Eastern White Pine	S5	GREEN	Y	Y					Y		Y								Y	Y	
Platanthera clavellata	Small Green Woodland Orchid	S4	GREEN														Y					
Poa pratensis	Kentucky Bluegrass	S5	GREEN	Y													Y					
Pogonia ophioglossoides	Rose Pogonia	S5	GREEN				Y															
polytrichium commun							Y															

Table B.1 Vascular plants recorded within the proposed altered wetland

Scientific Name	Common Name	ACCDC Rank	NSDNR Rank	Wetland																	
				01	02	05	06	07	08	09	10	12	13	14	15	19	20	21	22	23	24	25
Polytrichium communis									Y													
Populus balsamifera	Balsam Poplar	S4	GREEN															Y				
Populus grandidentata	Large-Tooth Aspen	S5	GREEN					Y			Y	Y	Y			Y	Y		Y			
Populus tremuloides	Quaking Aspen	S5	GREEN			Y	Y						Y	Y	Y		Y					
Potamogeton epihydrus	Nuttall Pondweed	S5	GREEN			Y																
Potentilla simplex	Old-Field Cinquefoil	S5	GREEN				Y						Y	Y			Y		Y	Y	Y	
Prenanthes trifoliolata	Three-Leaved Rattlesnake-root	S5	GREEN														Y		Y		Y	
Prunus pensylvanica	Fire Cherry	S5	GREEN		Y									Y	Y				Y			
Pteridium aquilinum	Bracken Fern	S5	GREEN		Y				Y			Y		Y	Y	Y	Y		Y	Y	Y	Y
Quercus rubra	Northern Red Oak	S5	GREEN	Y	Y									Y			Y					
Ranunculus repens	Creeping Butter-Cup	SNA	Exotic	Y																		
Rhinanthus minor ssp. minor	Yellow Rattle	S5	GREEN						Y													
Rhododendron canadense	Rhodora	S5	GREEN		Y		Y	Y		Y	Y		Y	Y		Y	Y		Y	Y	Y	Y
Rhynchospora alba	White Beakrush	S5	GREEN						Y											Y		
Rhynchospora fusca	Brown Beakrush	S4	GREEN						Y	Y										Y		
Rosa multiflora	Rambler Rose	SNA	Exotic											Y	Y							
Rosa rugosa	Rugosa Rose	S5	GREEN															Y				
Rosa virginiana	Virginia Rose	S5	GREEN											Y					Y			
Rubus allegheniensis	Allegheny Blackberry	S5	GREEN	Y	Y			Y				Y	Y	Y	Y		Y	Y	Y		Y	
Rubus canadensis	Smooth Blackberry	S5	GREEN				Y		Y			Y	Y	Y	Y		Y		Y	Y	Y	Y
Rubus hispidus	Bristly Dewberry	S5	GREEN		Y			Y	Y							Y	Y		Y	Y	Y	Y
Rubus idaeus	Red Raspberry	S5	GREEN	Y			Y							Y							Y	
Salix bebbiana	Bebb's Willow	S5	GREEN	Y		Y		Y	Y			Y	Y	Y	Y	Y	Y	Y	Y			
Salix discolor	Pussy Willow	S5	GREEN				Y						Y	Y		Y		Y				
Salix humilis	Prairie Willow	S5	GREEN						Y								Y					
Salix pyrifolia	Balsam Willow	S5	GREEN			Y		Y	Y					Y		Y	Y					
Scirpus cyperinus	Cottongrass Bulrush	S5	GREEN	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y		Y	Y		Y	Y	Y	Y
Solanum dulcamara	Climbing Nightshade	SNA	Exotic	Y																		
Solidago canadensis	Canada Goldenrod	S5	GREEN	Y											Y							
Solidago puberula	Downy Goldenrod	S5	GREEN				Y															
Solidago rugosa	Rough-Leaf Goldenrod	S5	GREEN	Y	Y	Y	Y	Y	Y			Y	Y	Y			Y		Y	Y	Y	Y
Solidago uliginosa	Bog Goldenrod	S5	GREEN		Y									Y	Y				Y	Y	Y	Y
Sorbaria sorbifolia	False Spiraea	SNA	Exotic	Y																		
Sorbus aucuparia	European Mountain-Ash	SNA	Exotic									Y		Y								
Sparganium americanum	American Bur-Reed	S5	GREEN			Y						Y										
Spiraea alba	Narrow-Leaved Meadow-Sweet	S5	GREEN	Y		Y			Y	Y		Y	Y		Y	Y	Y		Y	Y	Y	Y
Spiraea tomentosa	Hardhack Spiraea	S5	GREEN	Y	Y	Y	Y	Y				Y	Y	Y	Y	Y	Y		Y		Y	
Symphyotrichum novi-belgii	New Belgium American-Aster	S5	GREEN				Y															
Thelypteris noveboracensis	New York Fern	S5	GREEN	Y		Y						Y	Y	Y					Y	Y	Y	
Trientalis borealis	Northern Starflower	S5	GREEN		Y													Y				Y
Trifolium repens	White Clover	SNA	Exotic																Y			
Typha latifolia	Broad-Leaf Cattail	S5	GREEN	Y		Y								Y			Y					
Utricularia geminiscapa	Hidden-Fruited Bladderwort	S4	GREEN						Y											Y		
Vaccinium angustifolium	Late Lowbush Blueberry	S5	GREEN	Y	Y	Y	Y		Y	Y	Y	Y				Y	Y		Y	Y	Y	Y
Vaccinium macrocarpon	Large Cranberry	S5	GREEN		Y		Y	Y	Y	Y	Y	Y	Y	Y		Y	Y			Y	Y	Y
Vaccinium myrtilloides	Velvetleaf Blueberry	S5	GREEN	Y	Y	Y	Y		Y			Y		Y			Y					Y
Vaccinium oxycoccos	Small Cranberry	S5	GREEN						Y				Y									
Viburnum nudum	Possum-Haw Viburnum	S5	GREEN	Y				Y	Y			Y					Y		Y	Y		Y
Vicia cracca	Tufted Vetch	SNA	Exotic														Y					
Viola macloskeyi	Smooth White Violet	S5	GREEN										Y	Y					Y			

NOVA SCOTIA
Environment
Environmental Monitoring and Compliance

30 Damascus Road
Suite 115
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902 424-7773 T
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Our File Number: 95100-30BED-075008

January 28, 2011

W.M. Fares Group
480 Parkland Drive, Suite 205
Halifax, Nova Scotia
B3S 1P9

Dear Mr. Fiander:

RE: Approval to Construct - Wetland Alterations to Various Unnamed Wetlands on the Property Identified as 66 Tremont Drive (PID No. 00292730), Rockingham South - NSE Approval No. 2010-075008.

Please find enclosed, Approval # 2010-075008 issued to Sobeys Land Holdings Limited to construct alterations to various wetlands on the proposed Rockingham South Development site located at 66 Tremont Drive, Halifax, Halifax Regional Municipality, Nova Scotia. Please ensure that you forward the original Approval to Sobeys Land Holdings Limited.

This approval or a copy is to be kept on-site at all times. All personnel involved in the project must be made fully aware of the terms and conditions of this approval. The terms and conditions are shown as attached and it is the Approval Holder's responsibility to ensure that they are followed. Failure to comply with the terms and conditions is an offence under the *Environment Act*.

It is the Approval Holder's duty to advise the Department of any new and relevant information respecting any adverse effect that results or may result from the approved activity, which comes to the Approval Holder's attention after the issuance of the approval. This is required under Section 60 of *the Environment Act*.

This Approval does not constitute an Authorization to harmfully alter, disrupt or destroy fish habitat as regulated under 35(1) of the Fisheries Act. The Department of Fisheries and Oceans (DFO) may assess whether a harmful alteration, disruption or destruction of fish habitat (HADD) will occur as a result of the work and its interaction with fish including species protected under the Species at Risk Act (SARA).

If the activity is altered, extended or modified beyond the description given in this Approval, please reapply as a new Approval may be required.

The Approval Holder must provide the undersigned with three days notice prior to the commencement of the work.

Within 14 days of completion of the work authorized under this Approval, the Approval Holder or contractor is required to submit, to the Department, the enclosed form entitled "Completion of the Approved Work".

Despite the issuance of this Approval, the Approval Holder is still responsible for obtaining any other authorization which may be required to carry out the activity, including those which may be necessary under provincial, federal or municipal law.

Please call at once, if you or the Approval Holder have any questions about the conditions of this approval, especially those pertaining to the actual construction.

Should you or the Approval Holder have any questions, please contact Jonathan MacDonald, Central Region, Bedford Office at (902) 424-2558.

Yours truly,

Norma Bennett
District Manager, EMC Central Region

Eimas #: 2010-075008

NOVA SCOTIA
Environment

APPROVAL

Province of Nova Scotia
***Environment Act*, S.N.S. 1994-95, c.1**

APPROVAL HOLDER: Sobeys Land Holdings Limited

SITE PID: 00292730

APPROVAL NO: 2010-075008

EXPIRY DATE: December 31, 2018

Pursuant to Part V of the *Environment Act*, S.N.S. 1994-95, c.1 as amended from time to time, approval is granted to the Approval Holder subject to the Terms and Conditions attached to and forming part of this Approval, for the following activity:

Alteration of Wetlands on the Rockingham South Project Site at or near 66 Tremont Dr, Halifax, Halifax Regional Municipality in the Province of Nova Scotia.

Administrator Norma Bennett

Effective Date Feb 8/2011

TERMS AND CONDITIONS OF APPROVAL

Nova Scotia Environment

Approval Holder: Sobeys Land Holdings Limited

Project: Wetlands Alteration
Site: On Unnamed Wetlands
66 Tremont Dr,
Halifax, Halifax Regional Municipality
PID # 00292730

Approval No: 2010-075008

File No: 95100-30BED-075008

Map Series: 11/D/12

Grid Reference: E - 447,700 N - 4,947,100

Reference Documents:

- Application dated November 19, 2010 and attachments.
- Email from John Brazner, dated January 31, 2011.

1.0 Definitions:

a) "Act" means the *Environment Act* S.N.S. 1994-1995, c.1 and includes all regulations made pursuant to the Act.

b) "Department" means the Central Region, Bedford Office, of Nova Scotia Environment located at the following address:

Nova Scotia Environment
Environmental Monitoring and Compliance Division
Central Region, Bedford Office,
Suite 115, 30 Damascus Road,
Bedford, Nova Scotia, B4A 0C1.

Phone: (902) 424-7773
Fax: (902) 424-0597

c) "Minister" means the Minister of Nova Scotia Environment.

d) 'Watercourse" means
   (i) the bed banks and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not, and
   (ii) all groundwater;

e) "Wetland" means lands commonly referred to as marshes, swamps, fens, bogs, and shallow water areas that are saturated with water long enough to promote wetland of aquatic processes which are indicated by poorly drained soil, vegetation and various kinds of activity which are adapted to a wet environment.

2.0 Scope of Approval

a) This Approval (the "Approval") relates to the Approval Holder and their application and supporting documentation, as listed in the reference documents above, to construct the alteration of wetlands on the Rockingham South Development situated at or near 66 Tremont Dr, Halifax, Halifax Regional Municipality.

b) Under authority of this approval, the watercourse alterations specified in 2 a) shall be conducted between June 1st and September 30th (inclusive) of the same calendar year unless otherwise stated in the site specific terms and conditions.

c) This Approval supercedes previous approval number (s) which is/are now null and void.

3.0 General Terms and Conditions

a) The Approval Holder shall construct the watercourse alterations in accordance with provisions of the:

   i) *Environment Act* S.N.S. 1994-1995, c.1;
   ii) Regulations pursuant to the above Act;
   iii) Nova Scotia Watercourse Alteration Specifications, Operational Bulletin Respecting the Alteration of Wetlands current edition.

b) Nothing in this Approval relieves the Approval Holder of the responsibility for obtaining and paying for all licences, permits, approvals or authorizations necessary for carrying out the work authorized to be performed by this Approval which may be required by municipal by-laws or provincial or federal legislation.

The Minister does not warrant that such licences, permits, approvals or other authorizations will be issued.

c) No authority is granted by this Approval to enable the Approval Holder to construct the watercourse alterations on lands which are not in the control or ownership of the Approval Holder. It is the responsibility of the Approval Holder to ensure that such a contravention does not occur.

d) If there is a discrepancy between the reference documents and the terms and conditions of this Approval, the terms and conditions of this Approval shall apply.

e) The Minister or Administrator may modify, amend or add conditions to this Approval at anytime pursuant to Section 58 of the Act.

f) This Approval is not transferable without the consent of the Minister or Administrator.

g) (i) If the Minister or Administrator determines that there has been non-compliance with any or all of the terms and conditions contained in this Approval, the Minister or Administrator may cancel or suspend the Approval pursuant to subsections 58(2)(b) and 58(4) of the Act, until such time as the Minister or Administrator is satisfied that all terms and conditions have been met.

(ii) Despite a cancellation or suspension of this Approval, the Approval Holder remains subject to the penalty provisions of the Act and regulations.

h) The Approval Holder shall notify the Department prior to any proposed extensions or modifications of the activities outlined in the original Application for Approval.

i) Pursuant to Section 60 of the *Act*, the Approval Holder shall submit to the Administrator any new and relevant information respecting any adverse effect that actually results, or may potentially result, from any activity to which the Approval relates and that comes to the attention of the Approval Holder after the issuance of the Approval.

j) The Approval Holder shall immediately notify the Department of any incidents of non-compliance with this Approval.

k) The Approval Holder shall bear all expenses incurred in carrying out the environmental monitoring required under the terms and conditions of this Approval.

l) Unless specified otherwise in this Approval, all samples required to be collected by this Approval shall be collected, preserved and analysed, by qualified personnel, in accordance with recognized industry standards and procedures.

m) Unless written approval is received otherwise from the Administrator, all samples required by this Approval shall be analysed by a laboratory that meets the requirements of the Department's "Policy on Acceptable Certification of Laboratories" as amended from time to time.

n) The Approval Holder shall submit any monitoring results required by this Approval to the Department. Unless specified otherwise in this Approval, all monitoring results shall be submitted within 30 days following the month of monitoring.

o) The Approval Holder shall ensure that this Approval, or a copy, is kept on Site at all times and that personnel directly involved in the watercourse alterations are made fully aware of the terms and conditions which pertain to this Approval.

p) Failure to comply with the Terms and Conditions is an offence under the *Environment Act*.

q) The Approval Holder shall notify the Department three business days prior to commencing construction of the Activity. The notification must include the Approval Number.

r) Within 14 days of completion of the work authorized under this Approval, the Approval Holder or contractor is required to submit, to the Department, the enclosed form entitled "Completion of the Approved Work".

4.0 Covenant Conditions

a) The Approval Holder may alter the watercourse, or store water in any watercourse as authorized and, without limiting the generality of the foregoing, shall not alter or use the watercourse so as to:

   (i) prejudice any riparian rights of any owner or of any person lawfully in possession of or holding any lands abutting the watercourse or any rights therein;

   (ii) suffer any loss, damage or nuisance to adjacent or abutting lands.

b) The Approval Holder shall not, at any time or for any purpose, place a pecuniary value on or claim any pecuniary value for the rights and privileges granted by this Approval, whether considered alone or in conjunction with any other property

rights or privileges, over and above the amounts, if any, actually paid to the minister by the Approval Holder for said rights and privileges.

c) It is recognized and agreed that this Approval does not give sole or exclusive rights to any watercourse, and the Minister reserves the right to use the watercourse and water therein for any purpose and to allow others to use the watercourse and water for any purpose, provided that such use or purpose does not constitute a substantial interference with the rights granted to the Approval Holder.

d) The Approval Holder shall be responsible for obtaining and paying the costs of any and all approvals, services, easements, rights of way and authorizations of any kind necessary for the performance of any activities undertaken pursuant to this Approval. The Minister does not covenant that such approvals, services, easements, rights of way and authorizations of any kind will be issued by the Province of Nova Scotia, any other body or person.

e) The Approval Holder shall maintain any bridge, culvert, dam, sluice, flume, conduit or other structure built or used in or on the watercourse in a state of good repair and in a clean and tidy condition to the satisfaction of the Minister. The Approval Holder shall conform to any and all directions of the Minister concerning the rehabilitation of a watercourse or the construction, reconstruction, maintenance, removal, operation and location of any bridge, culvert, dam, sluice, flume, conduit or other structure built, used or maintained in and on the watercourse.

f) The Approval Holder shall indemnify and save harmless the Minister against any loss, cost or damage occasioned by the Approval Holder's relocation of a watercourse or the construction of, repair, alteration or addition to any culvert, bridge, dam, sluice, flume, conduit or other structure. Such indemnity shall include, but not be restricted to, all losses, costs or damages occasioned by the improper or faulty relocation of a watercourse or the improper or faulty construction of repair, alteration or addition to any culvert, bridge, dam, sluice, flume, conduit or other structure in or on the watercourse, or by any trespass, negligence or wilful act of the Approval Holder or any employees, agents, contractors, or guests of the Approval Holder.

g) On the expiry or termination of this Approval or at the end of the useful life of the structure, as determined by the Minister, the Approval Holder shall immediately cease operations and peaceably and quietly yield up and deliver possession of the watercourse in a condition satisfactory to the Minister, and the Minister shall incur no further expense, liability or cost in this regard.

h) The Approval Holder shall remove any bridge, culvert, dam, sluice, flume, conduit or other structure or remnants thereof, and any equipment or personal

property built, used or maintained in and on the watercourse at the end of the useful life of the structure, to the satisfaction of the Minister. In the event the Approval Holder fails to remove such bridge, culvert, dam, sluice, flume, conduit or other structure or remnants thereof and any equipment or personal property, the Minister may, without any attaching liability, remove or demolish the same in whatever manner the Minister deems necessary. The Approval Holder shall pay all expenses and costs of such removal or demolition.

i) The Minister or any employee, servant or agent of the Department will not be liable for any damage, loss or claim of any kind which may or hereafter arise.

j) If the Approval Holder assigns or sublets their Approval or any part thereof except as is expressly provided herein, if the contractor becomes bankrupt or insolvent, if a receiver is appointed for any part of the assets of the Approval Holder, if any assignment is made for the benefit of the creditors of the Approval Holder, or if it is wound up or goes into liquidation, the Minister may terminate the Approval.

k) This Approval shall ensure to the benefit of and be binding upon the Minister, the Minister's successors, assigns and authorized representatives, and upon the Approval Holder, and the heirs, administrators, executors and assigns of the Approval Holder.

l) The failure of the Minister to insist upon a strict performance of any covenant, proviso or Terms and Conditions contained in this Approval shall not be deemed a waiver of any rights or remedies that the Minister may have and shall not be deemed a waiver of any subsequent breach or default in the covenants, provisos or Terms and Conditions contained in this Approval.

5.0 Construction Terms and Conditions

a) All construction activities within or immediately adjacent to the watercourse channel must be carried out in isolation of the streamflow (in the dry).

b) Prior to the commencement of the proposed activity, sediment control measures shall be installed to prevent sedimentation of the watercourse and maintained as required until all exposed erodible soil adjacent to both a watercourse and the road surface are stabilized. Erosion control measures include but are not limited to flow checks, sediment traps and/or filters.

c) Erosion control materials shall be clean, non-erodible, non-ore-bearing, non-watercourse derived and non-toxic materials.

d) Slates or shales are not to be used without prior written consent from the

Minister or Administrator. The Approval Holder shall notify the Department immediately when slates or shales are encountered during any part of construction. Compliance with the Sulphide Bearing Materials Disposal Regulations is required.

e) All potentially erodible areas shall be stabilized with erosion protection material as work progresses (not at the end of the project).

f) All work operations shall be conducted in a manner to protect the watercourse from siltation and disturbance to the adjacent and downstream areas. Silted water is not to be released directly into the watercourse. Any silt laden water pumped from work areas is to be directed to heavily vegetated areas, settling ponds, or other treatment devices.

g) Any overland flow which has the potential to enter the construction area is to be diverted away from the construction site, into vegetated areas.

h) All construction site and roadway runoff shall be directed through natural vegetation or through erosion and sediment control devices before it reaches the watercourse. Where direction through natural vegetation is not possible, all construction site runoff shall be treated to prevent siltation of watercourses.

i) Road drainage must not be discharged over a cut or fill unless additional appropriately vertically staged erosion control measures are in place on the slope from the crest to the toe along the face of the embankment.

j) Settling ponds shall meet a minimum requirement of 1/16 acre-ft. of storage for every acre of exposed construction area. Settling ponds are to be cleaned out when they are half full of sediment or when they no longer provide for the precipitation of solids.

k) The Approval Holder shall ensure that the following discharge limits are met for any water which is discharged from the site to a watercourse or wetland:

Clear Flows (Normal Background Conditions):

i) Maximum increase of 25 mg/L from background levels for any short term exposure (24 hours or less)
ii) Maximum average increase of 5 mg/L from background levels for longer term exposure (inputs lasting between 24 hours and 30 days)

High Flow (Spring Freshets and Storm Events)

i) Maximum increase of 25 mg/L from background levels at any time when background levels are between 25 mg/L and 250 mg/L
ii) Shall not increase more than 10% over background levels when background is >250 mg/L.

l) The Approval Holder shall limit the size of the disturbed area to the area of the watercourse alteration. Once the soils in the area of installation have been exposed for installation, the structure installation shall commence immediately.

m) The Approval Holder shall limit the removal of riparian vegetation to the area of the watercourse alteration only.

n) All excavated material shall be placed in a location where it will not enter the watercourse. All debris resulting from construction activities shall be disposed of at a facility which is Approved to accept the specific material. Any material not regulated by the Department shall be removed to an area where flood water will not come in contact with the debris and excavated material must be removed from the areas adjacent to the watercourse and be disposed of in a manner acceptable to the Department.

o) On-site machinery and potential pollutants are to be stored in an area above the flood water limits.

p) Fuel storage and refuelling or lubrication of equipment is to take place in an area such that an accidental pollutant discharge will not enter surface water or domestic water supplies. Under no circumstances will the designated area be within 30 metres of a watercourse or wetland. Note: this clause is not applicable to pile-driving equipment.

q) Equipment required to work within a watercourse is to be mechanically sound, having no leaking fuel tanks or leaking hydraulic connections.

r) Machinery and equipment (e.g., concrete trucks) are not to be washed out within 30 metres of a body of water or in an area where wash water will run into a watercourse.

s) Blasting in or near a watercourse is not permitted unless authorized in writing by the Minister or Administrator.

6.0 Spills or Releases

a) All spills or releases shall be reported in accordance with the *Act* (Part VI) and the *Emergency Spill Regulations.*

b) Spills or releases shall be cleaned up immediately in accordance with the *Act.*

c) A quantity of spill/release response material is to be maintained on Site at all times.

7.0 Site Specific Terms and Conditions

a) This authorization is for the alteration of approximately 1.48 ha of wetlands associated with the construction of the proposed Rockingham South development in Clayton Park, HRM. This Approval involves the complete alteration of 19 of the 23 identified wetlands, as identified in Stantec Consulting Limited's report entitled "Wetland Alteration Proposal Rockingham South Residential Development", dated October 2010. **All works associated with the alteration of these wetlands and the creation and enhancement of the required compensation wetlands must be completed no later than December 31, 2013. All work associated with the required 5-years of follow-up monitoring, must be completed no later than December 31, 2018.** The following table outlines all wetlands identified on the property along with the size of the wetland and the area of the wetland that will be impacted by the proposed project.

Wetland ID	Total Area of Wetland (ha)	Proposed Direct Alteration (ha)	Proposed Direct Alteration (%)
1	0.02	0.02	100%
2	0.03	0.03	100%
3	0.95	-	-
4	0.04	-	-
5	0.11	0.11	100%
6	0.03	0.03	100%
7	0.03	0.03	100%
8	0.12	0.12	100%
9	0.01	0.01	100%
10	0.02	0.02	100%

Wetland ID	Total Area of Wetland (ha)	Proposed Direct Alteration (ha)	Proposed Direct Alteration (%)
12	0.07	0.07	100%
13	0.08	0.08	100%
14	0.17	0.17	100%
15	0.04	0.04	100%
17	0.18	-	-
18	0.18	-	-
19	0.06	0.06	100%
20	0.16	0.16	100%
21	0.04	0.04	100%
22	0.08	0.08	100%
23	0.26	0.26	100%
24	0.10	0.10	100%
25	0.03	0.03	100%
Total	**2.83 ha**	**1.48 ha**	**52%**

b) The Approval Holder must notify Nova Scotia Environment 3-days prior to beginning any wetlands alterations associated with this Approval.

c) The Approval Holder must submit a copy of an Environmental Protection Plan (i.e. Sedimentation and Erosion Control Plan) prior to beginning any wetland alterations on this site. This plan must be updated frequently as site conditions change.

d) All staging areas must be located in an area that will not impact adjacent watercourses/wetlands. Sediment controls are to be employed around this area to ensure that silt will not migrate to adjacent watercourses and wetlands.

e) The work sites are to be dewatered in a manner that does not cause siltation to watercourses in the area.

f) All materials removed from a wetland is to be disposed of in a manner that is acceptable to the department or reused on site in the construction of new wetlands, as is required in the compensation component of this approval. It should not be placed in an area where it have an impact on another wetland or watercourse (from siltation or a BOD consideration).

g) All areas of exposed soils are to be stabilized immediately upon reaching final grade.

h) Appropriate measures are to be employed to ensure that siltation does not occur as a result of the use of clay materials. If sediment ponds are considered to control silt, ponds are to be adequately sized and approved flocculent may be required. Traditional siltation devices alone will not suffice.

i) Only clean, pH neutral, coarse fill material is to be used within the Wetland areas.

j) Site drainage ditches are to be graded such that they do not directly discharge into surrounding wetlands and watercourses. Stormwater collected on this site must not be directly discharged into surrounding wetlands and watercourses. Post development flows into wetlands must be maintained at pre-development levels. Wetlands must not be used for stormwater retention purposes.

k) Emergency resources will be available on site to react to unforseen events.

l) All sediment barriers / controls are to be properly maintained and monitored throughout the construction and re-instated as necessary.

m) Compensation for the loss of these wetlands will be required. The compensation for loss of wetlands associated with this project has been addressed in Stantec Consulting Limited's report titled "*Wetland Alteration Proposal Rockingham South Residential Development*", dated October 2010. This proposal outlines three components to the compensation plan. The plan has been reviewed and the components involving onsite creation of wetlands (i.e. creation of 0.42 ha of new wetlands) and the Restoration and Enhancement of 1.46 ha of existing badly degraded wetlands have been accepted by Nova Scotia Environment as the required compensation for the alteration of 1.48 ha of wetlands associated with this project. All work associated with the construction of new wetlands and the restoration/enhancement of existing wetlands must be completed by December, 31st, 2013 and be followed up with a minimum of 5-years post construction monitoring, as outlined in Section 4.5 of Stantec Consulting Limited's report titled "*Wetland Alteration Proposal Rockingham South Residential Development*", dated October 2010. Annual progress reports must be submitted to NSE, Environmental Monitoring and Compliance Division, 30 Damascus Road, Suite 115, Bedford, NS B4A 0C1, on or before December 31st of each year until all components of the compensation plan are complete. In year 5, if an undesirable change is noted or there is concern over the condition of the unaltered, enhanced or created wetlands, adaptive management must be applied to improve health and function of that wetland. The future monitoring plan for that wetland may need to be re-evaluated at that time.

n) Compensation projects (i.e. construction of wetlands or enhancement of existing wetlands), must be conducted in a manner and with sufficient measures in place to prevent any adverse effect or unintentional alteration to adjacent watercourses or wetlands. No machinery or heavy equipment can be operated in an existing wetland or watercourse without written authorization from Nova Scotia Environment.

File No: 95100-30BED-075008

NOVA SCOTIA
Environment

COMPLETION OF THE APPROVED WORK

A condition of this Approval requires that the Approval Holder notify Nova Scotia Environment that the work authorized is complete.

Please enter the information on this sheet and return it to the Nova Scotia Environment at the following address:

Nova Scotia Environment
Environmental Monitoring and Compliance Division
Central Region, Bedford Office,
Suite 115, 30 Damascus Road,
Bedford, Nova Scotia, B4A 0C1.

Phone: (902) 424-7773
Fax: (902) 424-0597
NSE Contact: Jonathan MacDonald

APPROVAL NUMBER: 2010-075008

NAME OF APPROVAL HOLDER: Sobeys Group Inc.

NAME OF WATERCOURSE: Unnamed Wetlands

WORK AUTHORIZED: Wetland Alteration

NAME OF CONTRACTOR: _____

DATE WORK WAS COMPLETED: _____

COMMENTS: _____

_____

_____

_____

_____

_____

_____ _____

SIGNATURE Date


Grosvenor Rd
Dakin Dr
Kearney Lake Rd
Birch Cove Lane
Wilson Blvd
Dickson Ave
Bedford Hwy
Wedgewood Ave
Rockhaven Dr
Cascade Dr
Falcon Pl
Woodbury Dr
Winona Cres
Donaldson Ave
Lynwood Dr
Glenn Dr
Wentworth Dr
Torrington Dr
Tremont Dr
Dillon Cres
Crest Rd
Forest Hill Dr
Dunbrack St
Oakley Ave
Wren St
Houda Crt
Douglas Cres
Starling St
Remington Crt
Oriole St
Skylark St
Armada Dr
Ross St
Swallow St
Melody Dr
Farnham Gate Rd
Trailwood Pl
Bobolink St
Blue Jay St
Glenbourne Crt
Knightsridge Dr
Nightingale Dr
Dipper Cres
Flamingo Dr
College Rd
Red Fern Terr
Kingfisher Cres
Canary Cres
Langbrae Dr
Parkmount Cl
Turnmill Dr
Swan Cres
Seton Rd