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Stantec

July 22, 2011
File:1049385/121510734

Brunello Estates
2000 Barrington Street
Suite 202
Halifax, NS B3J 3K1

Attention: Andrew Giles, PEng.

Dear Mr. Giles:

Reference: Brunello Estates Baseline Monitoring Results

Brunello Estates has a proposed 18-hole golf course and residential development between Lakeside and Timberlea in Halifax, Nova Scotia, currently under construction. The property is bordered by Highways 3 and 103 (Figure 1). Further information regarding the development can be found at www.brunelloestates.com. All watercourses within the project area are identified and the associated habitat is described in the Aquatic Assessment report titled "Brunello Estates – Stream Assessments in Preparation for an Application for Watercourse Alteration" (Stantec 2009a). This report also includes baseline data on *in-situ* water quality and physical characteristics.

A water quality monitoring plan was submitted to the Halifax Area Watershed Advisory Board (HWAB). The plan was approved with the recommendation that baseline monitoring be performed to assess the pre-construction water chemistry within the development. This report summarizes the baseline monitoring results.

The Brunello Estates water quality monitoring plan was based on information contained within the "Halifax Regional Municipality's Water Quality Monitoring Functional Plan" (Stantec 2009b). The Water Quality Monitoring Functional Plan (WQMFP) is one of a series of diverse functional plans mandated by the HRM Regional Municipal Planning Strategy (August, 2006). Functional Plans are considered to be management guides considering the detailed elements of policy programming. Recognizing that "environmental features within a watershed all are connected and land-use activities in one part of the watershed can adversely affect quality and quantity of water in another", the Regional Municipal Planning Strategy (RMPS) in Policy E-18 identifies the need for the WQMFP to assist in the sustainable management land use and water resources.

SURVEY METHODOLOGY

The baseline water quality monitoring was carried out in accordance with methods described in Environment Canada's *Inspector's Manual* (2005). This manual is a guide to field-based sample collection and provides protocols for the sampling of water, sediment and soil for numerous parameters. In addition, Stantec's internal standard operating procedures was followed for the *in-situ* measurement of water quality parameters. Upon collection the samples were packed on ice and delivered to a third-party accredited laboratory (Maxxam Analytics in Bedford, NS) to be analyzed.

Sample locations were chosen based on the proximity of construction activities surrounding the watercourses, the identified habitat described in the aquatic assessment report (Stantec 2009a) and the connectivity of the watercourses to larger systems. In total six locations were chosen to be monitored all of which are streams or brooks. Four of the monitored watercourses drain into Governors Lake, the remaining two located along the

Reference: Brunello Estates Baseline Monitoring Results

western extent of the property flow into Nine Mile River. Figure 1 illustrates the locations of the water quality monitoring stations on each stream.

Water parameters to be analyzed are as outlined in the Water Quality Monitoring Functional Plan created for Halifax Regional Municipality and are presented in Table 1. Results are compared to appropriate guidelines from the Canadian Council of the Ministers of the Environment (CCME) *Guidelines for the Protection of Aquatic Life* (FAL).

Table 1 Grouped listings of Water Quality Parameters

Group 1	Group 2	Group 3
E.coli	Group 1 parameters in addition to;	Group 1 and 2 parameters in addition to;
Total Phosphorous	Potassium	Antimony
Total Suspended Solids	Sodium	Arsenic
Turbidity	Calcium	Barium
Colour	Magnesium	Beryllium
pH	Hardness as CaCO ₃	Bismuth
Conductivity	TDS	Boron
Dissolved Oxygen	Alkalinity as CaCO ₃	Cadmium
Air & Water Temperature	Bicarbonate as CaCO ₃	Chromium
Cloud Cover	Carbonate as CaCO ₃	Cobalt
Ice Depth	Sulphate	Lead
Date & Time	Reactive Silica	Molybdenum
	Nitrate-Nitrite	Nickel
	Ammonia	Selenium
	Turbidity	Silver
	Color	Strontium
	Total Organic Carbon	Thallium
	Iron	Tin
	Copper	Titanium
	Manganese	Uranium
	Zinc	Vanadium

Sampling occurred on the dates below for the associated water quality parameter groups.

- March 31, 2011 – Group 3
- May 17, 2011 - Group 2
- June 21, 2011 – Group 3

Reference: Brunello Estates Baseline Monitoring Results

In addition to the water chemistry samples taken at each location the following physical parameters were measured in the field.

- Date and time
- pH
- Conductivity
- Dissolved oxygen
- Air temperature
- Water temperature
- Ice depth (Winter)
- Incidental wildlife sightings,
- Observations on water Clarity and Odour

RESULTS

Monitoring events were chosen to correspond with periods of weather typical to the season in which the monitoring occurred with periods of elevated rainfall and drought conditions avoided. Monitoring occurred on:

- March 31, 2011 Mostly Cloudy, 10°C, no precipitation in the previous 48 hrs.
- May 17, 2011 Cloudy, 17°C 15 mm of rain in the previous 48 hrs.
- June 21, 2011 Mostly Cloudy 17°C, 3.2 mm of rain in the previous 48 hrs.

The water at the time of the surveys was observed to be running clear with no unusual odors or coloration observed. In addition, no sedimentation was visible. The following sections illustrate the baseline water quality conditions and concentrations of select chemical parameters observed at the monitoring locations within Brunello Estates development. All chemical analysis and field measurements not summarized below are included as an attachment with the relevant guidelines:

pH

Within the watercourses of Brunello Estates the pH ranges in the acidic; this is similar to conditions observed elsewhere within Nova Scotia. CCME FAL recommends a pH range of 6.5 to 9.5 pH units to maintain fish health. The low pH reduces the ability of certain species to spawn and hinders tissue development in juveniles (CCME 2006). Viable fish communities in Nova Scotia have been observed by Stantec personnel in conditions similar to or more acidic than those measured in the watercourses of Brunello Estates. The baseline mean and range for pH are provided in Table 2.

Table 2 Brunello Estates - pH

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean (pH units)	4.96	4.77	6.44	4.59	4.33	5.31
Range	4.76 – 4.98	4.77 – 5.21	6.33 – 6.53	4.40 – 4.96	4.27 – 4.45	4.63 – 6.19

Nutrients

Nutrient accumulation leads to an increase in primary productivity in the watercourse, resulting in increased algal and macrophyte growth. Continued unchecked growth of macrophytes and algae can lead to depleted oxygen levels in the depths of the watercourse when the decaying organic material decomposes. This reduction in oxygen at depth may result in increased mortality of fish species or the emigration of less tolerant

Reference: Brunello Estates

species. It should be noted that phosphorous is generally the limiting nutrient in Nova Scotia's freshwater environments.

Levels of nutrients found in the baseline assessment of the watercourses of Brunello Estates were moderate. Nutrient accumulation will become evident initially through increased levels in water quality and subsequently through in-stream vegetation growth. In general, nutrients remain elevated for a greater period of time in lentic (still water) systems than for lotic (moving water) systems based on the reduced flushing rates for the former. While baseline levels are moderate increased nutrient accumulation during project development could create downstream effects in Nine Mile River or Governors Lake which could promote eutrophic conditions if allowed to persist.

The trophic state of a body of water is a general measure of the nutrient accumulation within. The CCME *Canadian Guidance Framework for the Management of Freshwater Systems* has developed trophic levels based on ranges of phosphorous concentrations. A body of water is usually classified as being in one of four possible classes: *oligotrophic*, *mesotrophic*, *meso-eutrophic* or *eutrophic*. Watercourses with extreme trophic indices may also be considered *hyperoligotrophic* or *hypereutrophic*. The watercourses within Brunello Estates range from *mesotrophic* (watercourses 1,4,7,11 and 13) to *meso-eutrophic* (watercourse 6). A meso-eutrophic stream is one in which the limit for nutrient input has been reached or slightly exceeded. The water is commonly clear or slightly turbid with beds of submerged and emergent aquatic macrophytes; algal blooms may be present within the late summer months when annual water temperatures are the highest. Total phosphorous means and ranges for the watercourses within Brunello Estates are presented in Table 3.

Nitrate constitutes the majority of Nitrogen in surface waters saturated with dissolved oxygen and serves as the primary source of nitrogen for aquatic plants and algae. CCME recommends a concentration of less than 13 mg/L nitrate for the protection of aquatic life against nitrate toxicity; there is no current guideline for nitrate with respect to eutrophication potential. All the monitoring locations within Brunello Estates exhibited nitrate levels that are below the 13mg/L limit for the protection of aquatic life.

Table 3 Brunello Estates - Total Phosphorous

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean (µg/L)	15	15	23	16	12	14
Range (µg/L)	14 -17	11 - 23	22 - 25	14 - 19	10 - 15	12 - 16

Table 4 Brunello Estates – Nitrate

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean (mg/L)	0.12 - 0.07	0.10 - 0.20	0.21 - 0.45	<0.05 - 0.15	<0.05 - 0.05	0.15 - 0.79
Range (mg/L)	0.10	0.15	0.33	0.09	0.04 ¹	0.47

¹ One half HDL value used for calculation of average where one or more samples were reported as non-detectable.

Ammonia nitrogen is highly soluble in water and exists in two forms: un-ionized ammonia (NH³⁺) and ammonium (NH⁴⁺). Speciation is key to the toxicity of ammonia as the un-ionized form is considerably more toxic than ammonium. The speciation of ammonia is dependent on water temperature and pH; as such the CCME FAL guideline limits for ammonia are unique to each watercourse and will evolve with the changing conditions observed within the various seasons. CCME guideline values range from 69.7 – 153 mg/L; all the watercourses sampled within Brunello Estates fall below guideline values for total ammonia nitrogen. Means and Ranges of Ammonia Nitrogen for the streams within Brunello Estates are presented in Table 5.

Stantec

July 22, 2011
 Andrew Giles
 Page 5 of 8

Reference: Brunello Estates

Table 5 Brunello Estates – Ammonia Nitrogen

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean (mg/L)	0.04 ¹	0.11 ¹	0.09 ¹	<0.05	<0.05	<0.05
Range (mg/L)	<0.05 – 0.08	<0.05 – 0.28	<0.05 – 0.23	<0.05	<0.05	<0.05

¹ One half HDL value used for calculation of average where one or more samples were reported as non-detectable.

Dissolved Salt Concentrations

Sodium and Chloride means and ranges for both the watercourses within Brunello Estates is compiled in Tables 6 and 7. Specific conductivity (the measure of electrical conductance through water) increases with salt levels and the range and means are illustrated in Table 8. Salt concentrations and conductivity will tend to peak during the spring months when the snow melt releases the road salt and sediment accumulated from the winter months. Salt concentrations have the ability to diminish pH through the deterioration of alkalinity stores and the subsequent loss of buffering capacity. Alkalinity within the streams of Brunello Estates was observed to be low with Table 9 containing the means and ranges of alkalinity as bicarbonate (CaCO₃).

Table 6 Brunello Estates - Sodium

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean (mg/L)	56.9	110.7	35.5	4.78	3.45	6.5
Range (mg/L)	39.6 – 89.6	69.9 - 175	24.5 – 52.5	4.29 – 5.27	3.30 – 3.60	3.30 – 12.50

Table 7 Brunello Estates - Chloride

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean (µg/L)	105	210	58	7	5	14
Range (µg/L)	67 – 160	150 - 310	36 – 97	7 – 8	4 – 6	5 - 28

Table 8 Brunello Estates - Conductivity

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean (µS/cm)	319	713	240	55	45	72
Range (µS/cm)	250 – 590	520 - 1,100	170 – 370	47 – 67	42 – 48	38 - 120

Table 9 Brunello Estates - Alkalinity

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean (mg/L)	<0.05	<0.05	0.06	<0.05	<0.05	<0.05
Range (mg/L)	<0.05	<0.05	<0.05 – 0.06	<0.05	<0.05	<0.05

Stantec

July 22, 2011
Andrew Giles
Page 6 of 8

Reference: Brunello Estates

Water Clarity (TSS, Turbidity, DOC)

Water clarity and transparency of the streams in Brunello Estates were measured by the concentrations of total suspended solids (TSS) in the water column and the turbidity of the water sample.

TSS is a direct measure of the weight of solids in the water; this parameter is predominantly used as a method to indicate the quantity of sediment in the water column. Turbidity is a measure of clarity and indicates the 'cloudiness' of the water in standard units, turbidity is influenced by the type of sediment released into the watercourse. Clay and silt will result in more turbid water than an equivalent quantity of sand based on the particle size and suspension.

TSS in the baseline samples was low and indicates an aquatic environment with little sedimentation through natural erosion or anthropogenic effects. Turbidity is also low at all the sites with the exception of one sampling date in Watercourse 7, the TSS levels are low but turbidity is elevated indicating potential natural deposition of fines in the watercourse. Water clarity data is compiled in Tables 10, and 11.

Table 10 Brunello Estates – Total Suspended Solids

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean (mg/L)	1	<1	2	1	<1	6
Range (mg/L)	1 - 2	<1	<1 - 4	<1 - 2	<1	5 - 7

Table 11 Brunello Estates - Turbidity

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean ($\mu\text{S}/\text{cm}$)	0.5	0.5	0.9	2.5	0.4	1.1
Range ($\mu\text{S}/\text{cm}$)	0.4 - 0.5	0.5 - 0.5	0.7 - 1.1	0.5 - 6.5	0.4 - 0.5	0.5 - 2.1

Bacterial Concentrations

E. coli is a type of faecal bacteria commonly found in the intestinal tract of warm-blooded animals and is used as an assessment tool to identify fecal contamination. *E. coli* concentrations within the streams of Brunello Estates development are low with detectable results measured solely in the streams adjacent to existing residential units. The source of the *E. coli* measured in the three streams cannot be determined but could be attributed to wildlife, pets, or humans. As bacterial contamination has little effect on aquatic habitats the primary reason for monitoring is human health. The baseline levels of *E. coli* are below the CCME recreational guidelines for freshwater set at 200 CFU/100ml.

Table 12 Brunello Estates – Escherichia Coli

	Watercourse 1	Watercourse 4	Watercourse 6	Watercourse 7	Watercourse 11	Watercourse 13
Mean (CFU/100mL)	9	3	13	ND	ND	ND
Range (CFU/100mL)	8 - 11	ND - 7	ND - 37	ND	ND	ND

Stantec

July 22, 2011
Andrew Giles
Page 7 of 8

Reference: Brunello Estates

Metals Concentrations

Samples taken from the streams within the Brunello Estates development were analyzed for 30 commonly observed metals 11 of which have recommended limits within the CCME FAL guidelines. Four metals exceeded CCME guidelines and included Aluminum, Cadmium, Iron and Lead. The acidic water conditions increase the potential for weathering from the rock and soil contained in the streambed; the mobilization of metals in the water is further enhanced by the acidic conditions in the watercourse. Aluminum and Copper exceeded CCME guidelines within each stream and are commonly found to be in exceedance in Nova Scotia. Cadmium exceeded CCME guidelines within each stream as well, the source of the cadmium could not be determined at the time of the report. Lead exceeded the CCME FAL guideline at one site (Watercourse 13). The complete metals suite of analysis is attached.

SUMMARY

The results provided in this report represent the findings of the baseline monitoring program which occurred between March and June 2011. Water quality is typical of an urban Greenfield property in Nova Scotia with characteristically low conductivity and pH during base flows. Higher flows produced an increase in measured conductivity based on the influx of salt and other ions into the stream. Water clarity is adequate to support aquatic habitats with little sedimentation observed. Nutrient levels indicate mesoeutrophic conditions within the streams and are able to support plant growth while not resulting in excessive growth. Faecal coliforms are present as E.coli at levels that are below recreational limits and the presence is limited to streams which are closely associated with existing residences. Four metals exceeded CCME FAL guidelines two of which are commonly observed at elevated concentrations in Nova Scotia, the origin of the additional two exceedances is unknown.

References

- Clair, T.A., Dennis, I.F., Scruton, D.A., Gilliss, M. *Freshwater acidification research in Atlantic Canada: a review of results and predictions for the future*. Accessed in May 2011, at <http://www.nrcresearchpress.com/toc/er/15/NA>
- Canadian Council of Ministers of the Environment, 2004. *Canadian Water Quality Guidelines for the Protection of Aquatic Life*.
- Canadian Council of Ministers of the Environment, 2004. *Phosphorous: Canadian Guidance Framework for the Management of Freshwater Systems*
- Halifax Regional Municipality, 2011. *Seasonal Water Quality Sampling Program*. As accessed in May 2011 at: <http://www.halifax.ca/environment/lakesanddrivers.html#SeasonalSampling>
- Nova Scotia Environment, 2011. *Water Quality Dataset*.
- United States Environmental Protection Agency, (1991). *Volunteer Lake Monitoring*. EPA440-4-91-002.
- United States Environmental Protection Agency, (2007). Carlson's Trophic State Index. *Aquatic Biodiversity*. <http://www.epa.gov/bioindicators/aquatic/carlson.html> accessed 17 February, 2008.

Stantec

July 22, 2011
Andrew Giles
Page 8 of 8

Reference: Brunello Estates

CLOSING

We trust that this report meets the requirements pertaining to the development agreement between Nine Mile River Investments and HRM for the project known as Brunello Estates. Stantec is open to comments and suggestions regarding this study, and appreciates any feedback from local watershed advisory boards.

This report was undertaken exclusively for the purpose outlined herein and was limited to the scope and purpose specifically expressed in this report and the referenced documents. This report cannot be used or applied under any circumstances to another location or situation or for any other purpose without further evaluation of the data and related limitations. Any use of this report by a third party, or any reliance on decisions made based upon it, are the responsibility of such third parties. Stantec Consulting, Ltd. (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.

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This report represents the best professional judgment of Stantec personnel available at the time of its preparation. Stantec reserves the right to modify the contents of this report, in whole or in part, to reflect any new information that becomes available. If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

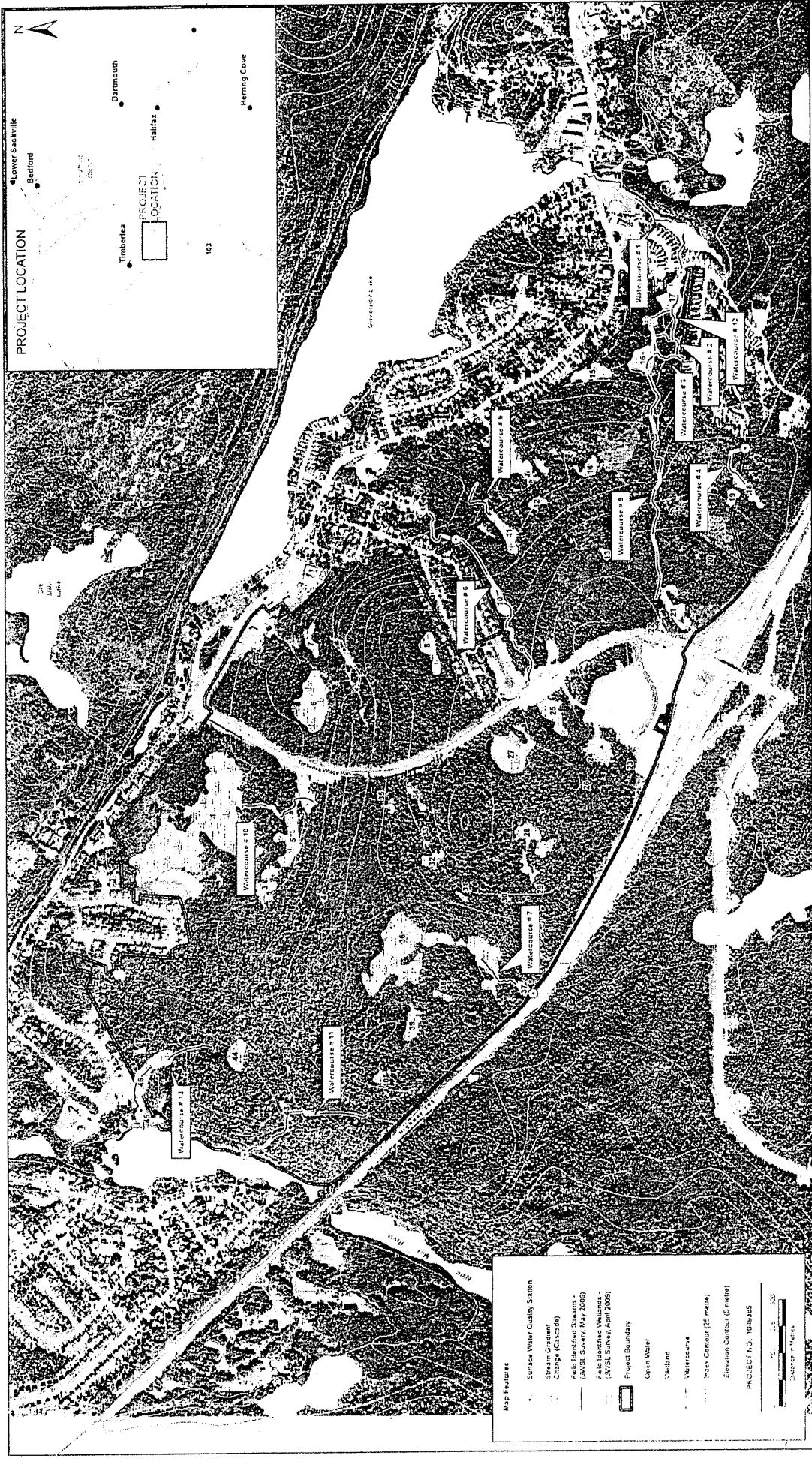
This report was prepared by Matt Steeves, B.Sc. and reviewed by Robert Federico MPA. Should you have any questions, please do not hesitate to contact the undersigned or Sam Salley at (902) 468-7777.

Sincerely,

STANTEC CONSULTING LIMITED

Matt Steeves
Environmental Scientist
Tel: (902) 468-7777
Matt.steeves@stantec.com

Attachment: Figure 1 – Site Overview
Figure 2 – Water Quality Monitoring Locations
Water Quality Results and Appropriate Guidelines



<p>DATE: January 27, 2010</p> <p>SCALE: 1:10,000</p> <p>COORDINATE SYSTEM: UTM MAD 83 ZONE 18</p>		<p>Figure 2</p>
<p>PROJECT NO. 1049145</p>		
<p>BRUNELLO ESTATES</p> <p>Sampling Locations for Brunello Estates Water Quality Monitoring Plan.</p>		

Table 1: Brunello Estates Water Chemistry (Baseline)

Date	Watercourse #1		Watercourse #4		Watercourse #6		Watercourse #7		Watercourse #11		Watercourse #13		CCME FWAL Guidelines
	3/31/2011	5/17/2011	6/21/2011	3/31/2011	5/17/2011	6/21/2011	3/31/2011	5/17/2011	6/21/2011	3/31/2011	5/17/2011	6/21/2011	
Calculated Parameters													
Ammon Sum	4.90	1.96	2.23	9.30	4.47	5.23	2.21	0.200	0.250	0.180	0.157	0.160	0.432
Barab. Alkalinity (calc. as CaCO3)	1	ND	ND	ND	ND	ND	2.21	6	ND	ND	ND	ND	ND
Barab. Alkalinity (mg/L)	287	121	166	544	262	265	89	17	22	17	14	22	28
Calculated TDS	1	ND	ND	ND	ND	ND	2.23	0.310	0.410	0.280	0.29	0.280	0.42
Calc. Alkalinity (calc. as CaCO3)	1	ND	ND	ND	ND	ND	1.50	3	5	3	4	11	4
Calc. S.S.	4	4.72	2.10	9.10	4.28	5.6	22	3	2	21.7	33.3	40.6	27.3
Hardness (CaCO3)	1	38	12	23	70	22	43	18	24.2	26.2	33.3	40.6	32.5
Ion Balance (% Difference)	1	1.87	3.45	3.5	1.09	2.17	2.1	21.6	24.2	26.2	33.3	40.6	27.3
Ion Balance (@ 20C)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Langlier Index (@ 4C)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Langlier Index (@ 4C)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Purite (PH)	0.05	0.12	0.07	0.20	0.20	0.1	0.21	0.21	0.15	0.15	0.05	0.05	0.15
Saturator pH (@ 20C)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Saturator pH (@ 4C)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Inorganics													
Total Alkalinity (Total as CaCO3)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Chloride (Cl)	1	160	67	88	310	170	42	36	7	6	5	4	9
Cobalt	5	31	190	211	16	140	150	35	170	130	86	240	220
Nitrate - Nitrite	0.05	0.12	0.05	0.07	0.20	0.1	0.45	0.26	0.21	0.15	ND	0.05	0.08
Nitrite (N)	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrogen (Ammonia Nitrogen)	0.05	0.08	ND	ND	ND	ND	0.23	ND	ND	ND	ND	ND	ND
Total Organic Carbon (C)	0.5	3.9	14	10	2.7	11	5.7	7.9	17	6.7	18	12	14
Orthophosphate (P)	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
pH	4.76	5.13	4.98	4.77	5.15	5.21	6.48	4.40	4.42	4.26	4.27	4.45	4.63
Total Phosphorus	0.002	0.014	0.017	0.023	0.012	0.011	0.022	0.016	0.019	0.014	0.010	0.015	0.012
Reactive Silica (SiO2)	0.5	5.1	3.5	2.3	5.3	3.3	7.4	4.9	3.6	3.4	4.3	4.4	4.5
Total Suspended Solids	2	1	1	2	ND	ND	4	ND	1	2	ND	ND	7
Dissolved Sulfate (SO4)	2	12	3	5	21	14	15	3	5	ND	ND	6	ND
NTU	0.1	0.4	0.5	0.5	0.5	0.5	0.8	1.1	0.7	0.5	0.4	0.5	0.5
Turbidity	1	590	250	340	1100	520	370	170	180	47	52	44	120
Conductivity	1	590	250	340	1100	520	370	170	180	47	52	44	120
Microbiological													
Es. Coli	9	11	8	ND	7	ND	37	ND	ND	ND	ND	ND	ND
CFU/100mL	0.1	4.94	10.73	13.01	3.03	11.97	10.19	4.15	10.73	13.61	2.49	9.89	6.69
Water Temperature	0.01	4.67	4.31	4.89	4.35	5.08	5.45	4.23	4.31	4.89	4.41	3.96	4.2
pH	0.01	5.80	4.9	3.70	12.12	5.49	176	51	49	42	51	42	41
Specific Conductivity	1	580	6.69	6.7	8.26	6.52	6.69	6.69	6.69	6.21	10.03	8.64	8.74
Dissolved Oxygen	0.01	7.27	60.2	6.7	61.6	57.1	75.7	71.5	60.2	59.7	73.6	73.6	71.2
%	0.1	0.377	0.032	0.208	0.788	0.356	0.334	0.033	0.032	0.033	0.027	0.026	0.024
Total Dissolved Solids	0.001	0.377	0.032	0.208	0.788	0.356	0.334	0.033	0.032	0.033	0.027	0.026	0.024
g/L	1	10	17	17	10	17	17	10	17	10	17	10	17
Air Temperature	1	10	17	17	10	17	17	10	17	10	17	10	17

Values in bold exceed CCME FWAL/Recreational guidelines

St. Louis, East St. Louis Water Quality - Metals Baseline
RESULTS OF ANALYSES OF WATER

Date	Units	Watercourse #1		Watercourse #4		Watercourse #6		Watercourse #7		Watercourse #11		Watercourse #13		CCME FWAL Guidelines
		5/17/2011	6/21/2011	3/31/2011	5/17/2011	6/21/2011	5/17/2011	6/21/2011	3/31/2011	5/17/2011	6/21/2011	3/31/2011	5/17/2011	
Metals	mg/L													
Calculated Parameters	Units													
Total Aluminum (Al)	ug/L	421	398	467	376	173	143	285	185	382	222	540	476	100
Total Arsenic (As)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Total Barium (Ba)	ug/L	51.7	48.3	94.7	67	31.8	29	5.8	4.2	7.3	1.8	15.9	2.3	ND
Total Beryllium (Be)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Boron (B)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Cadmium (Cd)	ug/L	0.132	0.0828	0.277	0.135	0.048	ND	0.065	ND	0.103	0.023	0.052	0.032	0.017
Total Calcium (Ca)	ug/L	11400	3690	21900	7830	15600	5370	695	1010	342	344	3980	760	850
Total Chlorine (Cl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Chromium (Cr)	ug/L	0.84	0.56	0.76	0.66	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Copper (Cu)	ug/L	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
Total Iron (Fe)	ug/L	261	724	560	330	113	374	177	803	228	489	430	207	300
Total Lead (Pb)	ug/L	0.50	0.55	ND	ND	ND	ND	0.58	ND	0.61	ND	1.68	1.10	0.98
Total Manganese (Mn)	ug/L	2290	742	560	1225	2720	1120	415	488	369	293	1225	375	521
Total Mercury (Hg)	ug/L	188	41.0	233	50	10.8	15.4	37.6	70.9	23.3	15.0	36.1	29.3	31.2
Total Nickel (Ni)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Nitrogen (N)	ug/L	1190	772	1770	1087	1300	923	477	1000	497	557	802	487	521
Total Phosphorus (P)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Selenium (Se)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Silver (Ag)	ug/L	41500	39600	175000	69000	52500	25400	4290	5270	3620	3440	12500	3750	3300
Total Sodium (Na)	ug/L	49.3	48.7	88.4	64.4	53.1	ND	4.6	ND	2.8	ND	15.4	7.8	0.6
Total Strontium (Sr)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Thallium (Tl)	ug/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Vanadium (V)	ug/L	2.0	ND	ND	ND	2.0	ND	2.6	ND	3.3	ND	11.6	4.2	ND
Total Zinc (Zn)	ug/L	18.1	11.1	15.0	5.8	5.3	6.1	5.7	7.3	5.2	5	5.2	ND	30

Values in bold exceed CCME FWAL Guidelines