

**Plant and Soil Analysis of the Proposed
Trade Show and Convention Centre
Site on Transport Canada Lands
in the National Capital Greenbelt**

An Interim Report

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Overview

This document should be considered as an interim report pending receipt and analysis of the Lester Road Wetland Evaluation and the SAR Mapping reports, and the Greenbelt Turtle Study from the City of Ottawa and the National Capital Commission.

The site of the proposed Trade Show and Convention Centre (TSCC) is located west of the Airport Parkway, north of the ramp to Uplands Drive. In the spring of 2010, Albert Dugal, a well known local Botanist, began a plant survey of the area, as part of a much more extensive study. His fieldwork indicated that most of this area was a wetland and since the area is mostly treed, it can be considered to be a wooded wetland.

According to the **Manual of Implementation Guidelines for the Wetlands Policy Statement** (Ontario, 1992), "**Wetlands** mean lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case, the presence of abundant water has caused the formation of hydric soils (soils in which there is an abundance of moisture) and has favoured the dominance of either hydrophytic or water tolerant plants". In Ontario, defining a wetland is, in reality, based on plant life. An area with a cover of 55% or more of water-loving (hydrophytic) plants is considered a wetland.

Five kinds of wetlands can be found in the Ottawa area. The kind of wetland on the proposed TSCC site is a swamp.

Swamps are wetlands where standing or gently moving water occurs seasonally or persists for long periods, leaving the subsurface continuously waterlogged. The water table may seasonally drop below the rooting zone of vegetation, creating aerated conditions at the surface. Swamps are nutrient-rich, productive ecosystems.

According to the definition of a wetland, "the presence of abundant water has caused the formation of hydric soils". To corroborate the existence of such soils on the property in question, Mr. Dugal enlisted the help of Dr. Clarke Topp, an eminent soil physicist. Dr. Topp's observations, confirm the presence of hydric soils.

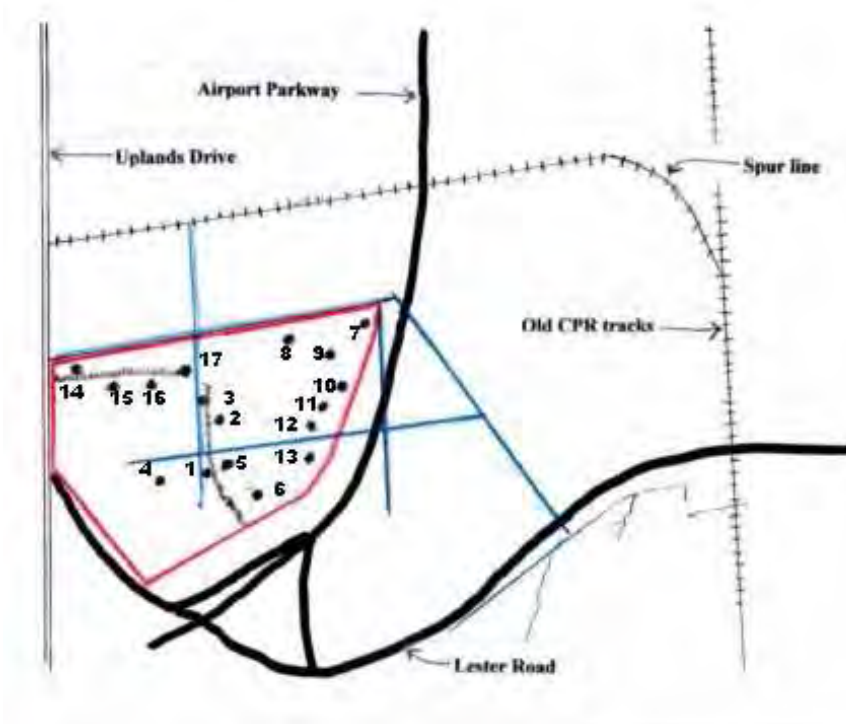
The report concludes the following:

1. the area proposed for development is a primarily wooded wetland and is contiguous with wetland areas to the east;
2. the area is part of the Greenbelt and is ecologically significant;
3. the area is part of the wetland headwaters of Sawmill Creek and the development would negatively impact the hydrology of the area and water flows in Sawmill Creek;
4. the area is actually part of the Leitrim Wetland;
5. considering that Blanding's Turtles (SAR) have been seen in Sawmill Creek and the nearby Lester Road Marsh (part of Leitrim Wetland), there is a good possibility that the area in question could be Blanding's Turtle habitat;

- Snapping Turtle road-kill on the west side of the Airport Parkway strongly suggests that this area is habitat for this Species of Special Concern.

Introduction

The site of the proposed Trade Show and Convention Centre (TSCC) is located west of the Airport Parkway, north of the ramp from the Airport Parkway to Uplands Drive and south of the primary east-west drainage ditch. (See Figure 1).



Soil Pit Excavations on the Proposed Trade Centre Site

Figure 1: Map of the proposed TSCC site area, showing the landmarks and surrounding roads.

In the spring of 2010, Albert Dugal began a plant survey of the area in question as part of his ongoing study to determine the boundaries of the original/historic Leitrim Wetland. This was prompted by a 1917 Surface Geology map of the Ottawa area which indicated that a large peat deposit extended west of the present-day Airport Parkway, and old (1945 & 1953) aerial photographs which suggested high moisture levels in the soil. His fieldwork indicated that most of this area was a wetland. (Refer to **Part 1 of this report**). Since the area is mostly treed, it can be considered to be a wooded wetland. (See satellite photo, Figure 2).



Figure 2: Satellite photo of proposed Trade Centre site.

According to the **Manual of Implementation Guidelines for the Wetlands Policy Statement** (Ontario, 1992), "**Wetlands** mean lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case, the presence of abundant water has caused the formation of hydric soils (soils in which there is an abundance of moisture) and has favoured the dominance of either hydrophytic or water tolerant plants". In Ontario, defining a wetland is, in reality, based on plant life. An area with a cover of 55% or more of water-loving (hydrophytic) plants is considered a wetland.

Five kinds of wetlands can be found in the Ottawa area. These include bogs, fens, marshes, swamps and shallow water (usually 2 metres deep or less). Some wetlands encompass more than one type. **The kind of wetland on the proposed TSCC site is a swamp.**

Swamps are wetlands where standing or gently moving water occurs seasonally or persists for long periods, leaving the subsurface continuously waterlogged. The water table may seasonally drop below the rooting zone of vegetation, creating aerated conditions at the surface. Swamps are nutrient-rich, productive ecosystems. Vegetation may consist of dense coniferous or deciduous forest or tall shrub thickets.

According to the definition of a wetland, "the presence of abundant water has caused the formation of hydric soils". To corroborate the existence of such soils on the property in question, Mr. Dugal enlisted the help of Dr. Clarke Topp, an eminent soil physicist. Dr. Topp's observations, which confirm the presence of hydric soils, can be found in **Part 2** of this report.

Part 1

Observations, Comments, and Conclusions

Based on the Studies of Albert Dugal

The Site was visited on five occasions (three times in the spring with Cheryl Doran — April 25, April 30 and May 5, 2010, and twice in the Summer with Dr. Clarke Topp — August 23 and 29, 2010). During each visit detailed plant lists were made, as well as notes on the general aspects of the area. Topographic maps, surficial geology maps, soils maps, aerial photographs and notes on adjacent wetland areas were also carefully examined.

Observations

1. The spring excursions to the proposed Trade Centre site indicated that **most** of the site is wetland. Among the factors favouring the wetland condition were:
 - a) the plant cover which exceeded the necessary 55% of hydrophytic or wetland tolerant plants;
 - b) the very wet soil which caused boots to sink into the soil in many places in the spring; and,
 - c) the dark coloured surface soil, rich in organic matter.

There is a **small area** along the west and southwest part of the site that **isn't wetland** (See Figure 3.) Part of this non-wetland area, in the south west, was heavily disturbed. Railway ties, apparently from an old spur line which is quite visible in the 1952 aerial photograph, were encountered during the soil observations with Dr. Topp.

- The wetland area south of the secondary east-west ditch continues east of the Airport Parkway and is contiguous with other wetland areas which are part of the extant Leitrim Wetland. Therefore, most of the proposed Trade Centre site can be regarded as a section of the Leitrim Wetland.

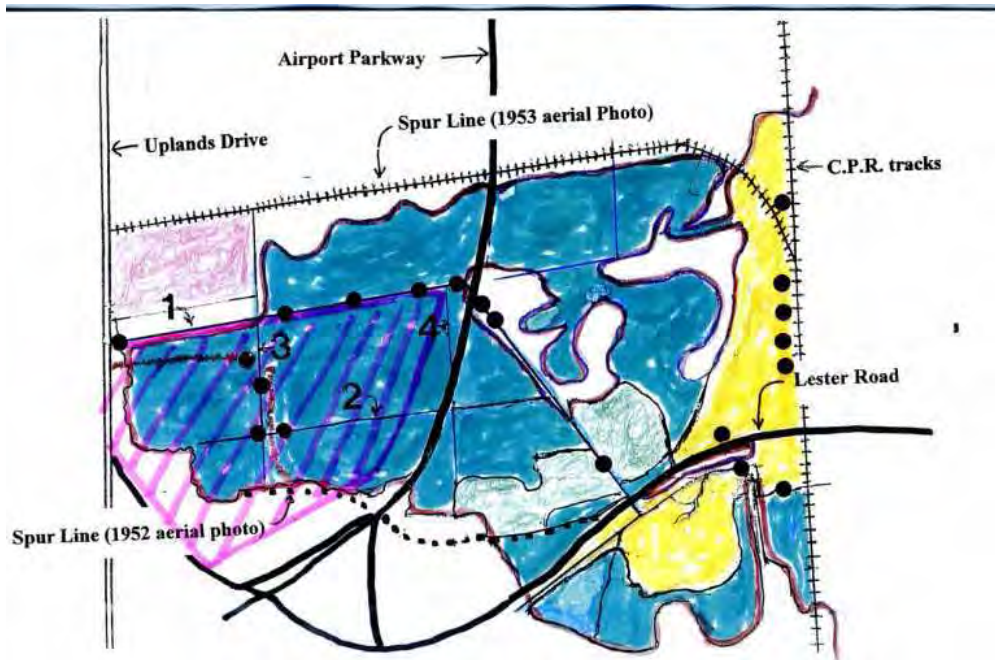


Figure 2. Wetland Areas on Airport Authority Lands South of the Spur Line to the Lester Road Area

Note: There are extensive wetland areas north of the spur line. This diagram is based on field work and aerial photograph A13637-36.

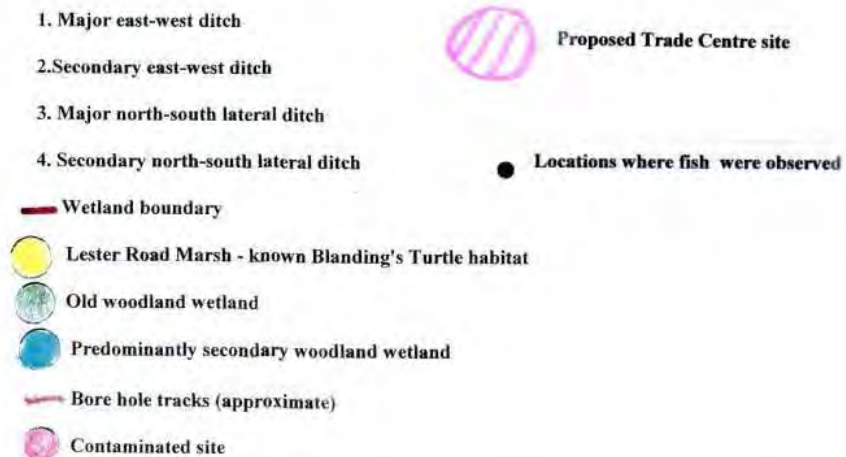


Figure 3: Wetland Areas on Airport Authority Lands South of Spur Line to the Lester Road Area

3. The dominant trees in the woodland are Balsam Poplar, *Populus balsamifera*, Trembling Aspen, *Populus tremuloides*, and, to a lesser extent, Red Ash, *Fraxinus pennsylvanica*. There is a fair amount of Manitoba Maple, *Acer negundo*, a weedy, invasive, tree species that one does not readily associate with wetlands. Yet according to **Trees in Canada**, Manitoba Maple, in its natural range, "Grows on lakeshores and stream banks and on sites that are seasonally flooded". In other words it is water tolerant. Black Cherry, *Prunus serotina*, and Elm, *Ulmus americana*, and a few White Birch, *Betula Papyrifera*, are also present.

The tree associations in the woodland vary across the site. For example, the area due west of the Airport Parkway, between the major/primary east-west ditch and the secondary east-west ditch to the south is a mixed Poplar woodland where Balsam Poplar is much more plentiful than Trembling Aspen. There is also a fair amount of Manitoba Maple. Red Ash is present as well as some Black Cherry.

South of the secondary east-west ditch, the wooded area is more variable. Near the Airport Parkway it is primarily a mixed Poplar woods - Balsam Poplar and Trembling Aspen with some Red Ash and Black Cherry. A couple of huge Trembling Aspens were noted in this area. Going south and west, Red Ash becomes more abundant. By the time the borehole track is reached, it is a Red Ash-Balsam Poplar woodland.

A couple of White Birch was noted along the secondary east-west ditch just east of the borehole track.

Prior to reaching the borehole track, two large, century plus Red Ash were encountered. This was puzzling as the 1945 aerial photos indicated that the area was cleared. The 1923 topographic map suggests an answer. This map shows a fairly open woodland extending from the old woodland wetland (which is shown in Figure 2.) to the western (major) north-south lateral ditch. It is likely that some time before 1945 that much of the area had been clear cut, leaving only a few trees standing.

The woodland to the west of the western (major) north-south lateral ditch is younger and is essentially a Poplar woodland - Balsam Poplar and Trembling Aspen. Balsam Poplar is abundant. There is some Red Ash and Manitoba Maple. A clump of Pin Cherry, *Prunus pensylvanica*, was also noted (probably growing on slightly higher ground).

Most of the older trees, 60 or more years, are located south of the secondary east-west ditch.

In some places the tree canopy is more open, allowing the growth of wetland species usually encountered in more open, marshy conditions.

4. The woodland's shrub layer is dominated by Glossy Buckthorn, *Rhamnus frangula*, an invasive species that infests much of the Greenbelt. Other wetland loving shrubs

such as Willows, *Salix spp.*, Speckled Alder, *Alnus rugosa*, Wild Currant, *Ribes triste*, Meadowsweet, *Spiraea alba*, and Canada Elderberry, *Sambucus canadensis* were noted.

5. Much of the herbaceous layer is dominated by Sensitive Fern, *Onoclea sensibilis*. In places, these ferns cover the ground for as far as the eye can see. There are also populations of Interrupted, *Osmunda claytoniana* and Ostrich Ferns, *Matteuccia struthiopteris* as well as lesser amounts of Royal Fern, *Osmunda regalis* and Spinulose Wood Fern, *Dryopteris carthusiana*. All of these ferns prefer the moist conditions found in wetland areas.

Other wetland loving herbaceous plants observed include Sedges, *Carex spp.*, Pennsylvania Bitter-cress, *Cardamine pennsylvanica*, Common Rush *Juncus effusus*, Spotted Touch-me-not, *Impatiens capensis*, Water Plantain, *Alisma triviale*, Purple-leaved Willow-herb, *Epilobium coloratum*, Mad-dog Skullcap, *Scutellaria galericulata* and Monkey-flower, *Mimulus ringens*.

6. In all, over 40 species of typical, hydrophytic or wetland tolerant plants were observed. (See Annex 1 for examples).
7. About 140 species of vascular plants have been noted/identified as of August 29, 2010, growing on the proposed Trade Centre site (see Annex 2). Among these were **one** Regionally Significant (**RS**), Hairy Buttercup, *Ranunculus pensylvanius*, and **17** Uncommon (**UC**) native species. (See Annex 2) It should be noted that most of the 140 species of vascular plants observed are frequently found in this type of wetland.
8. Three ditches - the major/primary east-west ditch, the secondary east west ditch and the primary north-south lateral ditch have fish in them, and therefore qualify as fish habitat.
9. The ruts and crushed vegetation, caused by vehicles clearing two tracks for boreholes in the spring of 2010, was largely obscured by the dense, high growth of wetland plants. This remarkable capacity for regeneration is typical for many wetlands of this type.
10. On August 29, 2010 Dr. Clarke Topp and Albert Dugal found the dried, road-killed remains of a young Snapping Turtle, *Chelydra serpentina*, a Species of Special Concern under the Species at Risk (SAR) designation, along the west side of the Airport Parkway between the primary and secondary east-west drainage ditches, indicating that the land west of the Parkway was probable habitat for this species
11. The 1906 topographic map of the Ottawa area (31G/5) and the 1917 Surface Geology map of the Ottawa area show, approximately, what the major branch of Sawmill Creek, from the old CPR tracks westward, looked like prior to the major ditching/rerouting for agricultural purposes. From these documents it is easy to see

that the area west of the Airport Parkway is part of the headwaters of Sawmill Creek. This also indicates that the wetland area is a headwater wetland.

Comments

1. We have been informed that the City claims that this area is dry (high) ground. However, as indicated by the flora, the opposite is the case. If this was dry ground, one would expect to find such tree species as Sugar Maple, White Ash, Large-toothed Aspen and Beech. These are not present. Trees that are commonly found in local wetlands such as Balsam Poplar, Elm, Red Ash, and Trembling Aspen grow here.
2. This wetland exhibits a remarkable capacity for regeneration. The devastation caused by clearing broad tracks for boreholes in the spring was largely masked by a lush growth of wetland plants. Even if the trees in this wetland were clear cut, it would not signal the demise of the wetland. It would quickly regenerate due to the remaining herbaceous plants as well as all the seeds, spores and sprouts from Poplar roots in the soil.
3. THE FEDERAL POLICY ON WETLAND CONSERVATION, calls for the federal government to, *"develop exemplary practices in support of wetland conservation and sustainable wetland use to be incorporated in the design and implementation of federal programs and in the management of federal lands and waters"*. Furthermore, this policy also states there should be *"no net loss of wetlands on federal lands"*.
4. **The proposed development site is currently under review by the NCC as part of its Greenbelt Master Plan review.** The old NCC Greenbelt Master Plan stated that "areas with ecological significance must be protected" and that "safeguarding the continuity and diversity of the Greenbelt's natural environment is vitally important". As this area meets these criteria, is the NCC willing to sacrifice it to unsustainable development?

Conclusions

This development should be strongly opposed because:

1. **the area proposed for development is a primarily wooded wetland and is contiguous with wetland areas to the east;**
2. **the area is part of the National Capital Greenbelt and is ecologically significant;**

3. the area is part of the wetland headwaters of Sawmill Creek and the development would negatively impact the hydrology of the area and water flows in Sawmill Creek;
4. the area is actually part of the Leitrim Wetland;
5. considering that Blanding's Turtles (SAR) have been seen in Sawmill Creek and the nearby Lester Road Marsh (part of Leitrim Wetland), there is a good possibility that the area in question could be Blanding's Turtle habitat;
6. Snapping Turtle road-kill on the west side of the Airport Parkway strongly suggests that this area is habitat for this Species of Special Concern;
7. the loss of this wooded wetland area to unsustainable development would reduce or negatively impact wildlife populations in the area.

Part 2

Soil Observations Made at Proposed Development Site

On August 23 and 29, Albert Dugal and Clarke Topp made brief excursions to the proposed site for a Trade Centre as indicated by a City of Ottawa sign. This reports the soil observations which were made to collect corroborative information to go along with a plant inventory.

Soil Pit Excavations and Augered Holes

Seventeen small soil pit excavations (25 X 25 cm X varied depths) or augered holes were made for the purposes of observation of the soil stratification, colour and texture. The proposed Trade Centre site is located in a forested wetland portrayed by the satellite photo in Figure 2. The seventeen holes were distributed over the proposed site as shown in Figure 1. All soil pit locations were in well treed location with some trees that were estimated to be older than 60 years. Where possible, the chosen soil pit locations were accessed from borehole tracks, which allowed easier pedestrian entry into luxuriant undergrowth. The limited aerial coverage given from the borehole tracks required that additional soil sites were needed to be adequately representative and were accessed from the northerly and easterly boundaries.

Soil Pit # 1

The first hole was located west of the borehole track and south of the secondary east-west ditch. The dark (black) highly organic surface layer of 30 cm depth was underlain

by a gray fine sand layer of about 7 to 10 cm thickness. The gray sand transformed to brown sand below 40 cm depth. All soil layers were of high water content.

Soil Pit # 2

Located east of the borehole track, north of the east-west ditch. The surface layer of 25 cm depth was dark in colour (i.e. black) and highly organic. The highly organic layer was underlain by brown fine sand. At 30 cm free water was encountered, indicating a groundwater level above that depth. A groundwater depth of less than 30 cm below surface in late August is seldom found except under wetland conditions.

Soil Pit # 3

Located on the west side of the borehole track, north of the east-west ditch. Again a deep dark soil zone (25 cm) followed by brown fine sand similar to pit # 2. Although free water was not evident from digging to 50 cm, the soil was at very high water content throughout.

Soil Pit # 4

Located a good distance west of the borehole track south of the east-west ditch. Deep black soil - 25-30cm - underlain by brown fine sand. As in pit # 3, the soil was at high water content but no free water to 45 cm.

Soil Pit # 5

Located east of the borehole track, and south of the east-west ditch. Dark highly organic soil 25 cm deep followed by gray fine sand and then brown fine sand at about 45 cm depth. The water content was high.

Soil Pit # 6

Located some distance east of the borehole track, south of the east west ditch and about 30 m north of the wetland boundary. The dark upper layer of soil was the shallowest here, only 20 cm. The brown sand was also coarser as a medium sand texture. This is not far from the outwash deposit (pretty well the wetland boundary area) where soil materials are coarser in texture. The water content of this soil was lower than at any of the previous five locations, indicative of its proximity to the wetland boundary.

Soil Pit # 7

About 15 m south of primary east-west ditch, about 5 m west north-south ditch, about 75 m west of Airport Parkway. The black topsoil was 30 cm deep and underlain by gray-brown, fine sand with iron oxide mottling. The orange and dull gray mottling is indicative frequent anaerobic conditions resulting from high water elevations most of the year. The sand was very wet almost showing free water at 50 cm depth.

Soil Pit # 8

About 15 m south of primary east-west ditch, about 150 m west of Airport Parkway. The upper surface layer of black soil was 22 cm deep and underlain with a very fine sand with more distinct mottles than in # 7. The finer soil and the more colour contrast –

orange/ deep gray – mottles indicate longer anaerobic periods than at #7. The surface soil was drier than at # 7 but the very fine sand or silty sand at 50 cm was wetter.

Soil Pit # 9

About 7 m south of the primary east-west ditch, about 90 m west of the Airport Parkway. Similar to # 8, with black surface soil about 22-25 cm deep.

Soil Pit # 10

About 100 m north of secondary east-west ditch, about 65 m west of Airport Parkway. Black soil of 22-25 cm depth transforms to uniform gray brown, fine sand. The subsoil was high in water content but without the mottling.

Soil Pit # 11

About 65 m north of secondary east-west ditch, about 100 m west of Airport Parkway. The 27 cm of black top soil was underlain by very fine sand to silty sand with a slight indication of mottling. The soil was wet at all depths.

Soil Pit # 12

About 35 m north of secondary east-west ditch, about 100 m west of Airport Parkway. About 27 cm of black soil was underlain by fine gray brown sand making this pit similar to #11 but with a slightly coarser texture.

Soil Pit # 13

About 25m south of secondary east-west ditch, about 100 m west of airport Parkway. As at pit #12 a 27 cm depth of black soil is underlain by gray brown sand, slightly finer than in # 12 and thus, similar to # 11. The gray brown sand shows some yellow colouring, rapidly transitioning to orange-brown sand which indicates a tendency for oxidation. At about 50 cm the soil becomes increasingly gray to display a dull gray sand at about 60 cm, indicating consistently anoxic conditions. The soil is uniformly wet throughout.

Soil Pit # 14

About 30 m east of Uplands Drive, about 2 m north of bore hole track. The surface layer was slightly less thick at about 23-24 cm than at many previous sites. This top soil was dark brown as opposed to the consistent black previously found. The dark brown colour is indicative of a high organic matter content but lower than most other sites. The somewhat drier surface soil than encountered at earlier locations may give a brown hue to the surface soil, also. Below the surface soil the sand was orange-brown and medium textured. The colour and texture gradually made a transition to fine sand of brown colour at 70 cm. The water content of this site was rapidly increasing with depth to be near saturation at 70 cm.

Soil Pit # 15

About 80 m east of Uplands Drive, about 5 m south of borehole track. The surface 25cm layer of black soil was underlain by about 8 cm of light, bright gray fine sand. Below that was orange brown fine sand. Soil was wet throughout.

Soil Pit # 16

About 200 m east of Uplands Drive, about 8 m south of borehole track. Surface was 30 cm of black soil followed by 2 cm of light, bright gray fine sand, underlain by orange gray fine sand. This hole appeared considerably wetter than #15 and free water was encountered above 70 cm.

Soil Pit # 17

About 260 m east of Uplands drive, at end of borehole track, about 1.5 m west of a north-south ditch. The 27 cm of dark soil appears to be darker and of higher organic matter content than previous three soil pits. The dull gray medium sand underlying the

surface soil indicates anaerobic conditions persist. The free water elevation was at 50cm.

Table 1: Summary of observations. Layer thicknesses in cm; textures are: fs –fine sand, ms – medium sand, vfs – very fine sand; colours are bl – black, br – brown, gr – gray, o – orange.																		
Pit #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Top Soil	thickness	30	25	25	27	25	20	30	22	23	24	27	27	27	23	25	30	27
	texture colour	bl	bl	bl	bl	bl	bl	bl	bl	bl	bl	bl	bl	bl	dar k br	bl	bl	bl
Sub Soil # 1	thickness	8				20								23	30	8	2	
	texture colour	fs gr	fs br	fs br	fs br	fs gr	ms br	fs gr- br	vfs o- br/g r	vfs o- br/g r	fs gr- br	vfs gr- br	fs gr- br	23 vfs o- br	30 ms o- br	8 fs brig ht gr	2 fs brig ht gr	ms dull gr
Sub Soil #2	thickness																	
	texture colour	fs br				fs br								vfs dull gr	fs br	fs o- br	fs o- gr- br	
Wet?		Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Water?			30					50									65	50

Overall, soil observations show the seventeen locations have very similar soil characteristics where soil colour is somewhat variable below the consistently black surface layer. The soil profile is a black highly organic surface of 20 – 30 cm depth underlain by sand ranging in texture from medium sand to very fine sand. The soil profile was generally of high water content, with free water being encountered in four of the soil holes at depths ranging from 30 to 65 cm below surface. This consistent evidence of high water content throughout the soil profile in late August under mature forest with significant undergrowth is very strong evidence of wetland soil conditions. There were only two soil pits (6 and 14) which were identified as not wet. These two pits were at the south and west limits of the wetland as shown in Figure 2.

Confirmation of Ecological Land Classification

On September 24, Clarke Topp returned to the site with David Kroetsch to establish by site visit and field sampling of the soil the Ecological Land Classification (ELC) for this site. Mr. Kroetsch is an Ecologist with specialization at the Masters level in Soil Pedology. David now serves as instructor for the soils portion of the Ecological Land Classification for OMNR.

During this brief excursion three locations were chosen for sampling and ELC. The locations were near locations 2, 5, 16 identified in Figure 1. The findings are listed below in a south to north sequence and identified as 5a, 2a, and 6a.

Soil Pit # 5a

Mineral surface soil (20 cm) high in organic carbon, effective texture of the profile is sandy clay loam. Prominent mottles at 40 cm and below with gleying in the 60 – 90cm depth.

5a was classified as **moist** in the **ELC**, and **poorly drained** according to the Canada Soil Survey.

Soil Pit # 2a

25 cm highly organic surface soil, hand textured at 30% organic carbon – the boundary between organic and mineral soil classification. The texture of the surface soil can only be classified with laboratory tests. Effective texture of the profile is sandy loam, distinct mottles occur in the 30 – 60 cm range with gleying starting at 30 cm

2a was classified as **very moist** in the **ELC**, and **poorly drained** according to the Canada Soil Survey.

Soil Pit # 16a

Mineral surface soil (25 cm) high in organic carbon, effective texture of the profile is sandy clay loam. Prominent mottles and gleying was evident in the 5 – 30 cm depth.

16a was classified as **very moist** in the **ELC**, and **poorly drained** according to the Canada Soil Survey.

From this very limited excursion to the centre of the proposed Trade Centre site two of the locations (2a and 16a) were clearly classified as **very moist**, giving them a **wetland** designation from a soil perspective. The location 5a was classified as moist, as the gleying was not evident above 60cm, designating this location as **upland** from a soil perspective.

Based on these limited observations and sampling Mr. Kroetsch could not give an ELC soil rating for this site and suggested that the evidence gathered from this visit pointed

very strongly to the wetland designation. To assign an ELC designation to the site would require stratified random sampling protocol.

Making a more comprehensive assessment, combining the plant observations with these soil findings, Mr. Kroetsch said “This site screams *wetland* with the soil and plant regimes we are seeing here.”

Conclusions

1. All of the soil pits showed a dark surface layer which has high organic matter content, strongly indicative of soil development in a water laden environment. The soils of this proposed building site are clearly hydric. The ELC designation on a limited number of sites indicates these soils are very moist and fit a wetland designation.
2. The occurrence of such wet soil throughout the soil profile in late August in a mature forest is additional evidence for this being a wetland site. Late August is usually the period of lowest annual water table. An annual low water table at 30 to 65 cm as encountered during this brief excursion is very strong evidence that this site is usually wet.
3. The generally dull grey (reduced iron colour) or orange/dull grey mottles is indicative of anaerobic (anoxic) conditions or extended anaerobic periods, which occur consistently in wet soils.
4. The soil observations support fully the biological conclusion that this site is a wooded wetland.
5. The proposed Trade Show and Convention Centre constructed in this wooded wetland will cause major hydrological disruption of the current regional hydrologic (wetland) regime.

Annex 1

Habitat Descriptions of Selected Swampy Wetland Plants Observed on the Site from the *New Britton & Brown Illustrated Flora of the Northeastern United States and Canada*

Osmunda regalis - swamps and moist places

Matteuccia struthiopteris -swamps and moist wooded slopes and flats

Alisma triviale - swamps, ponds and streams

Glyceria striata -open swamps and marshes

Poa palustris - wet meadows and damp soil

Carex bebbii - wet meadows and shores

Arisaema triphyllum - moist or wet woods

Juncus effusus -open marshes and wet meadows

Populus balsamifera - wet woods, river banks and shores

Salix bebbiana -moist to wet places

Salix discolor - in swamps and wet ground

Salix petiolaris - moist meadows, stream banks and lakeshores

Alnus rugosa - wet soil

Polygonum hydropiper - in wet soil

Polygonum sagittatum - Marshes and wet meadows

Ranunculus pensylvanicus - Marshes, ditch banks, and wet meadows

Cardamine pensylvanica - swamps and wet woods

Rorippa islandica - in wet soil

Penthorum sedoides - marshes and muddy soil

Ribes triste - bogs and wet woods

Rubus pubescens - damp woods and bogs

Geum laciniatum - in moist or wet soil

Spiraea alba - wet meadows, swamps and shores

Impatiens capensis - moist woods, brooksides and springy places

Rhamnus frangula - especially in wet soil

Lythrum salicaria - in marshes, and along the shores of lakes and rivers

Epilobium ciliatum - wet or boggy soil

Epilobium coloratum - wet soil

Fraxinus pensylvanica - moist or wet woods

Verbena hastata - in moist fields, meadows, prairies and swamps

Mentha arvensis - wet woods, low woods, marshes, and shores

Scutellaria galericulata - in wet soil

Scutellaria lateriflora - wet soil

Mimulus ringens - wet woods and swamps

Galium palustre - wet soil

Sambucus canadensis - moist woods, fields and roadsides

Aster puniceus - swamps and other moist places

Eupatorium perfoliatum - in moist or wet low ground

Annex 2

Vascular Plants of the Woodland Wetland on the Proposed Trade Centre Site

EQUISETACEAE (Horsetail Family)

<i>Equisetum arvense</i>	Field Horsetail
<i>Equisetum sylvaticum</i>	Woodland Horsetail

OSMUNDACEAE (Flowering-fern Family)

<i>Osmunda claytoniana</i>	Interrupted Fern UC
<i>Osmunda regalis</i>	Royal Fern

POLYPODIACEAE (Fern Family)

<i>Athyrium filix-femina</i>	Lady Fern
<i>Dryopteris carthusiana</i>	Spinulose Woodfern
<i>Dryopteris intermedia</i>	Evergreen Woodfern
<i>Dryopteris marginalis</i>	Marginal Shieldfern
<i>Matteuccia struthiopteris</i>	Ostrich Fern
<i>Onoclea sensibilis</i>	Sensitive Fern

TYPHACEAE (Cat-tail Family)

<i>Typha</i> sp.	Cat-tail
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ALISMATACEAE (Water-plantain Family)

<i>Alisma triviale</i>	Water-plantain
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POACEAE (Grass Family)

<i>Echinochloa muricata</i>	Barnyard Grass
<i>Glyceria borealis</i>	Northern Manna Grass UC
<i>Glyceria striata</i>	Fowl Manna Grass
<i>Panicum capillare</i>	Witch Grass
<i>Poa palustris</i>	Swamp Meadow Grass

CYPERACEAE (Sedge Family)

<i>Carex bebbii</i>	Bebb's Sedge
<i>Carex rosea</i>	Rolled-up Sedge
<i>Carex</i> spp	Sedges.
<i>Scirpus</i> sp.	Bulrush

ARACEAE (Arum Family)

<i>Arisaema triphyllum</i>	Jack-in-the-pulpit
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LEMNACEAE (Duckweed Family)

<i>Lemna minor</i>	Small Duckweed in ditch
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JUNCACEAE (Rush Family)

<i>Juncus dudleyi</i>	Dudley's Rush	UC
<i>Juncus effusus</i>	Common Rush	
<i>Juncus</i> sp.	Rush	

LILIACEAE (Lily Family)

<i>Erythronium americanum</i>	Trout-lily	
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SALICACEAE (Willow Family)

<i>Populus balsamifera</i>	Balsam Poplar	
<i>Populus tremuloides</i>	Trembling ASpen	
<i>Salix bebbiana</i>	Bebb's Willow	
<i>Salix discolor</i>	Pussy Willow	
<i>Salix petiolaris</i>	Meadow Willow	
<i>Salix x rubens</i>	Crack Willow	

BETULACEAE (Birch Family)

<i>Alnus rugosa</i>	Speckled Alder	
<i>Betula papyrifera</i>	White Birch	

ULMACEAE (Elm Family)

<i>Ulmus americana</i>	White Elm	
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URTICACEAE (Nettle Family)

<i>Pilea pumila</i>	Clearweed	UC
<i>Urtica dioica</i>	Slender Stinging Nettle	

POLYGONACEAE (Knotweed Family)

<i>Polygonum hydropiper</i>	Water-pepper	
<i>Polygonum lapathifolium</i>	Dock Knotweed	
<i>Polygonum pensylvanicum</i>	Pennsylvania Knotweed	
<i>Polygonum sagittatum</i>	Arrow Vine	UC
<i>Rumex</i> sp.	Dock	

RANUNCULACEAE (Crowfoot Family)

<i>Actaea rubra</i>	Red Baneberry	
<i>Clematis virginiana</i>	Virgin's Bower	
<i>Ranunculus abortivus</i>	Small-flowered Buttercup	
<i>Ranunculus acris</i>	Common Buttercup	
<i>Ranunculus pensylvanicus</i>	Hairy Buttercup	RS
<i>Ranunculus recurvatus</i>	Hooked Buttercup	UC

CRUCIFERAE (BRASSICACEAE) (Mustard Family)

<i>Alliaria officinalis</i>	Garlic-mustard
<i>Barbarea vulgaris</i>	Yellow-rocket
<i>Cardamine pensylvanica</i>	Pennsylvania Bitter-cress
<i>Rorippa islandica</i>	Yellow Cress

CRASSULACEAE (Stonecrop Family)

<i>Penthorum sedoides</i>	Ditch Stonecrop UC
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SAXIFRAGACEAE (Saxifrage Family)

<i>Ribes americanum</i>	Black Currant
<i>Ribes cynosbati</i>	Wild Gooseberry
<i>Ribes triste</i>	Wild Currant UC

ROSACEAE (Rose Family)

<i>Agrimonia gryposepala</i>	Hooked Agrimony
<i>Fragaria virginiana</i>	Common Strawberry
<i>Geum canadense</i>	White Avens
<i>Geum allepicum</i>	Yellow Avens
<i>Geum laciniatum</i>	Slashed Avens UC
<i>Geum sp.</i>	
<i>Potentilla norvegica</i>	Rough Cinquefoil
<i>Prunus pensylvanica</i>	Fire Cherry
<i>Prunus serotina</i>	Black Cherry
<i>Prunus virginiana</i>	Choke Cherry
<i>Rubus pubescens</i>	Dwarf Raspberry
<i>Rubus strigosus</i>	Common Raspberry
<i>Spiraea alba</i>	Meadowsweet

LEGUMINOSAE (FABACEAE) (Bean Family)

<i>Medicago lupulina</i>	Black Medic on borehole track
<i>Melilotus alba</i>	White sweet-clover on borehole track
<i>Trifolium hybridum</i>	Alsike Clover on borehole track
<i>Vicia cracca</i>	Cow Vetch on borehole track

OXALIDACEAE (Wood-sorrel Family)

<i>Oxalis stricta</i>	Yellow Wood-sorrel
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CALLITRICHACEAE (Water-starwort Family)

<i>Callitriche verna</i>	Common Water-starwort UC in ditch
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ANACARDIACEAE (Cashew Family)

<i>Rhus radicans</i>	Poison Ivy
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ACERACEAE (Maple Family)

Acer negundo Manitoba Maple

BALSAMINACEAE (Touch-me-not Family)

Impatiens capensis Spotted Touch-me-not

RHAMNACEAE (Buckthorn Family)

Rhamnus cathartica Common Buckthorn

Rhamnus frangula Glossy Buckthorn

VITACEAE (Grape Family)

Parthenocissus vitacea Virginia Creeper

Vitis riparia River Grape

VIOLACEAE (Violet Family)

Viola sororia Woolly Blue Violet

LYTHRACEAE (Loosestrife Family)

Lythrum salicaria Purple Loosestrife

ONAGRACEAE (Evening-primrose Family)

Circaea lutetiana Enchanter's-nightshade

Epilobium ciliatum Willow-herb

Epilobium coloratum Purple-leaved Willow-herb UC

Oenothera biennis Evening Primrose on borehole track

UMBELLIFERAE (APIACEAE) (Carrot Family)

Pastinaca sativa Wild Parsnip on borehole track

CORNACEAE (Dogwood Family)

Cornus stolonifera Red-osier Dogwood

PYROLACEAE (Wintergreen Family)

Pyrola elliptica Shinleaf

OLEACEAE (Olive Family)

Fraxinus pennsylvanica Red Ash

ASCLEPIADACEAE (Milkweed Family)

Asclepias syriaca

BORAGINACEAE (Borage Family)

Hackelia virginiana Virginia Stickseed UC

Lithospermum officinale Gromwell

VERBENACEAE (Vervain Family)

Verbena hastata Blue Vervain

LABIATAE (LAMIACEAE) (Mint Family)

Galeopsis tetrahit Hemp-nettle

Mentha arvensis Wild Mint

Scutellaria galericulata Marsh Skullcap

Scutellaria lateriflora Mad-dog Skullcap

SOLANACEAE (Nightshade Family)

Solanum dulcamara Deadly Nightshade

SCROPHULARIACEAE (Figwort Family)

Linaria vulgaris Toadflax on borehole track

Mimulus ringens Monkey-flower

Verbascum thapsus Mullein on borehole track

PLANTAGINACEAE (Plantain Family)

Plantago sp.

RUBIACEAE (Bedstraw Family)

Galium palustre Marsh Bedstraw

Galium triflorum Fragrant Bedstraw

CAPRIFOLIACEAE (Honeysuckle Family)

Lonicera tatarica Tartarian Honeysuckle

Sambucus canadensis Canada Elderberry UC

Sambucus pubens Red Elderberry

Viburnum lentago Southern Wild Raisin

Viburnum trilobum Highbush-cranberry UC

CUCURBITACEAE (Gourd Family)

Echinocystis lobata Wild Cucumber

LOBELIACEAE (Lobelia Family)

Lobelia inflata Indian Tobacco

COMPOSITAE (ASTERACEAE) (Aster Family)

Achillea millefolium Yarrow on borehole track

Arctium minus Common Burdock on borehole track

Aster lanceolatus Panicked Aster

Aster lateriflorus Calico Aster

Aster puniceus Purple-stemmed Aster

Cirsium arvense Canada Thistle

Cirsium vulgare Bull Thistle

Crepis tectorum
Conyza canadensis
Erechtites hieracifolia
Eupatorium maculatum
Eupatorium perfoliatum
Eupatorium rugosum
Gnaphalium uliginosum
Lactuca biennis
Solidago altissima
Solidago canadensis
Solidago gigantea
Solidago graminifolia
Solidago rugosa
Sonchus oleraceus
Taraxacum officinale

Hawk's-beard # UC
Horseweed
Pilewort UC
Joe-Pye-weed
Boneset
White Snakeroot
Mud Cudweed # UC on borehole track
Blue-lettuce UC
Tall Goldenrod
Canada Goldenrod
Giant Goldenrod UC
Narrow-leaved Goldenrod
Rough Goldenrod
Annual Sow-thistle # UC
Common Dandelion

= Non-native species

The significance ratings - uncommon, rare- taken from the URBAN NATURAL AREAS ENVIRONMENTAL EVALUATION STUDY, APPENDIX A - Vascular Plants of the City of Ottawa, with Identification of Significant Species by Daniel F. Brunton

About the Authors

Albert Dugal MSc.

Albert Dugal is a botanist with outstanding expertise in identifying vascular plants used in determining wetland areas. Mr. Dugal has an MSc. degree in Plant Taxonomy and has been collecting and identifying vascular plants for almost 50 years. Prior to retirement, he was the Collection Specialist of vascular plants for the National Herbarium and the designated wetland expert for the Canadian Museum of Nature. His experience in collecting and identifying plants from wetlands extends from the Maritime Provinces to the prairies, including extensive experience with wetlands in eastern Ontario, particularly with the Leirtrim Wetland Complex which includes the Lester Road Wetland, the site of the proposed Trade Show and Convention Centre. Mr. Dugal has authored many scientific articles and is currently involved in an ongoing study of the historic Leirtrim Wetland, including producing reports on various parts of this complex and the wetland boundaries.

G. Clarke Topp, Ph.D (Soil Physics), P.Ag.

Dr. Clarke was a research scientist for 37 years with Agriculture & Agri-Food Canada in Ottawa. His primary research focus was to improve field measurement methods for soil-water properties and parameters. In the 1970s Dr. Topp conducted a comprehensive research project to measure and compare the field measured soil-water properties of the major soils in the Ottawa-Carleton region. Later in the decade, he introduced the soil community to the use of high frequency electromagnetic (EM) measurement. From this came Time Domain Reflectometry (TDR), a very versatile and powerful technique, for soil-water content measurement. He has held positions as Adjunct professor at Carleton University and the University of Guelph. He and colleagues have patented a soil cone penetrometer which measures both soil strength and water content.

Dr. Topp has published over 130 research papers in peer reviewed journals and conference proceedings, of which 50 involved EM techniques including TDR.

Among Dr. Topp's Scientific Responsibilities and Recognitions are:

- Innovator 2000 Award for outstanding technical innovation on TDR. Federal Partners Tech. Transfer, Ottawa
- 1997 Applied Soil Research Award presented by Soil Science Society of America.
- Co-Editor for 3rd Edition of "Methods of Soil Analysis - Soil Physical Properties", Soil Science Society of America 2001.

- Member of the Canadian Society of Soil Science - CSSS Fellow 1988 and member of the Soil Science Society of America - SSSA Fellow 1990.
- Soil water section co-editor and author or co-author of nine chapters in "Soil Sampling & Methods of Analysis, 2nd Edition". Edited by M.R. Carter & E.G. Gregorich for Canadian Society of Soil Science with CRC Press. 2007.