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Toronto and Region Conservation for The Living City

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TRIECA 2014

Evaluation of a Geotube and Hydraulic Dredging Approach to SWM Pond Cleanout in the City of Vaughan

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Presentation Outline

Project Details

- Key Stakeholders and Site Location
- Scope
- Justification
- Schedule & Timeline
- Sediment Removal Process using Geotube® units

Project Review

- City of Vaughan's perspective

Key Stakeholders

Municipality & Ownership

- Block 11 Properties Inc.
- City of Vaughan
- Toronto and Region Conservation Authority

Consulting

- McGill Development Services (Block Manager)
- Schaeffers Consulting Engineers (Block Engineer)

Contractor

- Roni Excavating (GC)
- Layfield Environmental Systems (Geotube Subcontractor) with
  - Geo-dredging and Dewatering Solutions Inc
  - Bishop Water Technologies Inc.

Site Location

Project Approach

- The Block Managers based on pre-consultation with the City & TRCA were aware that issues had arisen with some cases of the usual approach of drain down and sediment mucking.
- McGill Development Services & N-MAC Consulting acting as the Block 11 managers researched options for alternatives and resolved that an approach with dredging/geotubes was a viable alternative to include in a tendering process for the ponds clean-out.
- The technology was presented to City and TRCA staff to provide a level of comfort with the technology before proceeding to tender.
- Sediment testing had confirmed the material as MOE Table 2

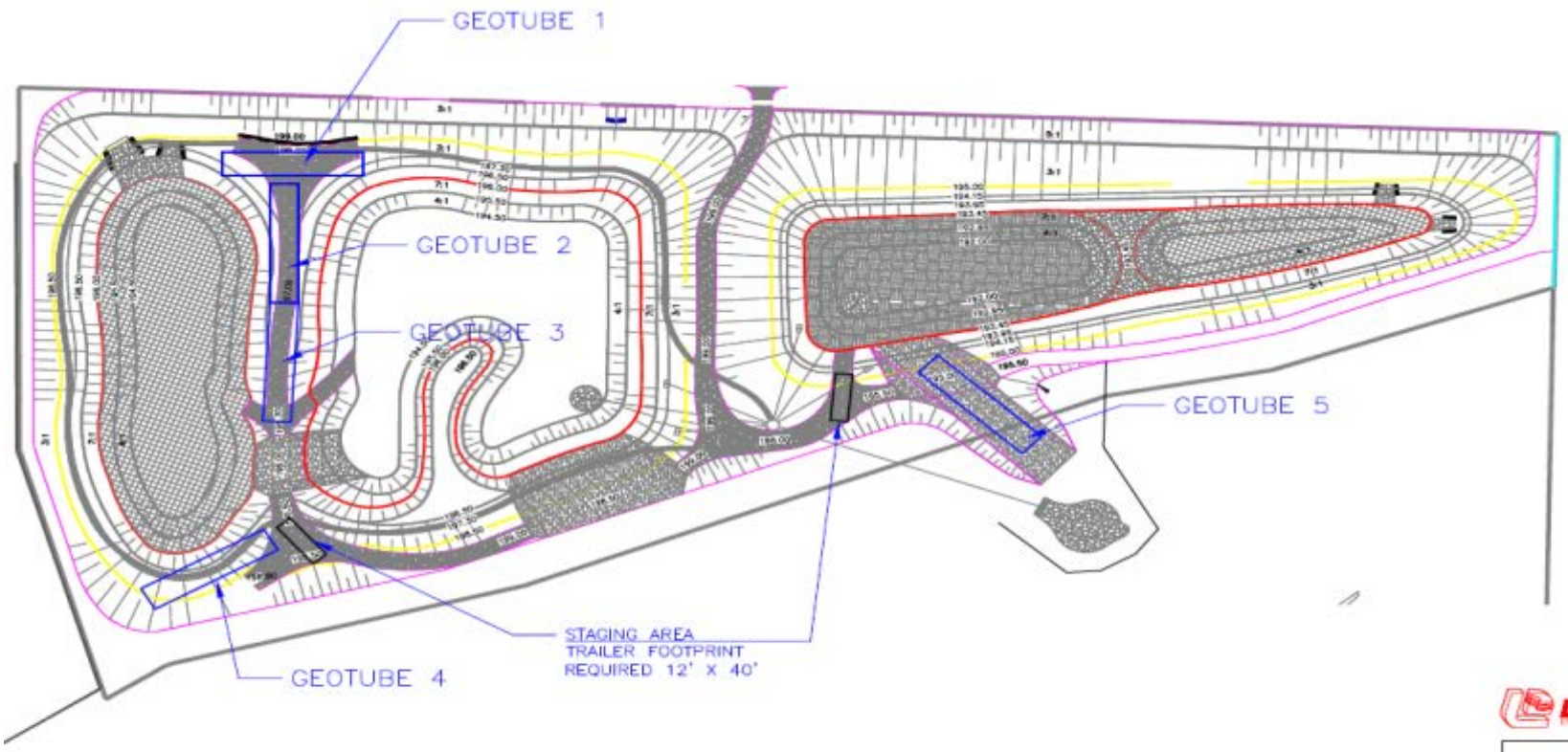
Project Scope

- Acquiring necessary permitting from relevant authorities
- Removal of 3,100 cubic metres of sediment from three SWM ponds in anticipation of assumption by the City
- The use of a hydraulic dredge and Geotube® dewatering technique to remove and consolidate the sediment
- Appropriately dispose of the dewatered sediment and restore the site

Project Justification – Why Geotube®?

- No need to drain the pond or take it off line while cleaning process takes place
- Extremely low impact to the surrounding naturalized area due to the absence of construction vehicle traffic
- Minimized impact to the surrounding community and reduced carbon footprint as the number of trucks required to haul the dewatered and consolidated sediment was substantially reduced.
- Minimal impact on the receiving downstream watercourse since neither the flow volumes nor turbidity levels from the pond were affected during the cleanout
- Dredging alternative was low bid for two of three ponds that were cleaned out.

SWM Pond 1A&1B Layout



Pond	Sed. Vol. Forebay	Sed. Vol. Main pond	Total (m^3)
1A	720	620	1340
1B	120	220	340

Avg Sediment Depth: 0.14 m to 0.33 m
Catchment Area: 1A = 28 ha. 1B = 32 ha.

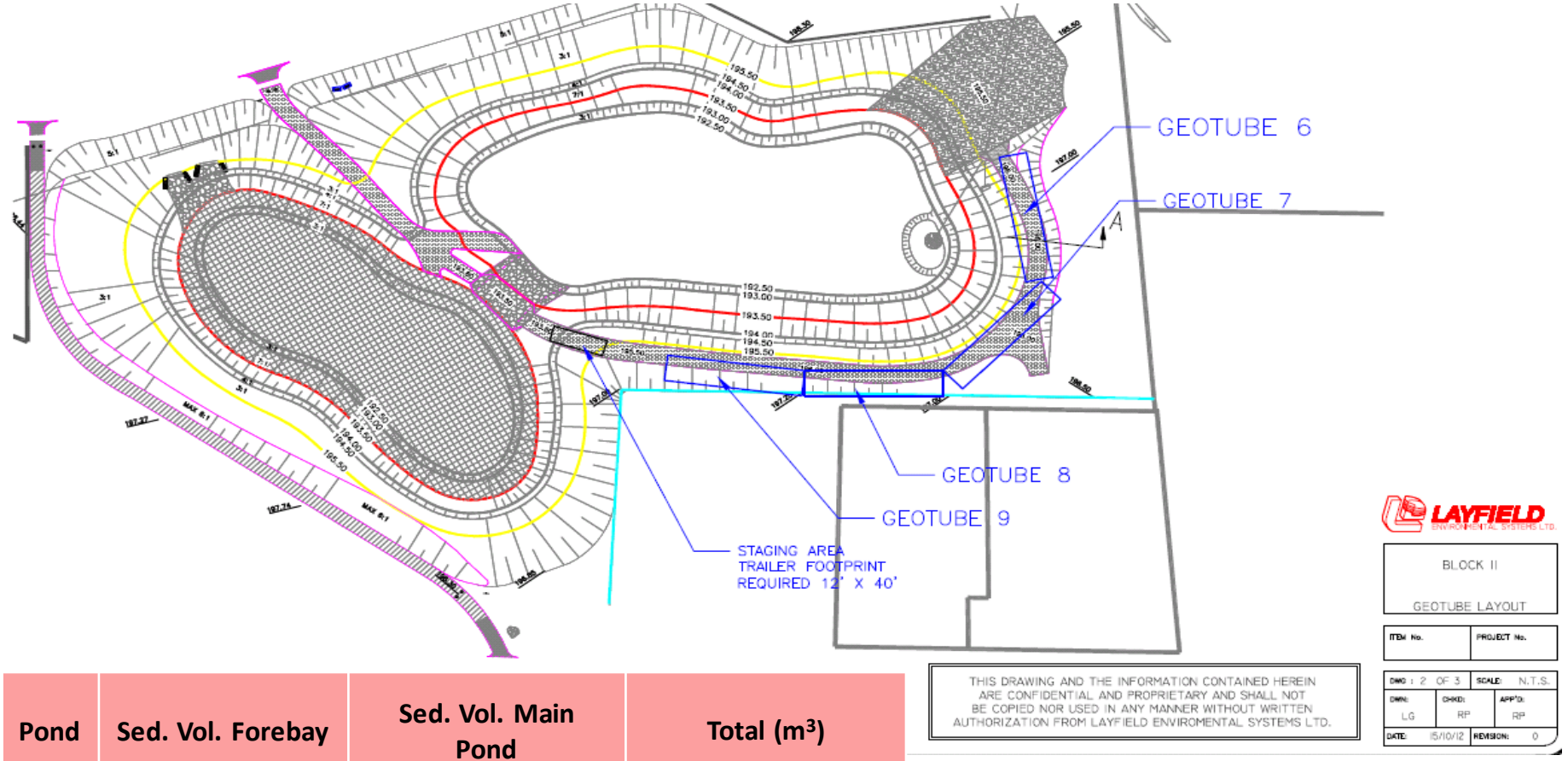
LAYFIELD

BLOCK II

GEOTUBE LAYOUT

ITEM No.	PROJECT No. P6516
DWG: 1 OF 3	SCALE: N.T.S.
DWN: LG	CHKD: RP
APP'D: RP	
DATE: 15/10/12	REVISION: 0

SWM Pond 4 Layout



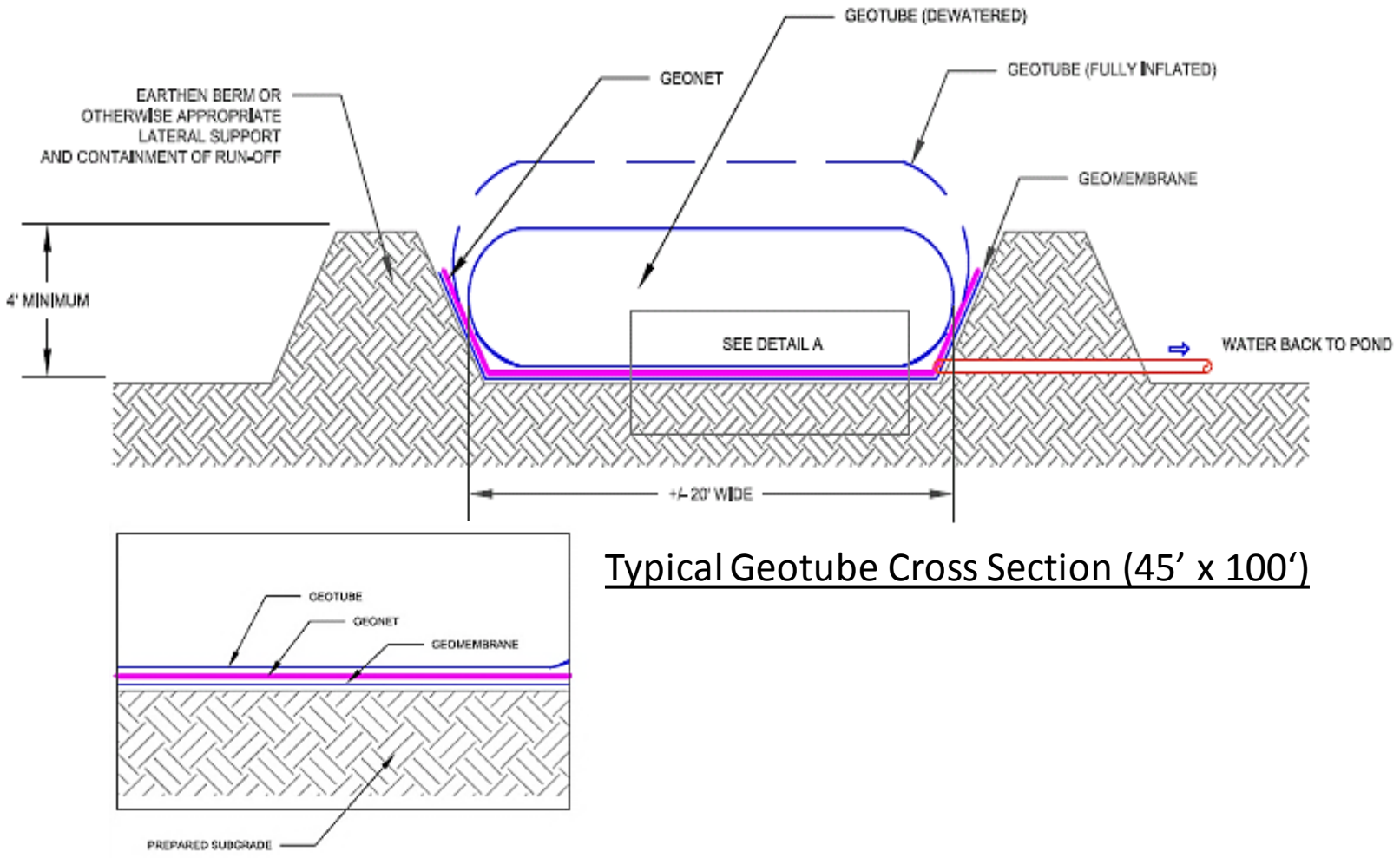
Pond	Sed. Vol. Forebay	Sed. Vol. Main Pond	Total (m^3)
4	770	460	1230

Avg. Sediment Depth: 0.08 m to 0.35 m
Catchment Area: 35 ha.

Sediment Removal Process

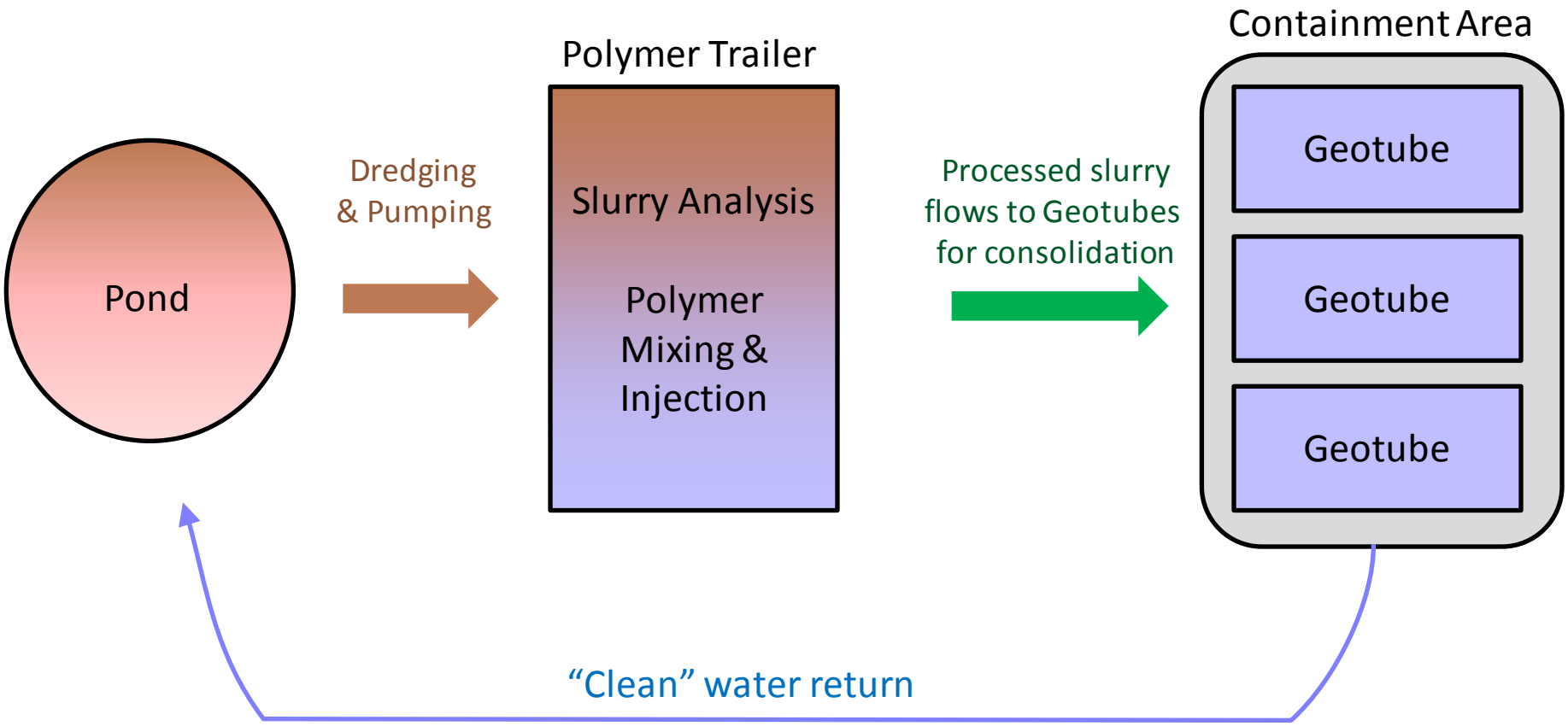
Preparation of Laydown Area: The area was lined and graded slightly to a low point so that the water discharged from the tubes could be controlled and directed back into the pond.

Sediment Removal Process



Typical Geotube Cross Section (45’ x 100‘)

Process Flow Diagram



Sediment Removal Process

Dredging: A remote controlled dredge with tow lines was deployed into the pond. The dredge was guided by a cable in a grid pattern to ensure no areas of the pond bottom were missed. Sediment load readings permit the operator to know when sediment removal is complete.

Sediment Removal Process

Pumping: The dredge pumped a slurry of sediment and water through a 6” diameter hose from the pond, passing through a polymer injection system and then into the Geotube® where the dewatering process took place. The sediment volume in situ totalled approximately 3,100 cubic meters at between 9 and 22% solids. As expected, a higher percentage solids content was found in the pond forebays.

Sediment Removal Process

Polymer Injection: A powdered anionic polymer was used in this application. State of the art injection technology allowed for optimization of the polymer used, a critical component to the project's success

Sediment Removal Process

Dewatering: The Geotube® continued to dewater the sediment after the pumping was completed. Generally the longer the Geotube® is allowed to sit, the more dewatering that takes place. After approximately one month, the tubes are ready to be opened up and the sediment removed. An approx. 10x reduction in volume can be achieved in some cases.

Sediment Removal Process

Sediment Removal: The Geotube® units were cut open and the consolidated sediment removed and hauled to a disposal site. The sediment is approximately 80% solids in these photos.

Work Schedule

CLIENT: Block 11 Properties Inc.

PROJECT: Block 11, Pond 1A & 1B & Pond 4

DESCRIPTION: Cleaning of SWMP

Month	May	June	July	Aug	Sept
Cleaning of Ponds (May-Sept)					
Mobilization, Site Preparation					
Layfield Dredging & Filling Geotubes					
Dewatering of Geotubes					
Removal of sediment, clean-up, Restoration					

City's Perspective

- How this cleaning approach compared with other similar projects.
- Early concerns on the how the proposed cleaning operation would be conducted.
- Opinion on the actual project outcome.

Assumed - Established Residential Pond Cleaning

- Municipalities essentially go with the lower cost solution. Not always the best one but we need alternatives.
- Traditional method involves sediment removal by conventional excavation and disposal off site.
- Haulage seems to be “the big ticket”.
- The conventional method includes:
- obtaining permits usually good for up two years, ensuring no interference with fisheries window
- Testing sediment to be removed for contamination.
- Conducting a precondition survey for insurance and deficiency purposes.
- Pumping the water out of the pond to an approved location using proper ESC measures.
- Setting up a bypass to avoid additional water from entering the pond during cleaning. Contingency plans are required in the event of major storms July 2013 for example.
- Using excavators to remove the sediment and placing it in locations to dry out or mix it with saw dust or other drier soil and finally its removal off site.
- A bathymetric survey will confirm the design volume of the pond is achieved.
- Winter cleaning is preferred as frozen conditions are easier to work in.
- Municipalities can reduce costs if they have somewhere to dispose of the fill nearby.
- Truck traffic in established residential subdivisions and minor mud tracking make up most of our complaints.
- We currently have 130 ponds. In the next 15 years Vaughan will own 200 ponds and require to clean at a frequency up to 7 ponds per year just to keep up.

Unassumed Pond Cleaning

- The Developer typically is responsible to clean their ponds before we assume them. We don't particularity care what method they use. The conventional method has been the most commonly used until last year.
- We have cleaned about 5 ponds so far using geotube.
- The main problem is space . Ponds 1a and 1b provided challenges which required creative thinking about where we were going to allow the tubes to be placed. Pond 4 had a large enough vacant parcel "Future site plan development lot". Our understanding is that the contractor entered into an agreement with the adjacent land owner to use the vacant land which was next to the pond.
- Using this method drew less attention by local area residents. No machines in the pond.
- There was a noticeable reduction in damage to landscaping features in the pond block.
- Not a single complaint was received during the cleaning of ponds 1a, 1b and 4.
- The geotube method while it is site specific is a viable alternative if we can have our pond and park block planning evolve with the technology. We should look into designing future storage areas in our pond blocks to keep costs down when 15-20 years down the road we have to clean them out.


CAT
28/10/2008


23/10/2008


29/10/2008


29/10/2008


Metres Pond Drain area
(approx. 300' X 40')
HOLE
Google earth

Summary

- Project survived two major rain events with no impact to schedule
- Polymer addition is critical to this technology's success
- "No surprises"
- Very low impact to the environment and surrounding neighborhood
- Total project cost is key to evaluating this approach
- Future consideration for tube laydown area in pond design would be beneficial for this technology