

**PHASE 2 ESA CONCEPTUAL SITE MODEL**

*of*

**210 QUAKER ROAD, WELLAND, ON**



Project: E-16-26-2

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## **1.0 REPORT PURPOSE**

The Record of Site Condition (RSC) property is identified as municipal address 210 Quaker Road, Welland, ON. The RSC property was once one of several lots owned by former adjacent commercial trucking business with parts of it utilized for additional parking of transport trailers and miscellaneous storage dating from the early 1970's. Prior to the land being utilized for adjacent commercial purposes a small portion of the property fronting Quaker Road was residential, and the northern part of the land agricultural, however, the land registry records for the RSC site determined no specific land use. See Figure 1 for Study Area, Site Location and Adjacent Land Uses. The proposed future use of the site is single family residential dwellings.

The Phase One Environmental Site Assessment (ESA) investigation identified fifteen (15) Potentially Contaminating Activities (PCA) that designated the RSC property with four (4) Areas of Potential Environmental Concern (APEC) thus triggering a Phase Two ESA, see Figures 2a and 2b for onsite and offsite PCAs and APECs. The objectives of the Phase Two ESA were to determine the presence/absence of potential contaminants of concern in soil and groundwater at the subject site in order to satisfy the requirements of Ontario Regulation 153/04, amended by O.Reg. 511/09. The purpose of this Phase Two ESA conceptual site model and RSC filing is to provide an overview of the work completed to date as documented within the Phase One ESA (August 30<sup>th</sup>, 2016) and Phase Two ESA (October 2<sup>nd</sup>, 2017).

### **Site Description**

The study site is currently a vacant parcel of land encompassing a total of 9.55 hectares. Towpath Drain (creek) runs along the northern part of the property from west to east. A former residence and shed/garage previously located along the southern part of the property and fronting Quaker Road, was demolished in the late 1980's/early 1990's. The area has since become overgrown with vegetation. The former east central portion of the site utilized by adjacent commercial trucking business was regraded with sparse vegetation beginning to develop.

### **2014 Towpath Drain Remediation**

As discussed above, the study site was once a part of the adjacent commercial trucking business property. Throughout the late 1990's-2014 various environmental site assessment work was completed at the adjacent site by Kevin Christian, P.Geo, QP, under consulting firms Eon Environmental Ltd., Oakhill Environmental Ltd. and Hallex Environmental Ltd. The site assessment work included site remediation pertaining to Towpath Drain, a portion of which is located at the current RSC property. It was determined that the infilling practices and distribution of fill material for parking and storage purposes had impacted the creek sediment within the watercourse, via runoff, resulting in deposition of Metals (cadmium, copper, lead,

nickel, and zinc) in exceedance of MOE sediment criteria. Remediation of the creek (across both the RSC site and adjacent site) took place in September 2014 and included:

- Niagara Peninsula Conservation Authority permit for in water works,
- design and reconstruction of the creek channel and south bank to stabilize the creek and prevent erosion and re-contamination of the creek sediments,
- site grading / drainage control design to prevent contaminants and sediment from entering the creek via surface runoff from the truck parking areas,
- excavation from high water line to high water line was down to the underlying native soil (silty clay) with all impacted sediment being removed and disposed of at an MOE licensed landfill,
- final verification samples (nine (9) samples within Towpath Drain at 210 Quaker Road RSC property) showed all soil parameters met applicable MOE Table 9 criteria.

The sediment was removed from the site and disposed of at an MOE licensed landfill. Figure 3a provides original and verification sample locations within Towpath Drain and located on the RSC property. The results of the final verification samples concluded the remediation work within the creek.

#### **Hallex 2016/2017 ESA Work Summary**

Following the sale of the adjacent lands, the new owner requested a Phase One ESA and RSC filing for the newly severed 210 Quaker Road property. The Phase One ESA identified fifteen (15) PCAs resulting in four (4) onsite APECs thus triggering a Phase Two ESA investigation. The Phase Two investigation occurred between 2016 and 2017 and included the advancement of nine (9) test-pits, seventeen (17) boreholes and three (3) monitoring wells across the site. See Figure 3b for Borehole, Test-pit and Monitoring Well Locations. Results revealed one (1) impacted area along the eastern property boundary, identified as APEC-4, with the presence of Metals and Petroleum Hydrocarbons, in surficial historic fill, in exceedance of applicable Table 9 regulations (Figure 3c Initial Phase Two Results). The area was remediated with impacted material transported to an MOE licensed landfill. Confirmatory verification samples met applicable Ministry of the Environment Table 9-Generic Site Condition Standards for land use within 30 m of a Water Body in a Non-Potable Ground Water Condition. No groundwater impact was noted throughout the site and no target contaminants were identified associated with APEC-1, APEC-2 or APEC-3 areas. The site was considered remediated and was subsequently regraded for proposed future development.

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## **2.0 REPORT ORGANIZATION**

The Phase Two conceptual site model (CSM) is organized to follow the requirements as set out in O.Reg 153/04 Part IV, Schedule E section 43(2) to 43(9), as amended by O.Reg 511/09. The CSM is compiled as per the Table of Contents. As required, the conceptual site model consists of diagrams, cross-sections and figures as well as text and tables presenting site history, potentially contaminating activities (PCA's), areas of potential concern (APEC's), environmental site assessment activities, and results. The information contained herein is obtained from the recent Phase One ESA (August 30<sup>th</sup>, 2016) and Phase Two ESA (October 2<sup>nd</sup>, 2017) investigations completed by Hallex.

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**3.0 CURRENT CONDITION OF THE PROPERTY OR, WHERE REMEDIAL ACTIONS HAVE BEEN UNDERTAKEN, THE CONDITION OF THE PHASE TWO PROPERTY BEFORE THE REMEDIAL ACTIONS WERE UNDERTAKEN**

The conditions of the soil at the property prior to remedial actions being undertaken were that exceedances to contaminant groups Metals and Petroleum Hydrocarbons were detected within the former parking lot/storage area along the northeastern and central eastern property boundary. Historically, target contaminants Metals were present within the sediment of Towpath Drain. Both areas were remediated to applicable residential site condition standards.

As groundwater met applicable Ministry of the Environment Site Condition Standards (2011) Table 9: Generic Site Condition Standards for land use within 30 m of a Water Body in a Non-Potable Groundwater Condition, no remedial actions were required.

#### **4.0 APPLICABLE SITE CONDITION STANDARD**

Site sensitivity analyses determined the Soil and Groundwater Site Condition Standards (SGWSS) that would be applicable to the subject site as per O.Reg. 153/04, amended by O.Reg. 511/09. Site sensitivity is determined based on conformance or non-conformance with: shallow soil conditions, soil pH, proximity to an “Area of Natural Significance”, and the presence of a stream or water body on-site or within 30 metres of the subject property. A ‘sensitive site’ would require application of ‘Full Depth Background Site Condition Standards’. The ‘Full Depth Generic’ standards that would apply to a ‘non-sensitive site’ are further determined based on potable or non-potable groundwater conditions and coarse or fine soil texture.

#### **210 Quaker Road, Welland, ON– Site Sensitivity Analysis**

The rationale for the selection of SGWSS criteria for the subject property included:

- **Intended Property Use:** Residential
- **Soil Texture:** fine
- **Soil pH:** 5.74-6.60
- **Area of Natural Significance:** No.
- **Environmentally Sensitive Area:** No.
- **Water Body:** Yes, one water body, a creek, identified as Towpath Drain runs through the north central part of the property. It is considered a regulated watercourse by the Niagara Peninsula Conservation Authority.
- **Shallow Soil Property:** No, the overburden at the RSC property is greater than 2.0 m in depth and therefore does not constitute what is called a “shallow soil property”.
- **Depth to bedrock:** Not encountered at maximum borehole depth of 3.0 metres. Depth to bedrock was encountered at 30 m below ground surface based on the wells within the surrounding area.
- **Water Wells:** No drinking water wells were identified on-site, however some were located within the study area. The site is yet to be serviced, however municipal services are present along Quaker Road.

#### **Applicable Regulatory Criteria**

O.Reg. 511/09 Ministry of the Environment Site Condition Standards (2011) Table 9: Generic Site Condition Standards for Use within 30 m of a Water Body in a Non-Potable Groundwater Condition fine texture soil was applied to the subject site, based on conditions observed at the time of the site assessment.



## 5.0 AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

### 5.1 Description of Each Area

Fifteen (15) Potentially Contaminating Activities (per Schedule D Table 2 in Ontario Regulation 511/09) were identified in the Phase One ESA that resulted in four (4) Areas of Potential Environmental Concern at the study site as described below and shown on Figures 2a and 2b.

| Areas of Potential Environmental Concern <sup>1</sup> | Location of Area of Potential Environmental Concern on Phase One Property | Potentially Contaminating Activity <sup>2</sup>     | Location of PCA (on-site or off-site) | Contaminants of Potential Concern <sup>3</sup> | Media Potentially Impacted (Ground water, soil and/or sediment) |
|---|---|---|---------------------------------------|--|---|
| APEC-1  | Central to east central portion of the site                               | #30 Importation of Fill Material of Unknown Quality | On-site                               | Metals   | Soil  |
| APEC-2  | Central to east central portion of the site                               | #11 Commercial Trucking and Container Terminals     | On-site                               | PHCs, BTEX, Metals                             | Soil and Groundwater  |
| APEC-3  | Southeast area of the property along eastern property line (Area A)       | #11 Commercial Trucking and Container Terminals     | On-site                               | PHCs, BTEX, Metals                             | Soil and Groundwater  |
| APEC-4  | Northeast area of the property along eastern property line (Area B)       | #11 Commercial Trucking and Container Terminals     | On-site                               | PHCs, BTEX, Metals                             | Soil and Groundwater  |
| APEC-5  | Central to east central portion of the site                               | #30 Importation of Fill Material of Unknown Quality | On-site                               | Metals   | Sediment  |

#### 5.1.1 PCA-1/APEC-1: Importation of Fill Material of Unknown Quality

The original ground surface in the central area of the property to the eastern property boundary was historically graded with imported fill material of unknown quality to facilitate expansion of truck/trailer overflow parking from adjacent Tallman Transports Ltd., a commercial trucking business. This area was identified as APEC-1 with contaminants of concern being Metals.

#### 5.1.2 PCA-2/APEC-2, PCA-3/APEC-3, PCA-4/APEC-4: Commercial Trucking and Container Terminals

The east adjacent commercial trucking business purchased the study site for use for additional parking/storage of trucks, trailers, and miscellaneous trucking related equipment/parts stored in sea faring containers dating from the early 1970's. The partial use of the site for storage purposes specific to a

trucking operation (within the centre towards eastern property boundary) represented APEC-2. Within APEC-2, two additional areas were considered APEC's. APEC-3 and APEC-4 were identified for the noted visible presence of dark staining across the ground surface. It is unknown what was previously stored within these locations to have resulted in the staining. Contaminants of concern within these areas included PHC's, BTEX and Metals.

### 5.1.3 PCA-5/APEC-5: Importation of Fill Material of Unknown Quality

The original ground surface in the central area of the property to the eastern property boundary was historically built-up with imported granular fill material of unknown quality and leveled to facilitate expansion of truck parking from adjacent Tallman Transports Ltd., a commercial trucking business. Runoff from this area into the onsite creek (Towpath Drain) could have resulted in deposition of Metals contaminants to the sediment.

## 5.2 PCA's within the Study Area

Eleven (11) properties within 250 m study area were noted for having PCA's, however, it was unlikely that any contaminants migrating offsite would have represented an onsite APEC at the study site given groundwater flow direction being northeast (away from study site), cross-gradient locations and distances to the study site.

| PCA             | Business                    | Address             | PCA        | Distance (m) to site |
|-----------------|-----------------------------|---------------------|------------|----------------------|
| PCA-6 to PCA-11 | Formerly Tallman Transports | 1003 Niagara Street | USTs/AST   | 134 m east           |
| PCA-12          | Autobody Shop               | 975 Niagara Street  | AST, drums | 111 m east           |
| PCA-13          | Automotive Machine Shop     | 967 Niagara Street  | AST, drums | 125 m east           |
| PCA-14          | Farrar Service Station      | 947 Niagara Street  | USTs       | 164 m east           |
| PCA-15          | Rays Auto Repair            | 160 Quaker Street   | AST, drums | 93 m east            |
| PCA-16          | Pioneer Gas Station         | 935 Niagara Street  | USTs       | 151 m southeast      |

Other land uses within the study area North, South, East, and West of the study site did not exhibit visible items of concern that would constitute potentially contaminating activities to the subject site regarding potential for impact to soil or groundwater.

## **6.0 PHYSICAL SETTING**

### **6.1 Stratigraphy, Topography, & Geology**

Review of topographic map # 30M/3 and 30M/6, Google Earth data, and site survey information indicated the site slopes in two directions; east towards the Welland Canal, located approximately 1.7 kilometers from the study site, and north towards a small creek (Towpath Drain) that meanders through the property. The developed areas of the site are generally flat lying with a slope of approximately 0.1% to 0.2% northeast. The approximate mean elevation of the site ranged from 177 to 183 metres above sea level (masl). Review of: Quaternary Geology of Ontario [Ontario Geological Survey Map 2556] indicated that the subject site is underlain by a thin veneer of granular fill material (varying in thickness from 0.1 to 0.3 m) over Glaciolacustrine silt and clay over the Guelph Formation; as was confirmed through the Phase Two program. The general overburden stratigraphy observed in boreholes and test pits consisted of:

| <b><u>Depth (avg.)</u></b> | <b><u>Description</u></b>                   |
|----------------------------|---|
| 0-1.5 m                    | Brown SILTY CLAY with trace/occasional SAND |
| 1.5-4.5 m                  | Brown SILTY CLAY                            |

Figures 4a-c represent regional and site specific cross sections.

### **6.2 Hydrogeological Characteristics**

The confined aquifer at approximately 165 masl was determined through surrounding well data records. The site hydrogeological conditions exhibited an unconfined aquifer at the study site. Hydraulic gradient for the subject site, measured through the onsite wells, ranged from  $i = 0.0042$  to  $0.0115$  across the site. Hydraulic conductivity based on field results was  $k = 3.756 \times 10^{-6}$  cm/s. Surface runoff at the site would be diverted northeast towards the creek. Net surface drainage across the site is northeast. Figure 5 portrays the topography and groundwater flow direction across the study site. The overall regional groundwater flow was interpreted as southeast within the Welland River drainage basin as influenced by the Welland River.

### **6.3 Climatic or Meteorological Conditions**

Climatic or meteorological conditions that may have influenced distribution and migration of the contaminants, such as temporal fluctuations in ground water levels, were not expected to be significant at the study site within the identified APEC areas.

### **6.4 Approximate Depth to Bedrock**

Depth to bedrock at the RSC property was greater than 4.5 metres and not encountered during site investigation. Using historic well records within the surrounding area, it was determined bedrock is encountered at approximately 30 m below ground surface or 152 masl.

### **6.5 Approximate Depth to Water Table**

Site hydrogeological conditions were identified regarding the unconfined, 'water table' regime via monitoring wells MW-1 to MW-3. The conditions within the overburden were documented regarding groundwater elevation and groundwater flow direction. Depths to groundwater varied from 0.48 to 1.71 metres below ground surface in MW-1, MW-2 and MW-3, respectively (see Figure 5). The elevated groundwater level was influenced by the presence of coarse stone, gravel and granular fill.

### **6.6 Areas where soil has been brought from another property and placed on, in or under the Phase Two property**

No soil was brought to the property during any of the Phase Two ESA investigation or post remedial phase.

### **6.7 Approximate locations, if known, or any proposed buildings and other structures**

Locations of new buildings are unknown, but development of residential spaces is planned.

## **7.0 INVESTIGATION METHODS**

Preparation for test-pit advancement and borehole/monitoring well installation was initiated via requests for demarcation of underground utilities by Ontario One Call: for Bell, cable, hydro, natural gas, water and sewer. All services were indicated as 'clear' for the designated work areas.

### **7.1 Test Pits**

Test-pits were advanced across the site by sub-contractor Anthony's Excavating, who utilized a mini excavator. TP-1 to TP-9 were advanced within APEC 1 and APEC 2.

### **7.2 Borehole Drilling**

Landshark Drilling utilized a Geoprobe brand dual tube sampling systems for borehole installation within APEC-3 and APEC-4. A beneficial feature of this type of system is its effectiveness in collecting continuous soil cores from within a cased hole. Some of the field advantages of using this type of sampling system include:

- continuous soil coring in both saturated and unsaturated zones; and
- the use of a cased hole eliminates the potential for cross contamination between samples.

### **7.3 Field Screening**

On site field screening measurements were conducted utilizing the E-34102 Portable Multi-Gas Detection Eagle Series (Eagle) capable of measuring hydrocarbon Combustible Soil Vapour Concentrations (CSVC's) from 1 part per million (ppm) to 100% Lower Explosive Limit (LEL). In the field, the split sample method was utilized for Volatile Organic Compounds (VOC's) screening and laboratory analysis. A portion of each borehole sample was placed in a plastic bag and allowed to warm to approximately 20°C for headspace combustible vapour measurement using an Eagle dual gas vapour probe. The remaining portion of each sample was placed in a 250 ml glass jar with a Teflon lined lid, filled to zero head-space, sealed, and placed in a cooler with ice packs for transportation. Additionally, the Eagle can measure oxygen (O<sub>2</sub>), hydrogen sulphide (H<sub>2</sub>S), methane, carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>) levels in LEL and % volume ranges. The readings from the Eagle metre were utilized to indicate the presence or absence of VOC's present within the field samples. Those samples with the highest ppm or % LEL readings were chosen, in addition to other samples from various depths, as determined by QP Kevin Christian, to be good representative samples to be analyzed.

All soil samples were logged for colour, texture, structure, moisture, and visual and olfactory evidence of contamination. Additionally, textural identification of soil, through hand soil textural techniques, including the 'squeeze test' and 'ribbon test' were conducted during all soil logging and sampling events.

## **7.4 Soil**

### **7.4.1 Test-pit Sampling – APEC-1 and APEC-2**

Nine (9) test-pits were installed across the site. Granular fill material of unknown origin was historically spread across this portion of the site for adjacent commercial truck and trailer parking and miscellaneous business-related use. Areas with visible staining were evaluated through borehole investigation (described below as APEC-3 and APEC-4). Test-pits were excavated to depths of 1.8 m with samples obtained from SA-1 (0-0.3 m) and SA-2 (0.3-1.8 m). Select samples were submitted for laboratory analysis of PHCs, BTEX and Metals. See Figure 3a for test-pit locations.

### **7.4.2 Borehole Sampling – APEC-3 and APEC-4**

A total of seventeen (17) boreholes, BH-1 to BH-17 and one (1) surface sample (SURF-1) were advanced across the site within the area previously utilized by the adjacent trucking facility for parking and miscellaneous storage. The boreholes were installed within the two areas with visible staining, denoted as APEC-3 and APEC-4 on the figures. APEC-3 had ten (10) boreholes, BH-1 to BH-10 installed within the southeast area of site. APEC-4 contained seven (7) boreholes, BH-11 to BH-17 and one (1) surface sample (SURF-1), located towards the northeast corner of the subject site. Select samples were submitted for laboratory analysis of PHCs, BTEX, and Metals. Borehole samples were collected from 0-1.5 m (SA-1), 1.5-2.4 m (SA-2), 2.4-3.0 m (SA-3). See Figure 3a for borehole locations.

## **7.5 Groundwater Monitoring Wells**

Three (3) monitoring wells were installed at the site, MW-1 was installed into APEC-3, MW-2 within APEC-4 and MW-3 in APEC-2 (Figure 3a). The wells were constructed to MOECC recognized industry standards and consisted of a 2-inch diameter slotted PVC screen surrounded by a silica sand pack, attached beneath a solid 2-inch diameter PVC riser, surrounded by bentonite grout to ensure a seal between ground surface and the water table. The wells were fitted with a stand-up metal protective casing. A waterra manual lift pump was installed into each well to allow purging and development, and subsequent groundwater sample collection. The groundwater samples were collected after each well was purged of a minimum of 3 well volumes.

## **7.6 Groundwater Field Measurement of Water Quality and Parameters**

Water quality parameters such as pH, specific conductance and temperature were not measured within the stage of investigation reported here.

## **7.7 Groundwater Sampling**

The groundwater levels in the wells were measured and recorded with a Solinst water-level metre prior to being purged dry. No free product or sheen was observed in any of the monitoring wells or samples. Groundwater sampling was conducted with samples being placed inside a cooler for transportation to the

lab. Samples from wells MW-1, MW-2 and MW-3 and were submitted to Paracel Laboratories Ltd. for analyses of PHCs, BTEX and Metals.

| Monitoring Well | Groundwater Elevation (masl) |
|-----------------|------------------------------|
| MW-1            | 181.97 masl                  |
| MW-2            | 179.73 masl                  |
| MW-3            | 180.28 masl                  |

## 7.8 Groundwater Calculations

The shallow unconfined groundwater conditions within the overburden, were documented regarding groundwater elevations, groundwater flow direction and hydraulic gradient, and saturated hydraulic conductivity via monitoring wells.

### Depth to Groundwater and Elevations

Depth to groundwater below top of casing: preliminary depths to groundwater and corresponding groundwater table elevations ranged from 179.73 to 181.97 masl.

### Groundwater Flow Direction

The groundwater flow direction at the study site was interpreted as north-northeast ranging from 22.5° to 45° azimuth.

### Hydraulic Gradient (*i*)

The hydraulic gradient was calculated as  $i = 0.012$  across the site

### Hydraulic Conductivity (*k*)

Rising-head hydraulic conductivity tests were conducted in monitoring wells using the Bouwer-Rice method.

| Monitoring Wells | Hydraulic Conductivity ( <i>k</i> ) cm/sec |
|------------------|--|
| MW-1             | $1 \times 10^{-7}$ cm/s                    |
| MW-2             | $2.398 \times 10^{-5}$ cm/s                |
| MW-3             | $6.295 \times 10^{-6}$ cm/s                |

## 8.0 RESULTS

### 8.1 Soil

Soil results from test-pits and borehole sample locations pertaining to APEC-1, APEC-2 and APEC-3 all met applicable MOE Table 9 criteria with no exceedances noted. Soil results from the borehole investigation within APEC-4 revealed exceedances at borehole sample location BH-16 for PHC F2 and F4 and at SURF-1 for Metals as presented below and on Figure 3c.

| Parameter           | Table 9 Residential, Non-potable | BH-16    |
|---------------------|----------------------------------|----------|
| <i>Hydrocarbons</i> |                                  |          |
| F1 PHCs (C6-C10)    | 25 ug/g dry                      | ND (7.0) |
| F2 PHCs (C10-C16)   | 10 ug/g dry                      | 16       |
| F3 PHCs (C16-C34)   | 240 ug/g dry                     | 142      |
| F4 PHCs (C34-C50)   | 120 ug/g dry                     | 130      |

| Parameter     | Table 9 Residential, Non-potable | SURF-1 |
|---------------|----------------------------------|--------|
| <i>Metals</i> |                                  |        |
| Antimony      | 1.3 ug/g dry                     | 7.8    |
| Chromium      | 70 ug/g dry                      | 187    |
| Cobalt        | 22 ug/g dry                      | 338    |
| Copper        | 92 ug/g dry                      | 1190   |
| Nickel        | 82 ug/g dry                      | 922    |

### 8.2 Delineation & Verification of APEC-4

Within the area designated as APEC-4 two distinct pockets of black foundry sand and one area that was questionable for containing foundry sand was identified. The areas were labelled as Area 1, Area 2 and Area 3. Area 3 (the questionable black foundry sand area) was the only one initially sampled (with results BH-16 and SURF-1 reported above). Initial excavation of Areas 1 and 2 with subsequent verification sampling was planned based on visual inspection and previous Phase Two work at the site. A Toxicity Characteristic Leachate Procedure (TCLP) analysis was conducted on the fill material for landfill disposal requirements. Anthony's Excavating Inc. was subcontracted to remove the contaminated material from Areas 1, 2 and 3 via scrapping layers of soil. The material was disposed of at Walker's Landfill. Initial verification and sampling was obtained from the floor area of the excavation as maximum depth was 2" (0.051m). Laboratory results continued to revealed exceedances for Metals and PHCs F3 and F4 as presented below and on excavation Figures 6a-6e and cross section Figures 7a and 7b.

| Parameter     | Table 9 Res. Non-potable | AREA 1-1 | AREA 1-2 | AREA 1-3 | AREA 2-1 | AREA 2-2 | AREA 2-3 | AREA 3-1 | AREA 3-2 |
|---------------|--------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| <i>Metals</i> |                          |          |          |          |          |          |          |          |          |
| Antimony      | 1.3 ug/g dry             | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |



| Parameter | Table 9 Res. Non-potable | AREA 1-1 | AREA 1-2 | AREA 1-3 | AREA 2-1 | AREA 2-2 | AREA 2-3 | AREA 3-1 | AREA 3-2 |
|-----------|--------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Chromium  | 70 ug/g dry              | 20.2     | 15.8     | 23.3     | 34.6     | 28.6     | 24.6     | 40.8     | 21.2     |
| Cobalt    | 22 ug/g dry              | 11.4     | 7.7      | 13.2     | 21.6     | 18.7     | 11.4     | 44.3     | 11.2     |
| Copper    | 92 ug/g dry              | 10.7     | 8.5      | 12.5     | 75.3     | 55.1     | 26.8     | 146      | 27.8     |
| Nickel    | 82 ug/g dry              | 16.2     | 14.8     | 20.8     | 52.9     | 44.0     | 24.9     | 120      | 24.3     |

| Parameter           | Table 9 Res. Non-potable | AREA 1-1 | AREA 1-2 | AREA 1-3 | AREA 2-1 | AREA 2-2 | AREA 2-3 | AREA 3-1 | AREA 3-2 |
|---------------------|--------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>Hydrocarbons</b> |                          |          |          |          |          |          |          |          |          |
| F2 PHCs (C10-C16)   | 10 ug/g dry              | ND (4)   | ND (4)   | ND (4)   | ND (4)   | ND (4)   | ND (4)   | ND (4)   | ND (4)   |
| F3 PHCs (C16-C34)   | 240 ug/g dry             | 201      | 44       | 37       | 564      | 271      | 301      | 35       | ND (8)   |
| F4 PHCs (C34-C50)   | 120 ug/g dry             | 573      | 126      | 76       | 1620     | 1140     | 703      | 143      | ND (6)   |

Additional material was scraped from depths 2''-4'' (0.051-0.10 m) from within the exceedance areas with a second round of verification samples obtained. The second round of verification sampling indicated Areas 1 and 3 now met applicable site condition standards for PHCs and Metals while Area 2 still indicated exceedances for PHC (F3 and F4), as per below.

| Parameter     | Table 9 Res. Non-potable | VS- 1-1  | VS- 1-2  | VS- 1-3  | VS- 2-1  | VS- 2-2  | VS- 2-3  | VS- 3-1  | VS- 3-2  |
|---------------|--------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>Metals</b> |                          |          |          |          |          |          |          |          |          |
| Antimony      | 1.3 ug/g dry             | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) | ND (1.0) |
| Chromium      | 70 ug/g dry              | 20.4     | 17.3     | 23.0     | 38.8     | 25.8     | 27.7     | 22.8     | 24.8     |
| Cobalt        | 22 ug/g dry              | 8.5      | 6.6      | 13.5     | 18.7     | 12.2     | 17.8     | 11.4     | 13.2     |
| Copper        | 92 ug/g dry              | 9.5      | 8.3      | 11.4     | 84.7     | 32.4     | 35.8     | 18.0     | 26.3     |
| Nickel        | 82 ug/g dry              | 17.5     | 15.4     | 19.6     | 33.8     | 25.4     | 35.0     | 21.4     | 25.4     |

| Parameter           | Table 9 Res. Non-potable | VS- 1-1 | VS- 1-2 | VS- 1-3 | VS- 2-1 | VS- 2-2 | VS- 2-3 | VS- 3-1 | VS- 3-2 |
|---------------------|--------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| <b>Hydrocarbons</b> |                          |         |         |         |         |         |         |         |         |
| F3 PHCs (C16-C34)   | 240 ug/g dry             | ND (8)  | ND (8)  | 51      | 486     | 88      | 541     | 67      | ND (8)  |
| F4 PHCs (C34-C50)   | 120 ug/g dry             | ND (6)  | ND (6)  | 84      | 331     | 139     | 60      | 109     | ND (6)  |

Subsequent removal of material within Area 2 to final floor sampling depth of 6'' (0.15m) followed by final verification sampling and analysis concluded that the requirements of Ontario Regulation 153/04, amended by O.Reg. 511/09 Table 9: Generic Site Condition Standards for Use within 30 m of a Water Body in a

Non-Potable Groundwater Condition had been satisfied. The approximate volume of impacted material removed from site and disposed of at an MOE licensed landfill was 15.65 MT.

| Parameter           | Table 9 Res.<br>Non-potable | Area-2<br>VS-1 | Area-2<br>VS-2 | Area-2<br>VS-3 |
|---------------------|-----------------------------|----------------|----------------|----------------|
| <i>Metals</i>       |                             |                |                |                |
| Antimony            | 1.3 ug/g dry                | ND (1.0)       | ND (1.0)       | ND (1.0)       |
| Chromium            | 70 ug/g dry                 | 27.9           | 17.0           | 26.0           |
| Cobalt              | 22 ug/g dry                 | 12.8           | 8.0            | 11.1           |
| Copper              | 92 ug/g dry                 | 27.5           | 23.5           | 30.1           |
| Nickel              | 82 ug/g dry                 | 28.7           | 17.6           | 24.8           |
| <i>Hydrocarbons</i> |                             |                |                |                |
| F3 PHCs (C16-C34)   | 240 ug/g dry                | ND (8)         | 62             | ND (8)         |
| F4 PHCs (C34-C50)   | 120 ug/g dry                | ND (6)         | 46             | ND (6)         |

### 8.3 Fine-Medium Soil Texture

Grain size analysis was conducted by Paracel Laboratories Ltd. to determine textural classification. Sample results indicated Med/Fine texture. Soil texture across the site as observed in native soil in test pits and boreholes as in common through the Welland area based on QP work at numerous sites in the area, was consistent and considered representative of grain size analysis results conducted by Paracel Laboratories Ltd.

### 8.4 Groundwater Results

Groundwater was investigated within the identified areas of potential environmental concern with all sampling results for target contaminant groups PHCs, BTEX and Metals meeting applicable MOE criteria.

### 8.5 Quality Assurance and Quality Control Measures

Instruments and all their associated components are checked daily prior to field use. Annual equipment servicing and maintenance is conducted by Enviro Measure Inc. to ensure the Eagle Dual Gas Monitor remains properly calibrated and functioning. In addition, Hallex conducted Quality Assurance/Quality Control (QA/QC) measures throughout all stages of the assessment and remediation process, including blind duplicate groundwater samples, trip blanks, field blanks to verify sampling procedures and results. The data indicated comparable accurate results for all wells and the trip blank indicated no cross contamination of samples. Additionally, Paracel Laboratories, (accredited to the ISO/IEC 17025 Standard by CALA), conducts in-house QA/QC measures on their client's samples to ensure accuracy in their testing methods.

## **9.0 CONTAMINANTS**

### **9.1 Each area where a contaminant is present on, in or under the Phase Two property at a concentration greater than the applicable site condition standard**

As discussed above in Section 1.0 (2014 Towpath Drain Remediation), an initial area of Metals impacted sediment was located within Towpath Drain, the creek that runs through the northern part of the site. Remedial efforts were completed in 2014 and met applicable industrial/commercial site condition soil standards (land use at that time), as all sediment had been removed down to native material. As Table 9 commercial and residential standards for soil are the same the previous verification results were still considered valid for the conversion of the property to residential land use.

Following the Phase Two soil and groundwater ESA investigation it was confirmed that APEC-4 contained exceedances within the soil for contaminants of concern Metals and PHCs vs. Table 9 Site Condition Standards for Residential Land Use in a Non-Potable Ground Water Situation within 30 metres of a water body. Remediation of this portion of the property was subsequently completed to residential site condition standards.

### **9.2 Each medium in which a contaminant associated with an area is present**

Contaminants were identified within the soil mediums in exceedance of Table 9 Site Condition Standards and previously within the sediment in exceedance of Table 9 Site Condition Standards for Commercial Land Use in a Non-Potable Ground Water Situation.

### **9.3 Migration of Contaminants**

The extent of exceedances noted within APEC-4 appeared to only coincide with the locations of the black foundry slag material potentially deposited as fill to grade the site for parking lot use. Over time, target contaminants from the parking lot area were deposited to the sediment within Towpath Drain. Horizontal migration of contaminants was observed at the site via runoff from the parking areas. Vertical migration of contaminants was not observed throughout the site as was confirmed through clean sample results.

### **9.4 If applicable, information concerning soil vapour intrusion of the contaminants into buildings**

No buildings are located at the study site therefore vapour intrusion is not applicable.

### **9.5 Subsurface Structure or Utilities that may affect Contaminant Distribution and Transport**

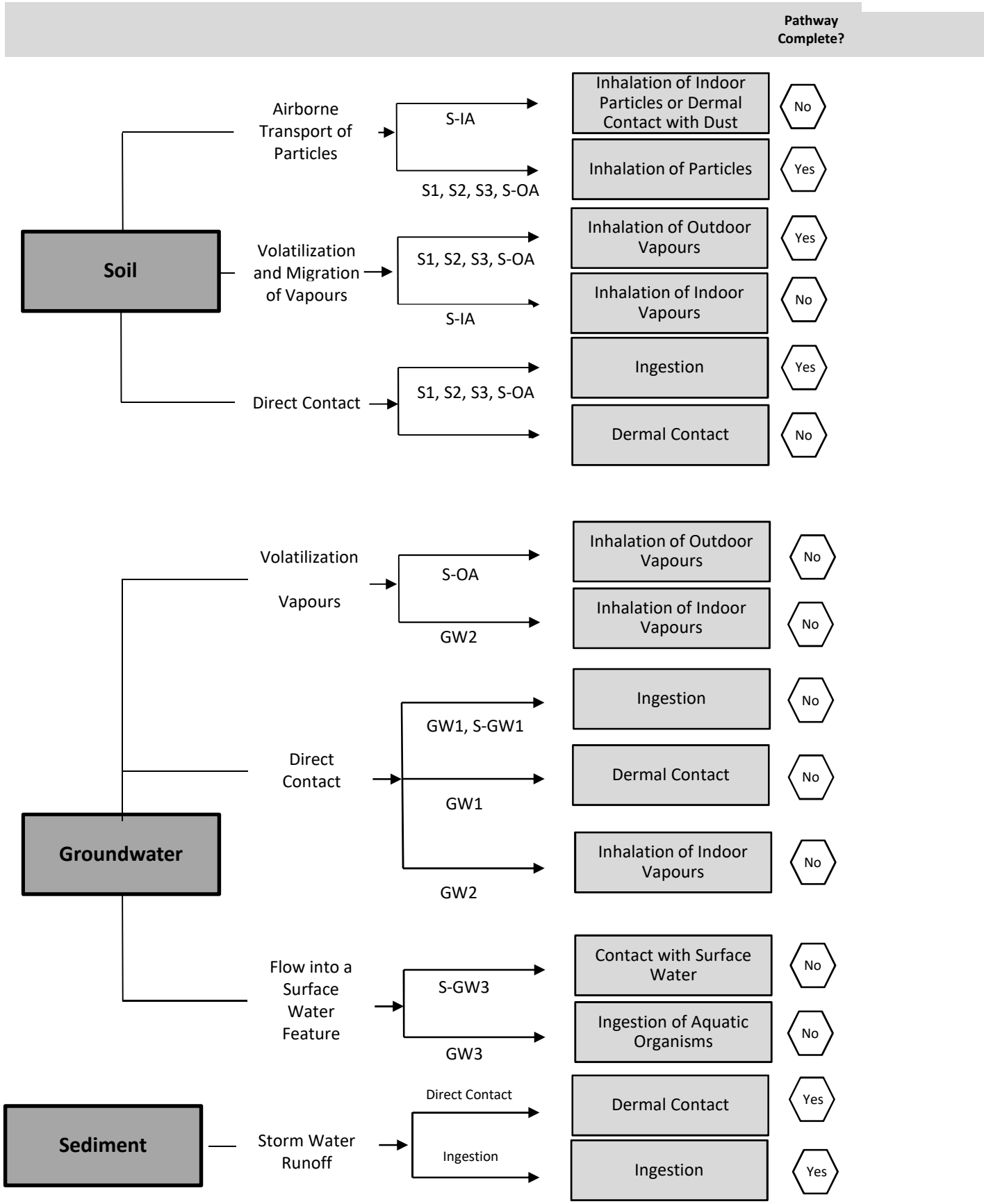
The only services once provided to the site were along Quaker Road at the former location of the residence and shed/garage, having been decommissioned with demolition approximately 27 years ago. The identified APEC areas across the site never housed any utilities or subsurface structures that would have contributed to contaminant distribution and transportation.

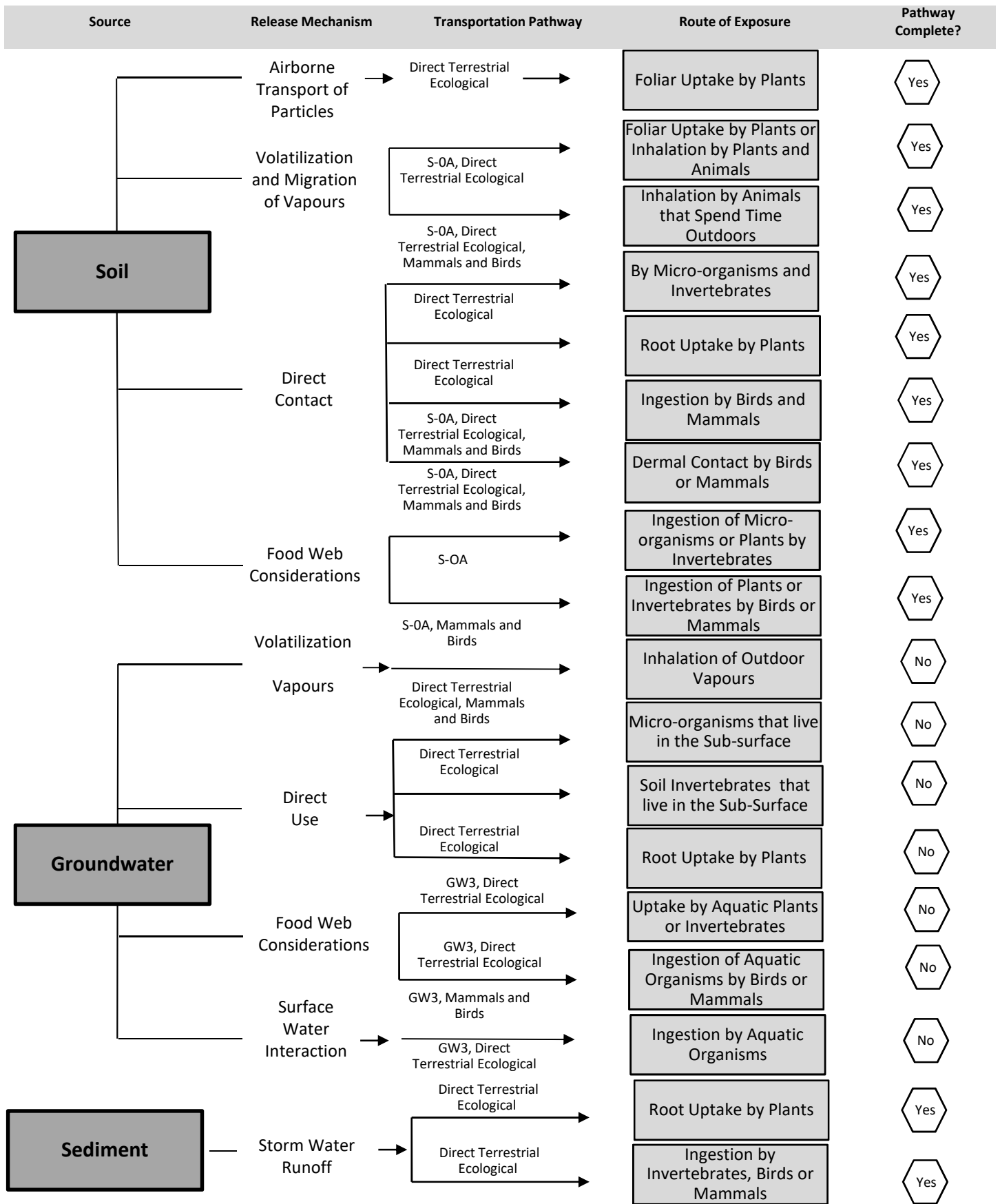
## **10.0 RECEPTOR EXPOSURE TO CONTAMINANTS**

The Phase Two conceptual site model diagrams qualitatively consider the potential interaction of target contaminants and the pathway(s) and exposure route(s) to the receptors for human and ecological health prior to remediation. The diagrams depict impacts resulting from target contaminants prior to any remediation of soil. Petroleum Hydrocarbons and Metals were identified in the soil and Metals within the sediment at the study site. No contaminants were identified within the groundwater at the study site.

Through airborne transportation of particles, volatilization and migration of vapours, and direct contact, the PHCs in soil could cause human health concerns. Inhalation or ingestion of the particles or vapours, dermal contact, or odours from the soil all represent possible routes of exposure through various soil to air transport pathways for Metals. Ecological health concerns include the PHCs released through volatilization and migration of vapours, and Metals through direct contact by mammals, birds, or invertebrates. Inhalation or ingestion of the particles or vapours, or dermal contact by animals that spend time outdoors all represent possible routes of exposure through various soil transport pathways. Through ingestion and root uptake from storm water runoff, metals in sediment may affect ecological health. Since no groundwater exceedances were present on the study site, all pathways for human and ecological health for groundwater are not complete.

## Human Health Conceptual Site Model





## **11.0 CONCLUSIONS**

### **11.1 Any uncertainty or absence of information obtained in each of the components of the Phase Two ESA that could affect the validity of the model**

The CSM is considered valid with no absence of information. The Phase Two ESA investigation pertaining to the study site was completed in full and considered accurate.

### **11.2 Rationale for filing RSC based on Phase Two ESA**

#### **Sediment**

Towpath Drain was remediated in 2014 with contaminated sediment removed down to native material and disposed of at an MOE licensed landfill. Final verification results met applicable Table 9 criteria.

#### **Soil**

A total of 15.65 MT of contaminated material was removed from APEC-4 and disposed of at an MOECC licensed landfill. All final verification sampling results met Ministry of the Environment Site Condition Standards 2011 Table 9: Generic Site Condition Standards for Use within 30 m of a Water Body in a Non-Potable Groundwater Condition.

#### **Groundwater**

The Phase Two ESA groundwater observations at monitoring well locations MW-1, MW-2 and MW-3 indicated all samples met Ministry of the Environment and Climate Change Site Condition Standards 2011 Table 9: Generic Site Condition Standards for Use within 30 m of a Water Body in a Non-Potable Groundwater Condition.

**Hallex therefore concludes no further environmental assessment work is considered necessary. The results as of September 21<sup>st</sup>, 2017 justify filing a Record of Site Condition for change to residential land use.**

### **11.3 Signature**



---

Kevin Christian, M.Sc., P.Geo. Qualified Person  
Principal Geoscientist











Source: 2010 Google Earth Imagery



**Legend**

- Phase One, Two & RSC Property
- Adjacent Property Boundaries
- PCA/APEC
- Towpath Drain

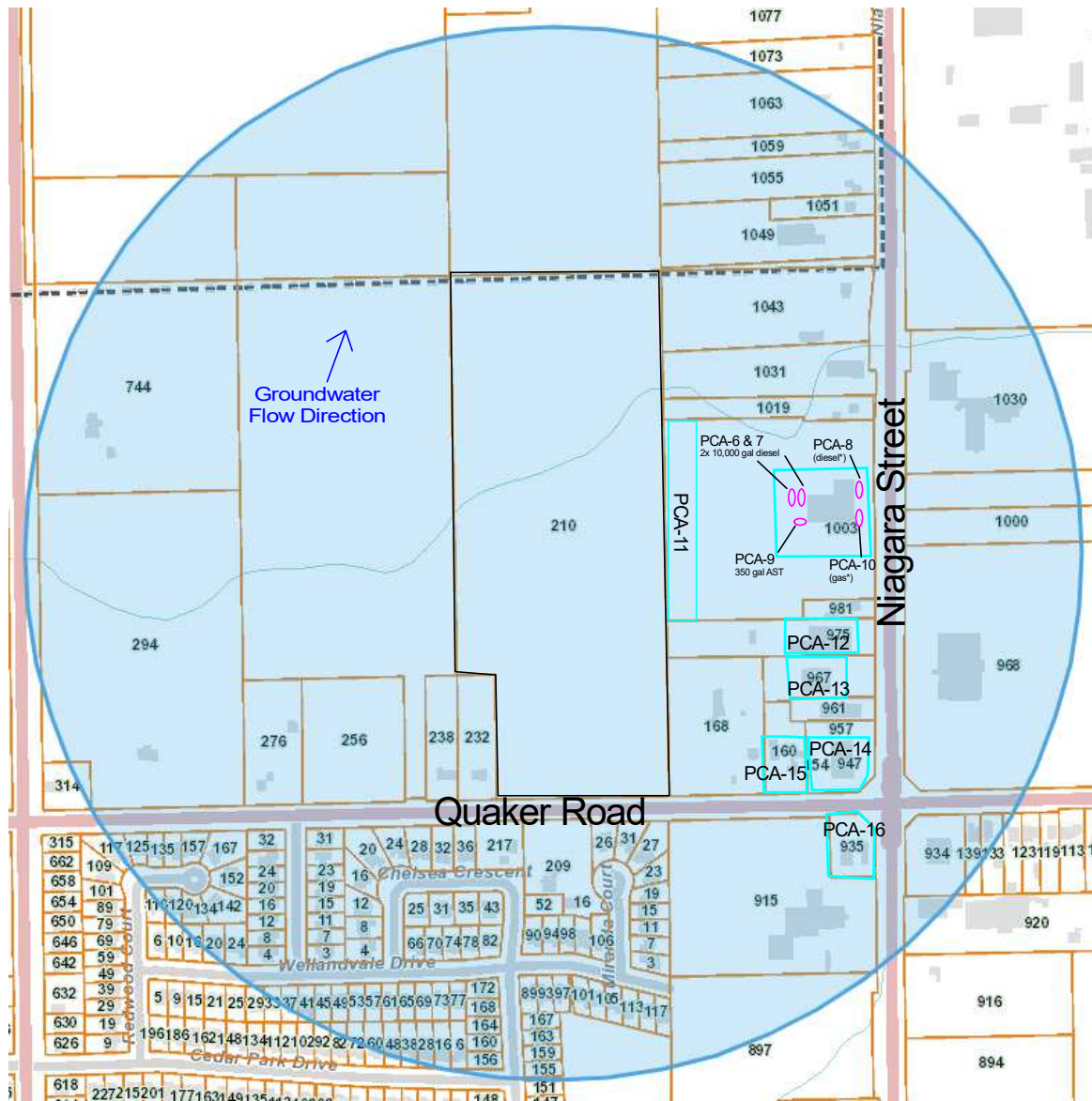
PCA-1/APEC-1: Fill Material  
 PCA-2/APEC-2: Commercial Trucking  
 PCA-3/APEC-3: Commercial Trucking  
 PCA-4/APEC-4: Commercial Trucking  
 PCA-5/APEC-5: Fill Material

Client  
 2547634 Ontario Limited & IVA Homes Ltd.

Project  
 Phase Two Conceptual Site Model:  
 210 Quaker Road  
 Welland, ON

Figure Name  
 On-site PCA's and APEC's

|   |               |
|---|---------------|
| <small>Project</small><br>E-16-26-4                                     | <b>Figure</b> |
| <small>Date</small><br>September 2017                                   | <b>2a</b>     |
| <small>Drafted:</small> J. Anema<br><small>Reviewed:</small> J. Glasier |               |



**HALLEX**  
ENVIRONMENTAL LTD.

**Legend**

- Phase One, Two & RSC Property
- Study Area (250 m radius)
- PCA-#
- USTs/ASTs

PCA-6-10: USTs/ASTs  
 PCA-11: Commercial Trucking  
 PCA-12,13, 15: Autobody Shop  
 PCA-14: Service Station (Historic)  
 PCA-16: Service Station

\* volume of tanks unknown, removed in early 1950's

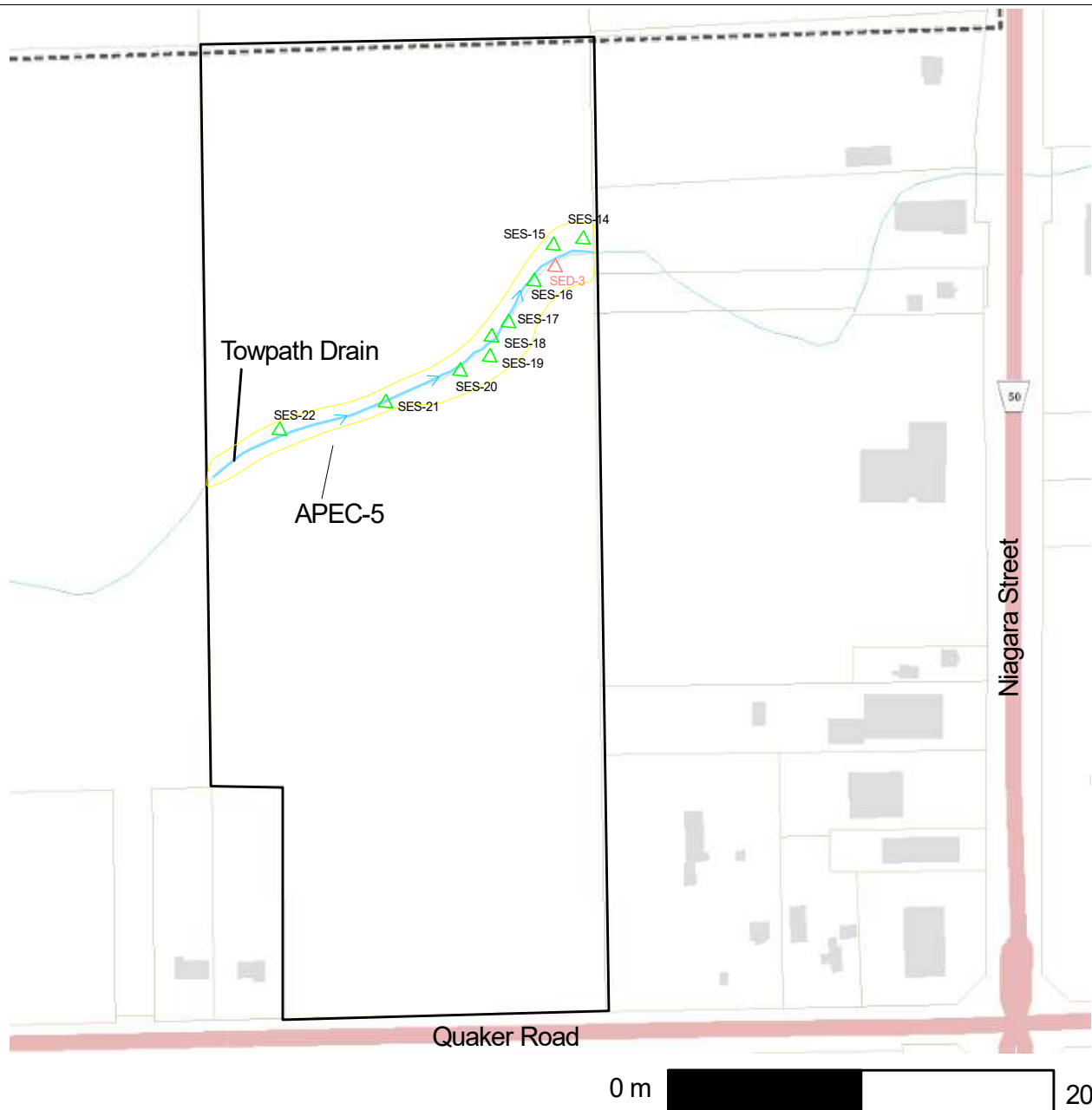
Client  
 2547634 Ontario Limited & IVA Homes Ltd.

Project  
 Phase Two Conceptual Site Model:  
 210 Quaker Road,  
 Welland, ON

Figure Name  
 Off-site PCA's within the Study Area

|  |           |
|--|-----------|
| Project<br>E-16-26-4                     | <b>2b</b> |
| Date<br>September 2017                   |           |
| Drafted: J. Anema<br>Reviewed: J. Glaser |           |





**Legend**

- Phase One, Two & RSC Property
- Watercourse
- APEC-5
- △ Sample Location

SED = original sediment sample location  
 SES = verification sample

Meets applicable criteria  
 Indicates previous exceedance location

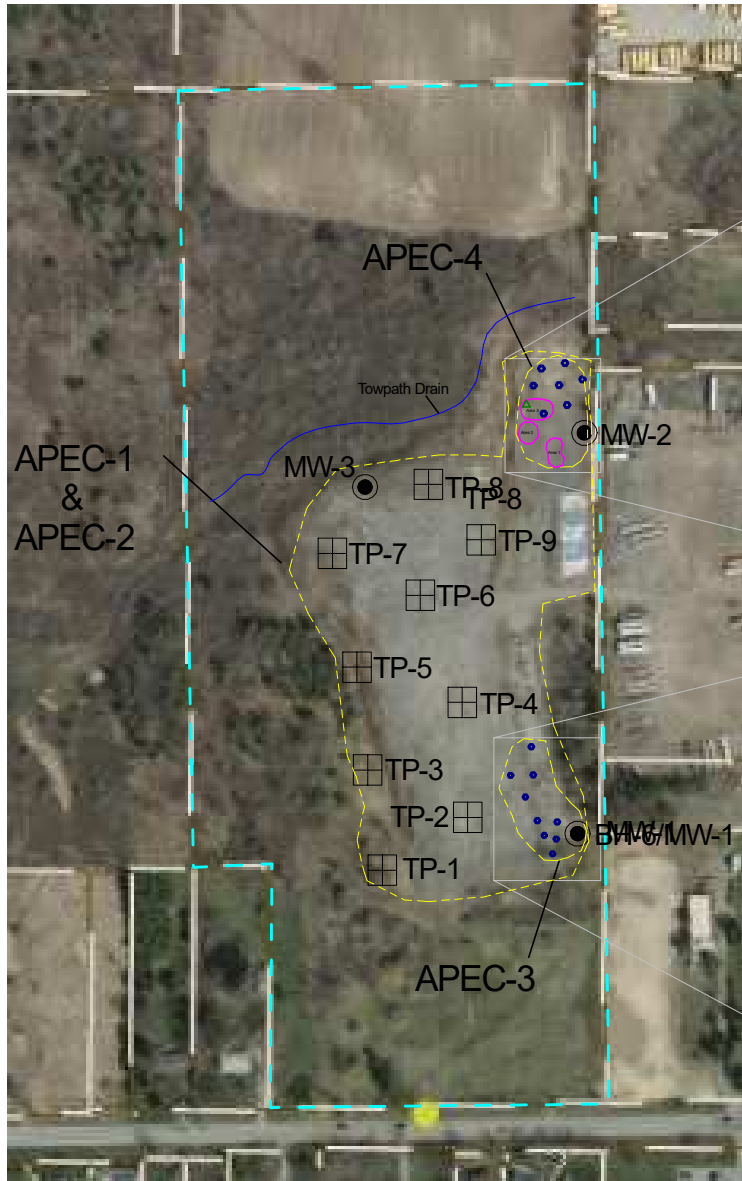
Client  
 2547634 Ontario Limited & IVA Homes Ltd.

Project  
 Phase Two Conceptual Site Model:  
 210 Quaker Road,  
 Welland, ON

Figure Name  
 Sample Locations - Towpath Drain

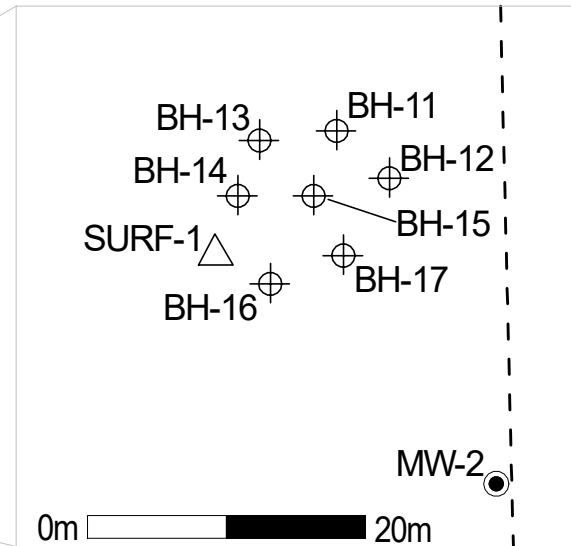
|                        |                      |
|------------------------|----------------------|
| Project<br>E-16-26-4   | <b>Figure<br/>3a</b> |
| Date<br>September 2017 |                      |
| Drafted: J. Anema      |                      |
| Reviewed: JG           |                      |



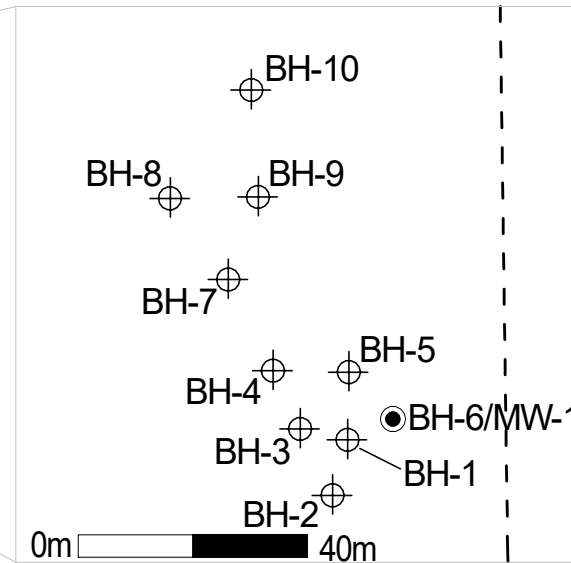


Source: 2016 Google Earth Imagery



0m 200m



0m 20m



0m 40m

**Legend**

- Property Boundary
- Monitoring Well Location
- Borehole Location
- Test Pit Location
- Borehole Location
- Surface Sample
- APEC Area
- Focused areas within APEC-4

**Client**  
 2547634 Ontario Limited & IVA Homes Ltd.

**Project**  
 Phase Two Conceptual Site Model:  
 210 Quaker Road,  
 Welland, ON

**Figure Name**  
 Borehole, Test Pit and Monitoring Well Locations

|                        |                  |
|------------------------|------------------|
| Project<br>E-16-26-4   | <b>Figure 3b</b> |
| Date<br>September 2017 |                  |
| Drafted: JF            |                  |
| Reviewed: JG           |                  |

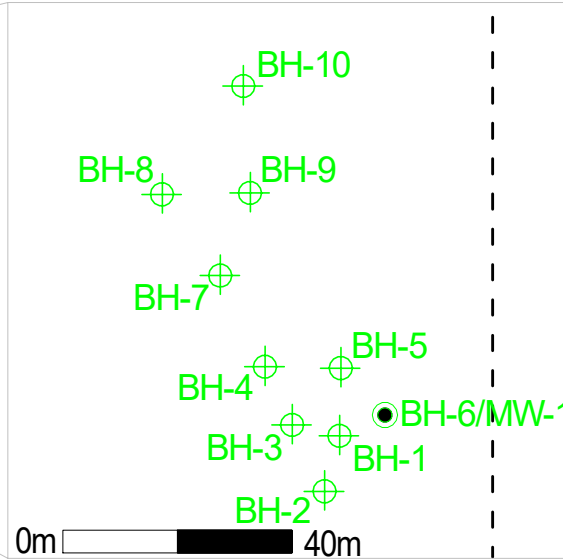
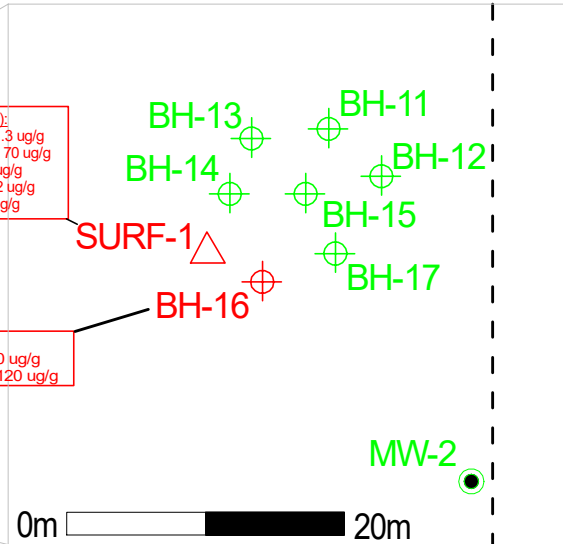


Source: 2016 Google Earth Imagery

0m 200m

**SURF-1 (0-0.051 mbgs):**  
 Antimony 7.8 ug/g vs. 1.3 ug/g  
 Chromium 187 ug/g vs. 70 ug/g  
 Cobalt 338 ug/g vs. 22 ug/g  
 Copper 1190 ug/g vs. 92 ug/g  
 Nickel 992 ug/g vs. 82 ug/g

**BH-16 (0-0.10 mbgs):**  
 PHC F2 16 ug/g vs. 10 ug/g  
 PHC F4 130 ug/g vs. 120 ug/g



**Legend**

- Property Boundary
- Monitoring Well Location
- Borehole Location
- Test Pit Location
- Surface Sample
- APEC Area
- Focused areas within APEC-4

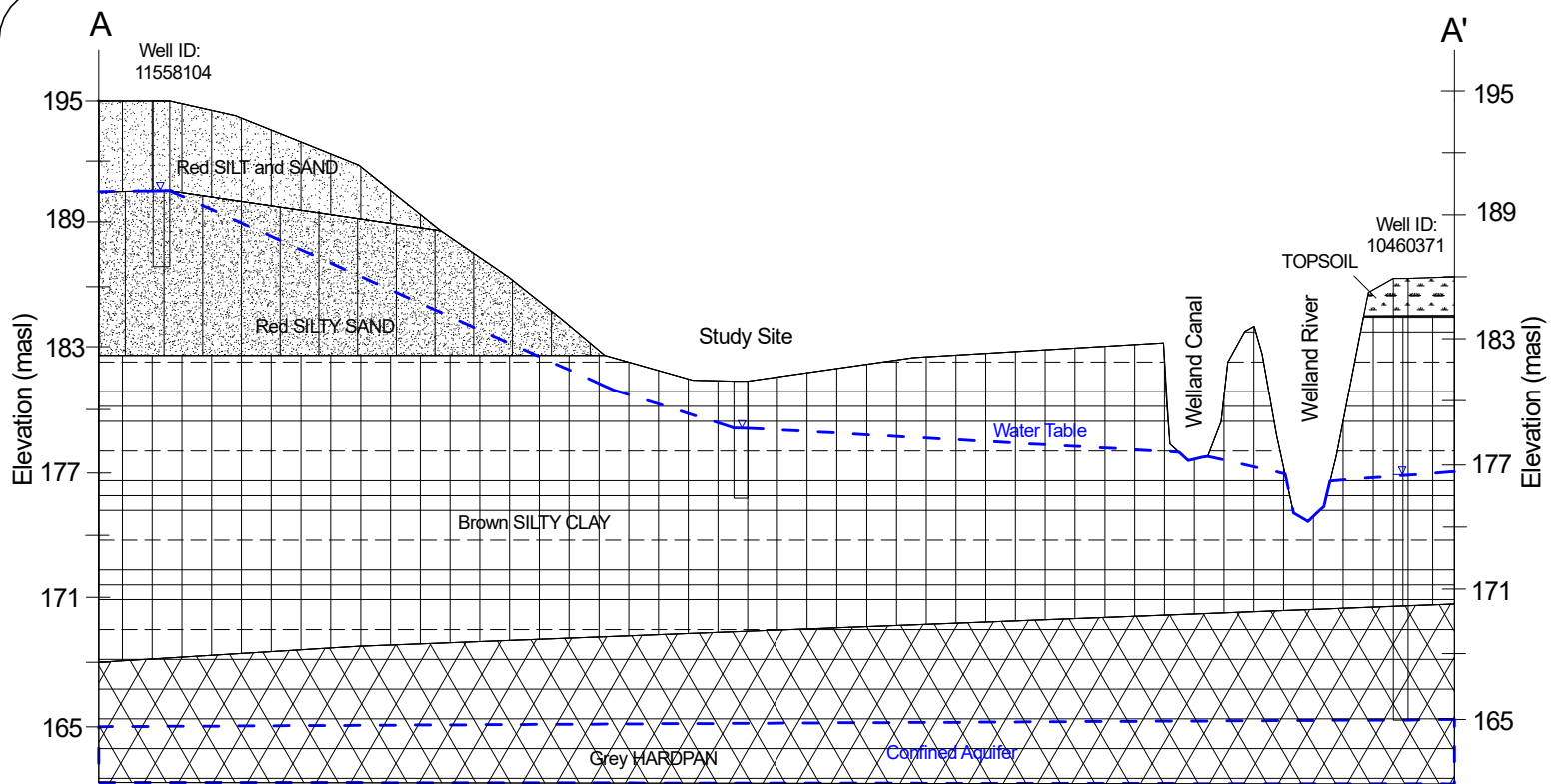
Exceeds applicable criteria  
Meets applicable criteria

**Client**  
 2547634 Ontario Limited & IVA Homes Ltd.

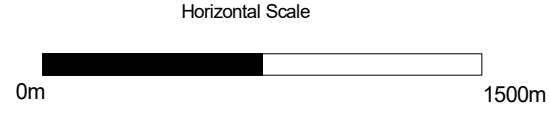
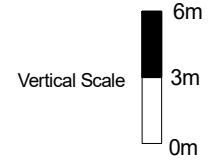
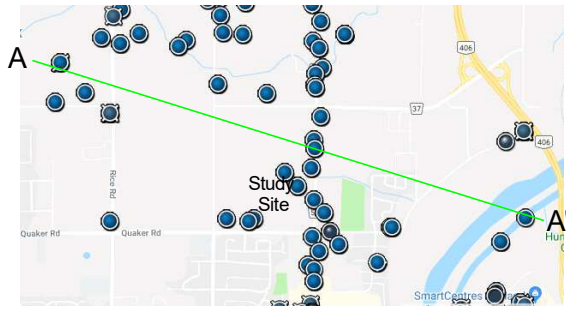
**Project**  
 Phase Two Conceptual Site Model:  
 210 Quaker Road, Welland, ON


**Figure Name**  
 Initial Phase Two Results


|                        |                  |
|------------------------|------------------|
| Project<br>E-16-26-4   | <b>Figure 3c</b> |
| Date<br>September 2017 |                  |
| Drafted: JF            |                  |
| Reviewed: JG           |                  |









\* Vertical Exaggeration 71.7x







**LEGEND**

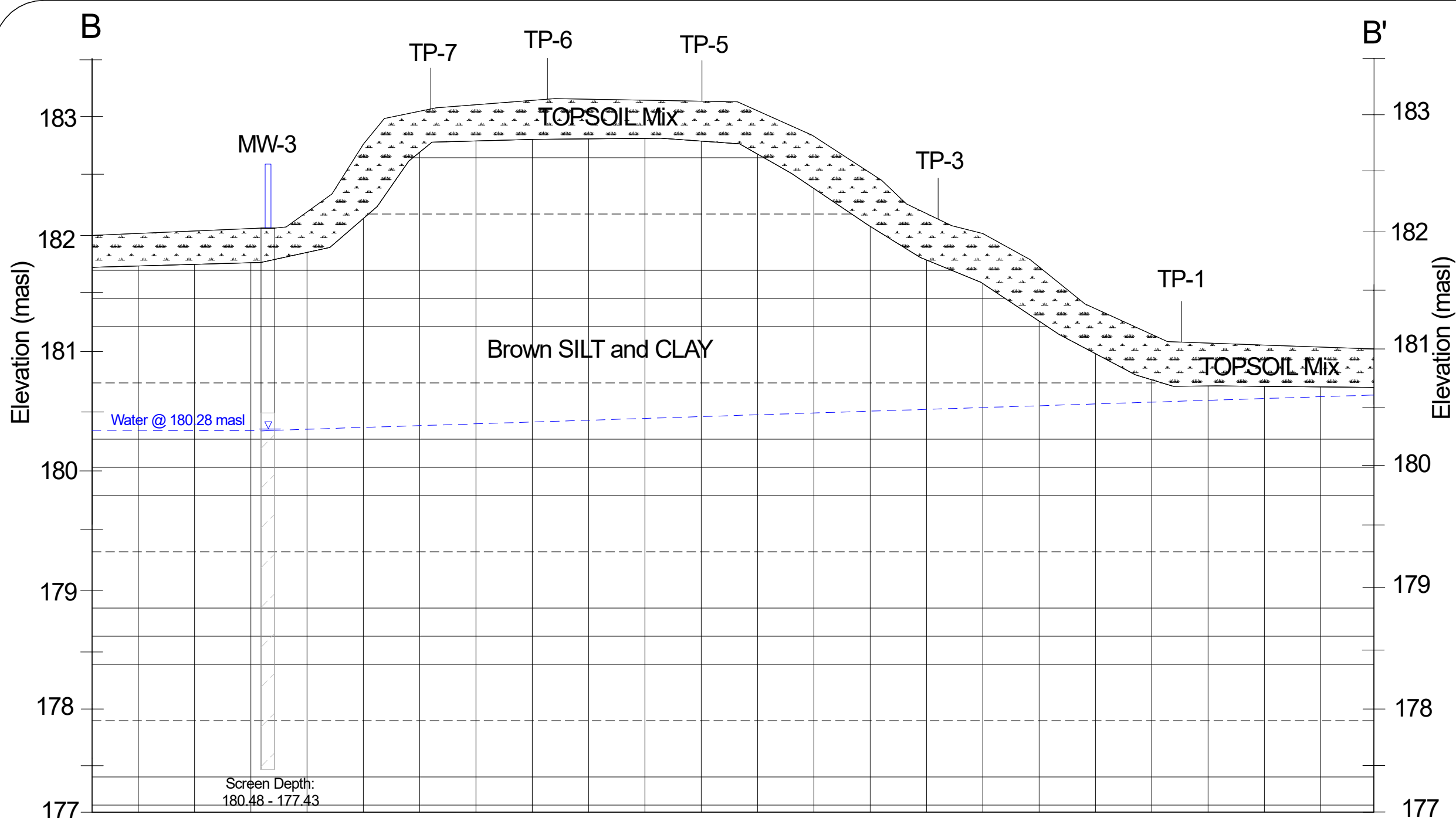
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-  Bedrock
-  Topsoil
-  Sand
-  Silt
-  Clay

CLIENT:  
2547634 Ontario Limited & IVA Homes Ltd.

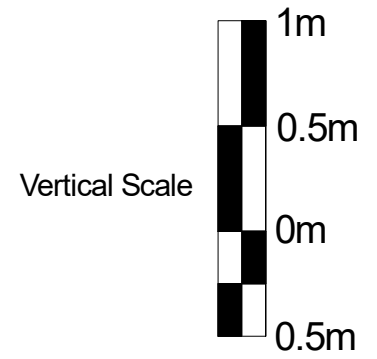
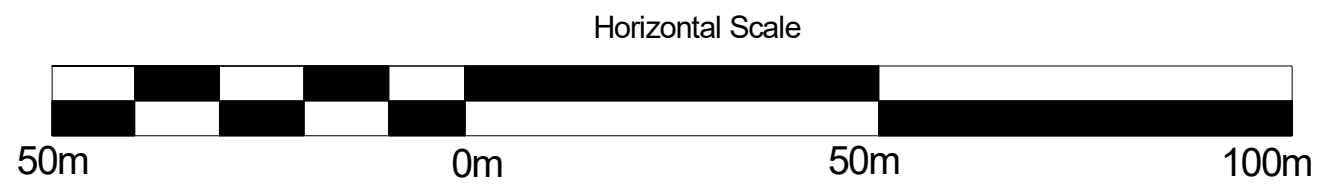
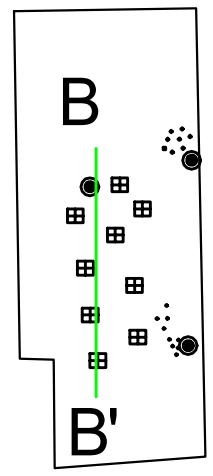
PROJECT:  
Phase Two Conceptual Site Model:  
210 Quaker Road Welland, ON



FIGURE NAME:  
Regional Cross Section A- A'

|                                   |        |
|-----------------------------------|--------|
| PROJECT:<br>E-16-26-4             | FIGURE |
| DATE:<br>September 2017           | 4a     |
| Drafted: J. Anema<br>Reviewed: JS |        |







\* Vertical Exaggeration 25.7x



**LEGEND**

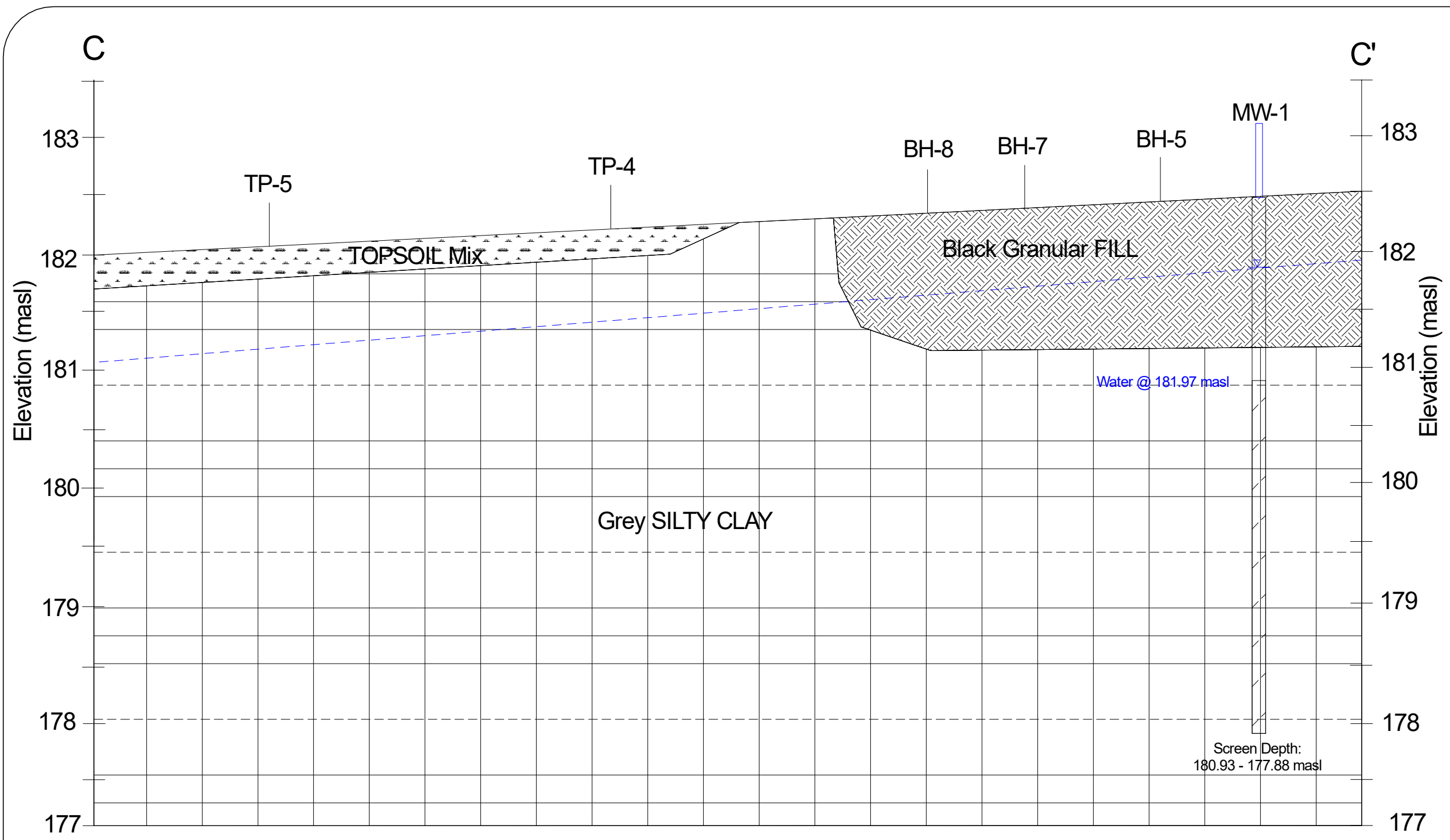
-  Interpreted groundwater Level
-  Topsoil Mix
-  Silt
-  Clay



CLIENT:  
2547634 Ontario Limited & IVA Homes Ltd.

PROJECT:  
Phase Two Conceptual Site Model:  
210 Quaker Road  
Welland, ON






FIGURE NAME:  
North South Cross Section B - B'

|                                   |        |
|-----------------------------------|--------|
| PROJECT:<br>E-16-26-4             | FIGURE |
| DATE:<br>September 2017           | 4b     |
| Drafted: J. Anema<br>Reviewed: JG |        |



**LEGEND**

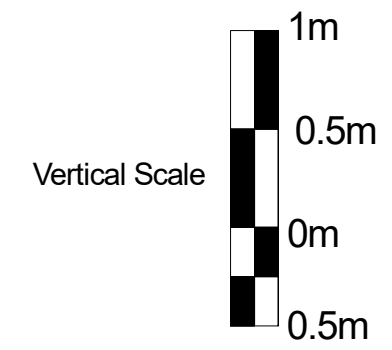
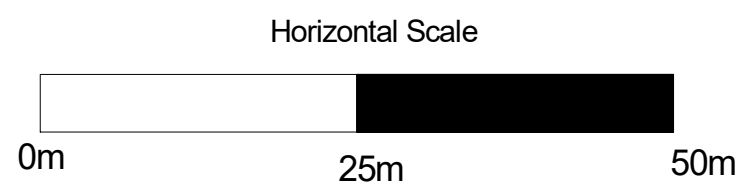
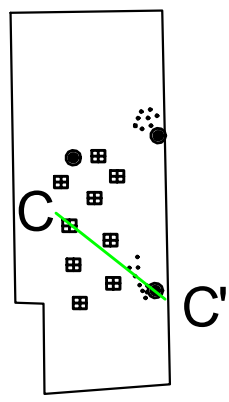
-  Interpreted groundwater Level
-  Topsoil
-  Fill
-  Silt
-  Clay

CLIENT:  
2547634 Ontario Limited & IVA Homes Ltd.

PROJECT:  
Phase Two Conceptual Site Model:  
210 Quaker Road  
Welland, ON

FIGURE NAME:  
East West  
Cross Section C - C'

|                                   |        |
|-----------------------------------|--------|
| PROJECT:<br>E-16-26-4             | FIGURE |
| DATE:<br>October 2017             | 4C     |
| Drafted: J. Anema<br>Reviewed: JG |        |

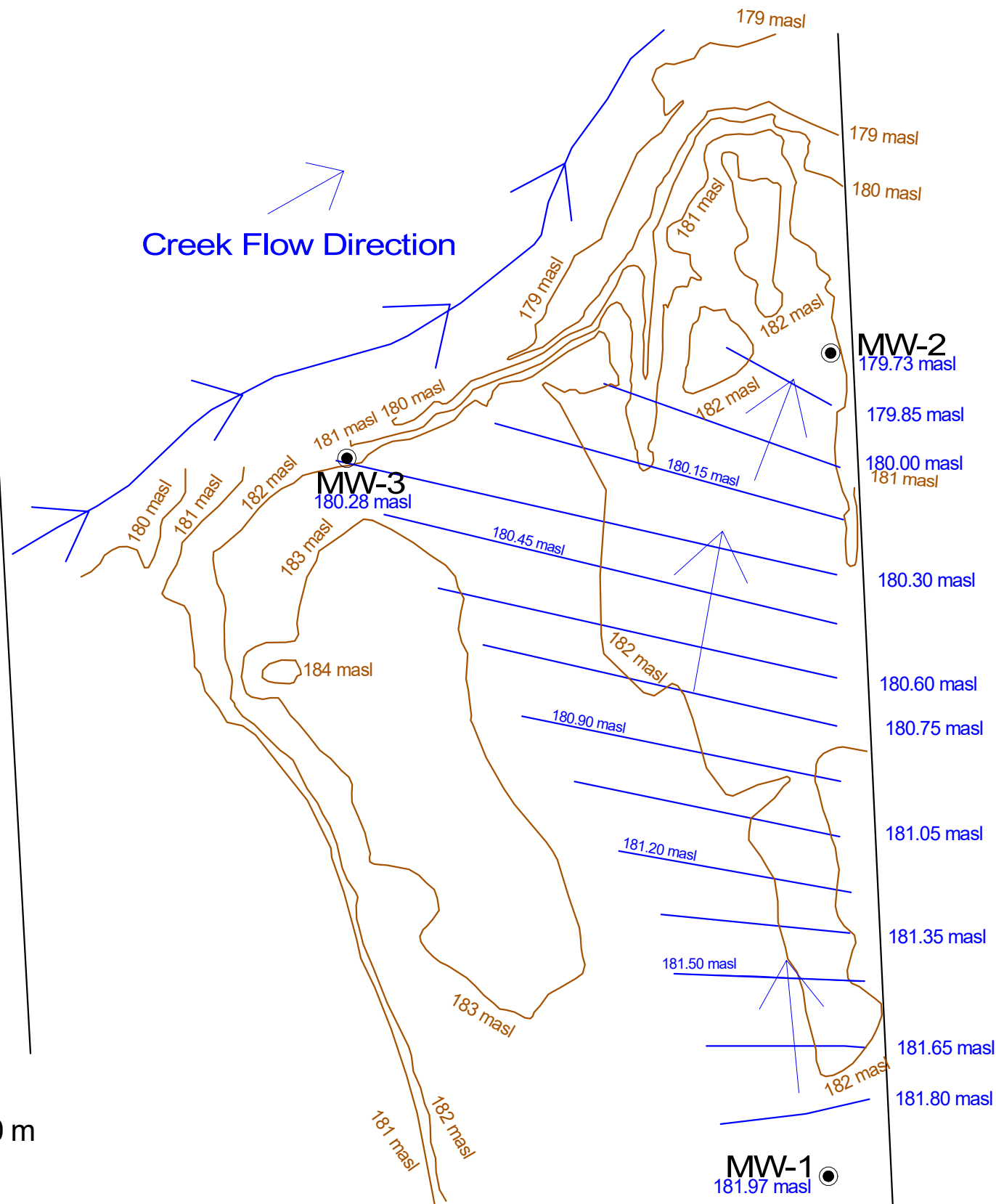




\*Note: MW-3 may not have been at static groundwater elevation, therefore interpreted groundwater flow direction of northeast (based on regional data, topographic slope and direction of flow within the creek) is assumed accurate for the subject site.

Local GW Flow Direction

Creek Flow Direction



- Legend**
- Study Site
  - Monitoring Well
  - Surface Elevation Contour
  - Groundwater Flow Contour

Client  
2547634 Ontario Limited  
& IVA Homes Ltd.

Project  
Phase Two Conceptual  
Site Model:  
210 Quaker Road  
Welland, ON

Figure Name  
Topography and Ground  
Water Flow Direction

|                        |                     |
|------------------------|---------------------|
| Project<br>E-16-26-4   | <b>Figure<br/>5</b> |
| Date<br>September 2017 |                     |
| Drafted: J.Anema       |                     |
| Reviewed: JG           |                     |



Source: 2016 Google Earth Imagery

Note: Areas 1, 2, 3 were individually identified within APEC-4 due to visible evidence of fill material and staining. See Section 8.2 in CSM Report for additional explanation.

0m 20m



**Legend**

- Property Boundary
  - Monitoring Well Location
  - ⊕ Borehole Location
  - △ Surface Sample
  - Verification Sample Location
  - APEC Area
  - Focused areas within APEC-4
- Exceeds applicable criteria  
 Meets applicable criteria  
 Indicates previous exceedance location

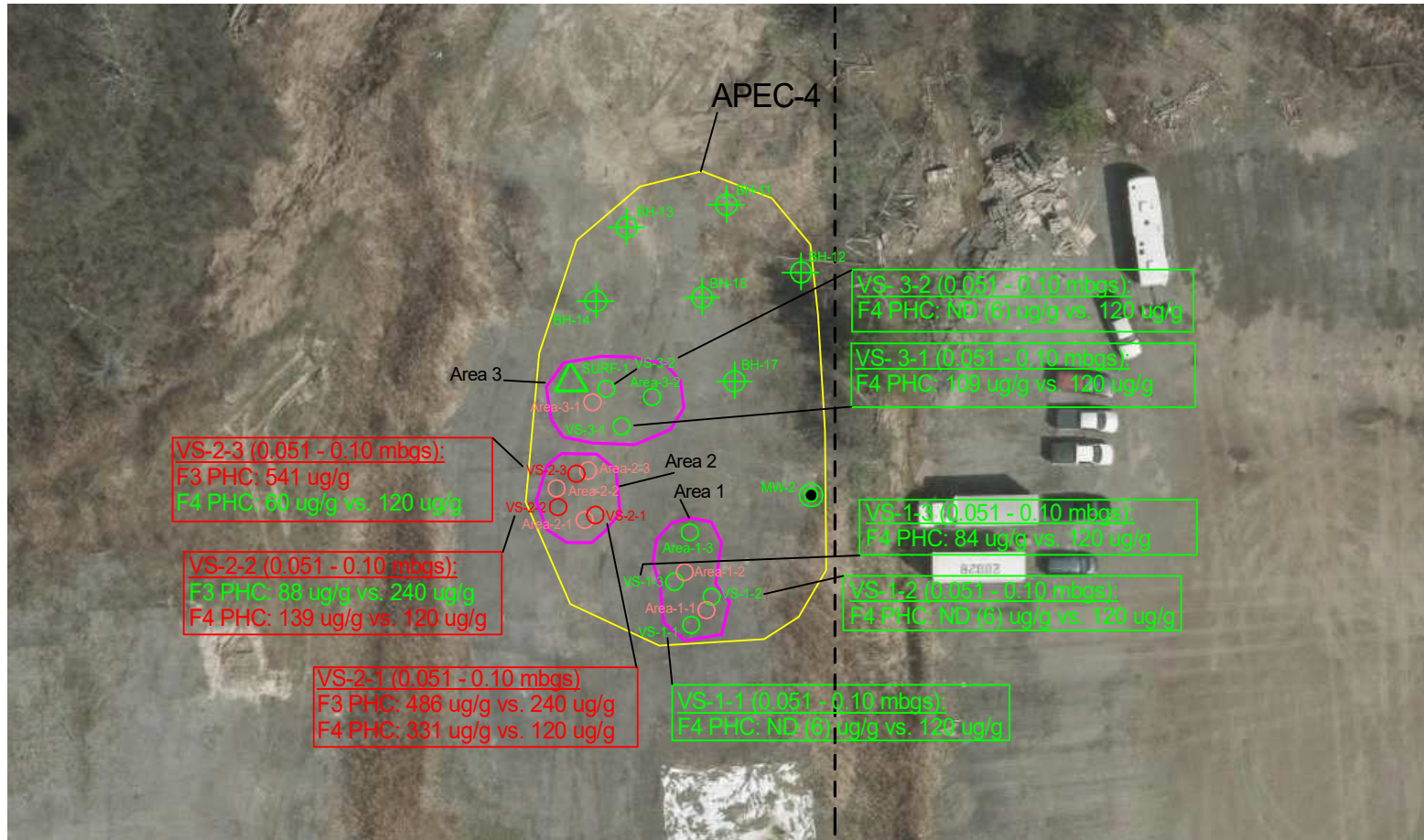
\*\* 2" = 0.051 m

Client  
 2547634 Ontario Limited  
 & IVA Homes Ltd.

Project  
 Phase Two Conceptual  
 Site Model:  
 210 Quaker Road,  
 Welland, ON

Figure Name  
 Excavation APEC-4:  
 Verification Sampling  
 PHCs: 0-2" depth

|                             |           |
|-----------------------------|-----------|
| E-16-26-4                   | Figure    |
| September 2017              | <b>6a</b> |
| Drafted: JF<br>Reviewed: JG |           |



Source: 2016 Google Earth Imagery

Note: Areas 1, 2, 3 were individually identified within APEC-4 due to visible evidence of fill material and staining. See Section 8.2 in CSM Report for additional explanation.

0m 20m

**ALLEX ENVIRONMENTAL LTD.**

**Legend**

- Property Boundary
- APEC Area
- Monitoring Well Location
- Borehole Location
- Surface Sample
- Verification Sample Location
- Excavation Area

**Exceeds applicable criteria**  
**Meets applicable criteria**  
**Indicates previous exceedance location**

\*Analysed vs. Table 9 Residential criteria

\*\* 2" = 0.051 m  
4" = 0.10 m

**Client**

2547634 Ontario Limited & IVA Homes Ltd.

**Project**

Phase Two Conceptual Site Model:  
210 Quaker Road,  
Welland, ON

**Figure Name**

Excavation APEC-4  
Verification Sampling  
PHCs: 2-4" depth

|                             |                  |
|-----------------------------|------------------|
| E-16-26-4                   | <b>Figure 6b</b> |
| October 2017                |                  |
| Drafted: JF<br>Reviewed: JG |                  |





Source: 2016 Google Earth Imagery

Note: Areas 1, 2, 3 were individually identified within APEC-4 due to visible evidence of fill material and staining. See Section 8.2 in CSM Report for additional explanation.



**Legend**

- Property Boundary
- Monitoring Well Location
- ⊕ Borehole Location
- △ Surface Sample Location
- Verification Sample Location
- APEC Area
- Focused areas within APEC-4
- Meets applicable criteria

\*\* 4" = 0.10 m  
6" = 0.15 m

Client  
2547634 Ontario Limited & IVA Homes Ltd.

Project  
Phase Two Conceptual Site Model:  
210 Quaker Road,  
Welland, ON

Figure Name  
Excavation APEC-4  
Verification Sampling  
PHCs: 4-6" depth

|                             |                      |
|-----------------------------|----------------------|
| E-16-26-4                   | <b>Figure<br/>6c</b> |
| September 2017              |                      |
| Drafted: JF<br>Reviewed: JG |                      |



Source: 2016 Google Earth Imagery

Note: Areas 1, 2, 3 were individually identified within APEC-4 due to visible evidence of fill material and staining. See Section 8.2 in CSM Report for additional explanation.



**Legend**

- - - Property Boundary
  - Monitoring Well Location
  - ⊕ Borehole Location
  - △ Surface Sample Location
  - Verification Sample Location
  - APEC Area
  - Focused areas within APEC-4
- Exceeds applicable criteria  
 Meets applicable criteria  
 Indicates previous exceedance location

\*\* 2" = 0.051 m

Client  
 2547634 Ontario Limited & IVA Homes Ltd.

Project  
 Phase Two Conceptual Site Model:  
 210 Quaker Road,  
 Welland, ON

Figure Name  
 Excavation APEC-4  
 Verification Sampling  
 Metals: 0-2" depth


|                             |           |
|-----------------------------|-----------|
| E-16-26-4                   | Figure    |
| September 2017              | <b>6d</b> |
| Drafted: JF<br>Reviewed: JG |           |






Source: 2016 Google Earth Imagery

Note: Areas 1, 2, 3 were individually identified within APEC-4 due to visible evidence of fill material and staining. See Section 8.2 in CSM Report for additional explanation.





**Legend**

- Property Boundary
- Monitoring Well Location
- ⊕ Borehole Location
- △ Surface Sample
- Verification Sample Location
- APEC Area
- Focused areas within APEC-4

Exceeds applicable criteria  
 Meets applicable criteria  
 Indicates previous exceedance location

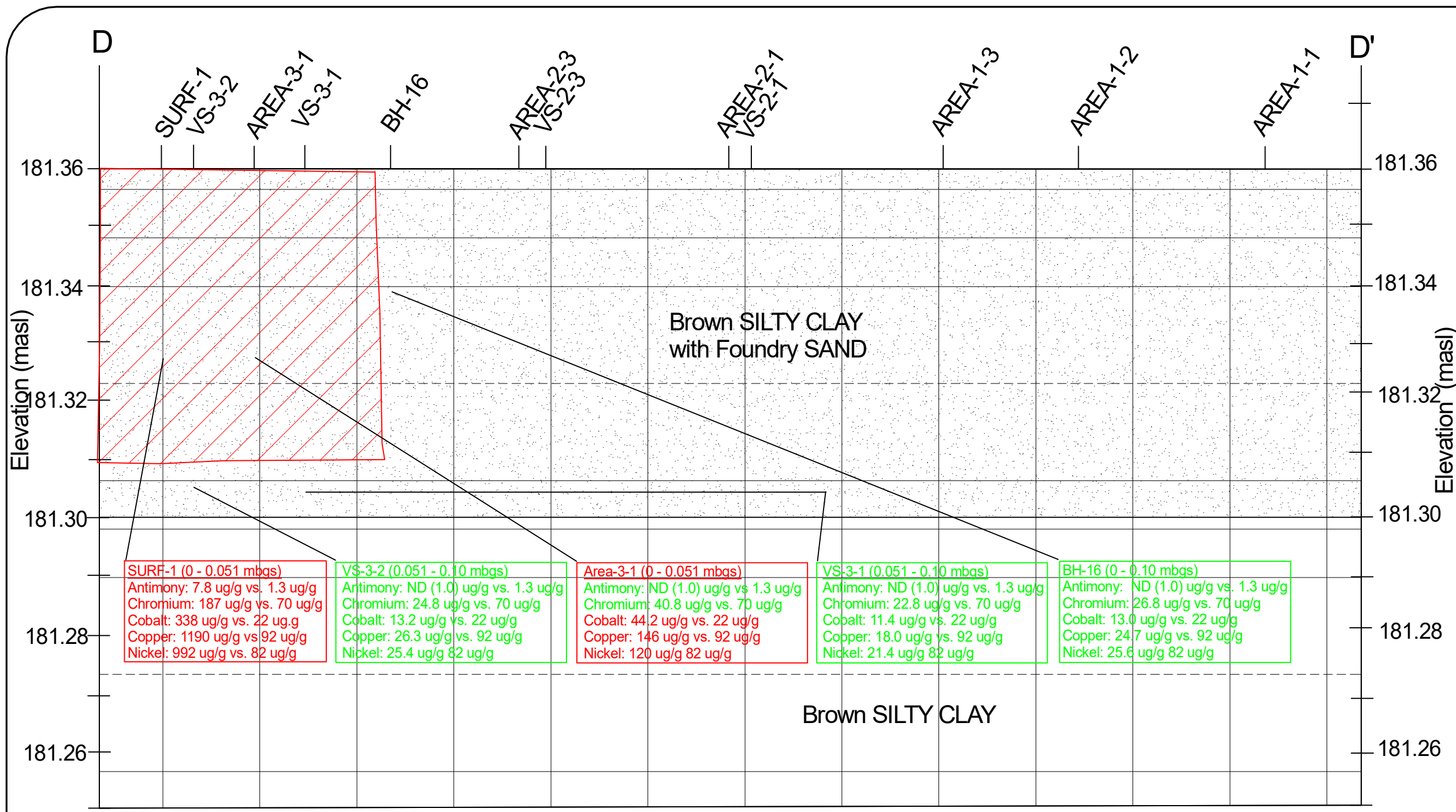
\*\* 2" = 0.051 m  
 4" = 0.10 m

**Client**  
 2547634 Ontario Limited  
 & IVA Homes Ltd.

**Project**  
 Phase Two Conceptual  
 Site Model:  
 210 Quaker Road,  
 Welland, ON

**Figure Name**  
 Excavation APEC-4  
 Verification Sampling  
 Metals: 2-4" depth

|                             |                     |
|-----------------------------|---------------------|
| E-16-26-4                   | Figure<br><b>6e</b> |
| September 2017              |                     |
| Drafted: JF<br>Reviewed: JG |                     |



**SURF-1 (0 - 0.051 mbgs)**  
 Antimony: 7.8 ug/g vs. 1.3 ug/g  
 Chromium: 187 ug/g vs. 70 ug/g  
 Cobalt: 338 ug/g vs. 22 ug/g  
 Copper: 1190 ug/g vs. 92 ug/g  
 Nickel: 992 ug/g vs. 82 ug/g

**VS-3-2 (0.051 - 0.10 mbgs)**  
 Antimony: ND (1.0) ug/g vs. 1.3 ug/g  
 Chromium: 24.8 ug/g vs. 70 ug/g  
 Cobalt: 13.2 ug/g vs. 22 ug/g  
 Copper: 26.3 ug/g vs. 92 ug/g  
 Nickel: 25.4 ug/g vs. 82 ug/g

**Area-3-1 (0 - 0.051 mbgs)**  
 Antimony: ND (1.0) ug/g vs. 1.3 ug/g  
 Chromium: 40.8 ug/g vs. 70 ug/g  
 Cobalt: 44.2 ug/g vs. 22 ug/g  
 Copper: 146 ug/g vs. 92 ug/g  
 Nickel: 120 ug/g vs. 82 ug/g

**VS-3-1 (0.051 - 0.10 mbgs)**  
 Antimony: ND (1.0) ug/g vs. 1.3 ug/g  
 Chromium: 22.8 ug/g vs. 70 ug/g  
 Cobalt: 11.4 ug/g vs. 22 ug/g  
 Copper: 18.0 ug/g vs. 92 ug/g  
 Nickel: 21.4 ug/g vs. 82 ug/g

**BH-16 (0 - 0.10 mbgs)**  
 Antimony: ND (1.0) ug/g vs. 1.3 ug/g  
 Chromium: 26.8 ug/g vs. 70 ug/g  
 Cobalt: 13.0 ug/g vs. 22 ug/g  
 Copper: 24.7 ug/g vs. 92 ug/g  
 Nickel: 25.6 ug/g vs. 82 ug/g



**LEGEND**

- Interpreted groundwater Level
- Silt
- Clay
- Sand
- Metals Table 9 Exceedance

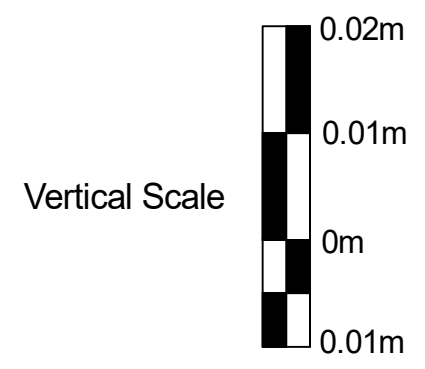
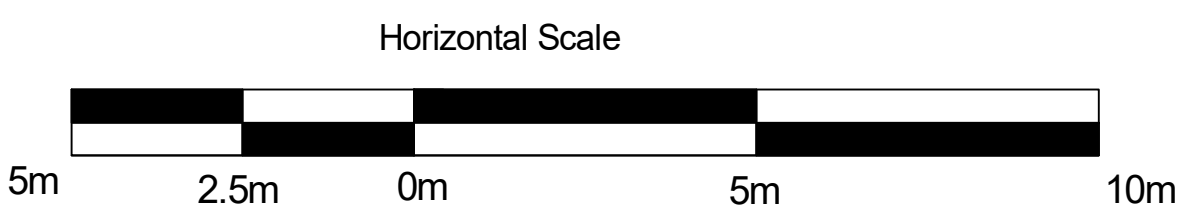
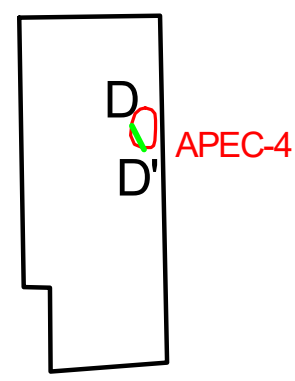
\* Groundwater not encountered at this depth

CLIENT:  
 2547634 Ontario Limited & IVA Homes Ltd.

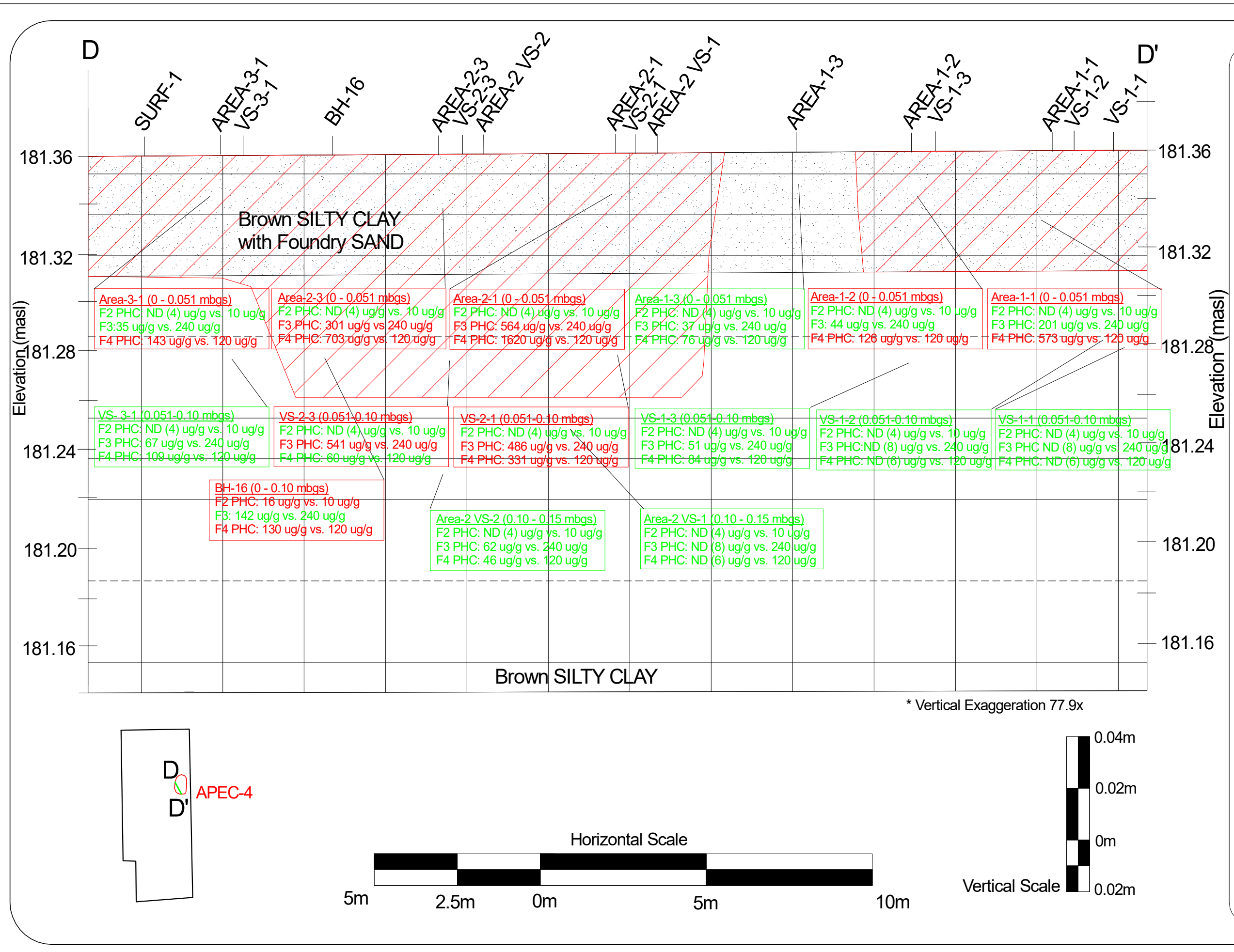
PROJECT:  
 Phase Two Conceptual Site Model:  
 210 Quaker Road  
 Welland, ON



FIGURE NAME:  
 APEC-4 Shallow Cross Section D - D'  
 - Metals Exceedance

|                                |           |
|--------------------------------|-----------|
| PROJECT:<br>E-16-26-4          | FIGURE    |
| DATE:<br>September 2017        | <b>7a</b> |
| Drafted: J. Anema<br>Reviewed: |           |



\* Vertical Exaggeration 149.14x



**LEGEND**

- Interpreted groundwater Level
- Silt
- Clay
- Sand
- PHC Table 9 Exceedance

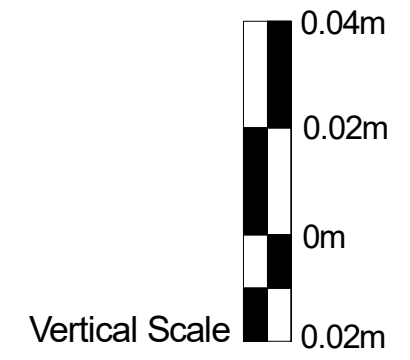
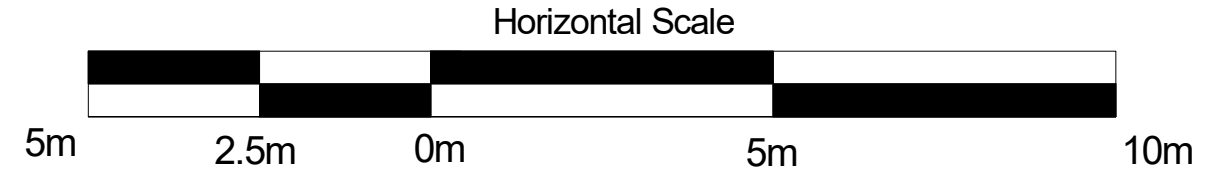
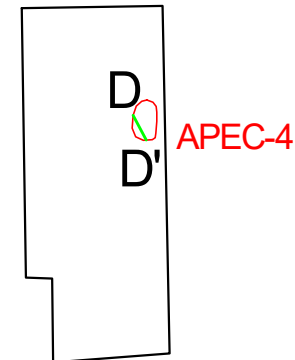
\* Groundwater not encountered within these depths

**CLIENT:**  
2547634 Ontario Limited & IVA Homes Ltd.

**PROJECT:**  
Phase Two Conceptual Site Model:  
210 Quaker Road  
Welland, ON

**FIGURE NAME:**  
APEC-4 Shallow Cross Section D - D'  
- PHC Exceedance

|  |               |
|--|---------------|
| <b>PROJECT:</b><br>E-16-26-4                 | <b>FIGURE</b> |
| <b>DATE:</b><br>November 2017                | <b>7b</b>     |
| <b>Drafted:</b> J. Anema<br><b>Reviewed:</b> |               |



\* Vertical Exaggeration 77.9x