GEOTECHNICAL INVESTIGATION

GEOTECHNICAL INVESTIGATION AND SLOPE STABILITYASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
40-60 EMMA STREET
GRAND VALLEY, ONTARIO

CMT Project 23-146.R01

Prepared for:

Willem Wildeboer

August 31, 2023

CMT Engineering Inc.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

August 31, 2023 23-146.R01

Sheldon Creek Developments
75 First Street, Suite 14
Orangeville, Ontario
L9W 2E7

Attention: Willem Wildeboer

Dear Willem:

Re: Geotechnical Investigation and Slope Stability Assessment
Proposed Residential Development
40-60 Emma Street
Grand Valley, Ontario

As requested, CMT Engineering Inc. conducted a geotechnical investigation and slope stability assessment at the above-referenced site, and we are pleased to present the enclosed report.

We trust that this information meets your present requirements, and we thank you for allowing us to undertake this project. Should you have any questions, please do not hesitate to contact our office.

Yours truly,

Brandon Figg

Brandon R Figg, C.Tech.
Senior Soil Technician

ht

TABLE OF CONTENTS

1.0 INTRODUCTION

The services of CMT Engineering Inc. (CMT Inc.) were retained by Willem Wildeboer of Sheldon Creek Developments to conduct a geotechnical investigation and slope stability assessment for the proposed residential development to be constructed at 40-60 Emma Street South in Grand Valley, Ontario. The location of the site is shown on Drawing 1.

It is understood that the proposed residential development is to consist of one (1) or two (2) townhouse blocks comprising approximately eight (8) townhouse units. It is likely that the new residences will consist of basements. The new development is located within an existing slope area regulated by the Grand River Conservation Authority (GRCA), and as such the GRCA requires that a slope assessment be conducted to analyze the potential risk of slope instability and failure with respect to the proposed development.

The purpose of the geotechnical investigation was to assess the existing soil and groundwater conditions encountered in the boreholes. Included in the assessment are the soil classification and groundwater observations, as well as comments and recommendations regarding geotechnical resistance (bearing capacity); serviceability limit states (anticipated settlement); dewatering considerations; site classification for seismic site response; recommendations for site grading, site servicing, excavations and backfilling; recommendations for slab-on-grade construction; pavement design/drainage; soil design properties; slope stability assessment; chemical results and a summary of the laboratory results.

The recommendations in this report are solely based on the soil conditions encountered in the boreholes advanced on the subject property during this investigation.

2.0 EXISTING SITE CONDITIONS

The existing site for the proposed residential development is currently vacant and predominantly tree covered with mature trees and ground cover throughout the site. Based on County of Wellington GIS Mapping it is apparent that the proposed building lot slopes down from the west towards the east, with an elevation change of approximately 9.0 m (29.5 ft).

3.0 FIELD AND LABORATORY PROCEDURES

Prior to the commencement of the field drilling program, public utility locates were organized by CMT Inc. to ensure that underground utilities would not be damaged, or personnel injured.

The field investigation was conducted on July 24, 2023 and comprised the advancement of five (5) boreholes (referenced as Boreholes 1 to 5, inclusive), utilizing a Geoprobe 7822DT drillrig. Boreholes 1 advanced to a depth of approximately 4.57 m (15.0 ft) below the existing ground surface elevation. Borehole 2 advanced to a depth of approximately 4.27 m (14.0 ft) below the existing ground surface elevation and was terminated on very dense till soils. Boreholes 3, 4 and 5 were advanced to depths of approximately 5.18 m (17.0 ft) below the existing ground surface elevation.

Standard penetration testing and sampling was carried out in the boreholes using a 38 mm inside diameter split spoon sampling equipment and an automatic hammer, in accordance with ASTM D 1586 "Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils". In the boreholes SPT soil sampling was generally conducted at 0.76 m (2.5 ft) intervals to 3.05 m (10.0 ft), and every 1.52 m (5.0 ft) thereafter, to borehole termination. Macro core (MC5) direct push sampling was typically conducted between the SPT soil samples conducted below 3.05 m (10.0 ft) depth at the boreholes.

Boreholes 1 and 5 were equipped with a 25 mm diameter PVC monitoring wells. The monitoring wells were comprised of a 1.52 m long screen backfilled with filter sand and then riser pipe, backfilled with bentonite. The monitoring wells were installed according with the Ontario Water Resources Act, Regulation 903 (O.Reg. 903) by well technicians licensed by the Ministry of the Environment, Conservation and Parks (MECP), working for a contractor also licensed by the MECP. The monitoring wells were registered with the MECP and must be decommissioned in accordance with O.Reg. 903 prior to future construction. The well log records are provided in Appendix D.

Technical staff from CMT Inc. observed the drilling operation as well as collected and logged the recovered soil samples. A small portion of each soil sample was placed in a sealed, marked jar for moisture content determinations.

Representative soil samples from the following boreholes and depths were submitted to the CMT Inc. laboratory in St. Clements, Ontario for grain size analyses and Atterberg limit determinations:

- Borehole 1 - depth 2.29 m to 2.90 m (7.5 ft to 9.5 ft); and
- Borehole 4 – depth 1.52 m to 2.13 m (5.0 ft to 7.0 ft);

The borehole logs are provided in Appendix A and the resulting grain size analyses are found in Appendix B.

CMT Inc. personnel surveyed the ground surface elevations at the borehole locations (using laser survey equipment) on July 24, 2023. Benchmark 1 (top of fire hydrant adjacent the subject property) was utilized as a temporary benchmark with a reported geodetic elevation of 457.34 m. As such, the ground surface elevations at the borehole locations ranged from approximately 457.60 m to 462.64 m. The locations of the boreholes and the temporary benchmark are shown on Drawing 2.

4.0 SUBSOIL CONDITIONS

The soils encountered in the boreholes are described briefly below with more detailed stratigraphic descriptions provided on the borehole logs in Appendix A. The following paragraphs have been simplified into terms of major soil strata. The soil boundaries indicated have been inferred from non-continuous samples and observations of sampling and drilling resistance and typically represent transitions from one soil type to another rather than exact planes of geological change. Further, the subsurface conditions are anticipated to vary between and beyond the borehole locations.

4.1. Topsoil

Very loose to compact, moist, dark brown, silty organic topsoil was encountered at the surface of all boreholes. The thickness of the topsoil encountered at the borehole locations ranged from approximately 100 mm and 325 mm (average 213 mm). It should be expected that the surficial topsoil thickness will vary throughout the site. Materials noted as topsoil in this report were classified based on visual and textural evidence. Testing of organic content or for other nutrients was not carried out.

4.2. Sand and Gravel Fill/Silty Sand Fill

Brown and/or dark brown, sand and gravel fill and/or silty sand fill was encountered underlying the topsoil at Boreholes 2, 4 and 5. The fill materials were considered to be very loose to dense, with SPT N-values ranging from 3 to 39 blows per 0.30 m (average 21 blows per 0.30 m). The fill materials were considered to be moist, with moisture contents ranging from approximately 5.2% to 11.4% (average of 8.3%).

4.3. Silty Gravelly Sand

Light brown and/or brown, silty gravelly sand, with some clay was encountered underlying the topsoil at Boreholes 1 and 3; underlying the fill material at Borehole 2; underlying the silty clay at Borehole 4 and underlying the silty clay at Borehole 5. The silty gravelly sand was considered to be loose to very dense, with SPT N-values ranging from 6 to greater than 100 blows per 0.30 m (average 53 blows per 0.30 m). The silty gravelly sand was considered to be moist to saturated, with moisture contents ranging from approximately 8.4% to 17.5% (average of 13.0%).

4.4. Sand and Gravel

Brown, sand, and gravel was encountered underlying the fill material at Borehole 5. The sand and gravel was considered to be dense, with a SPT N-value of 39 blows per 0.30 m. The sand and gravel was considered to be moist, with a moisture content of about 4.4%.

4.5. Silty Clay

Dark brown and/or brown, silty clay, with some sand, trace gravel was encountered underlying the fill material at Borehole 4 and underlying the sand and gravel at Borehole 5. The silty clay was considered to be loose to compact, with SPT N-values ranging from 5 to 24 blows per 0.30 m (average 15 blows per 0.30 m). Atterberg Limits were completed for the silty clay, and the plastic limit is approximately 18% while the liquid limit was approximately 29%, and a plasticity index of 11%. The silty clay was considered to be about the plastic limit (APL) to drier than the plastic limit (DTPL), with moisture contents ranging from approximately 15.6% to 18.1% (average of 16.9%).

4.6. Silty Gravelly Sand Till

Brown, silty gravelly sand till, with some clay was encountered underlying the silty gravelly sand at Boreholes 1, 2, 3 and 4. The silty gravelly sand till was considered to be dense to very dense, with SPT N-values ranging from 36 to greater than 100 blows per 0.30 m (average 68 blows per 0.30 m). The till was considered to be moist, with moisture contents ranging from approximately 7.3% to 11.1% (average of 9.2%).

4.7. Groundwater

Moist to saturated soil conditions were encountered in the majority of the boreholes. It should be noted that the dense to very dense till soils observed in the boreholes have the potential to create perched water conditions. These conditions would be expected to occur near the interface of the looser upper soils and the compact to very dense lower soils. Groundwater conditions (particularly perched water) are generally dependent on the amount of precipitation, control of surface water, as well as the time of year, and can fluctuate significantly in elevation and volume. The groundwater levels and wet to saturated soil conditions encountered in the boreholes could make excavations difficult, and it should be expected that caving or sloughing of the excavation walls will occur when excavating into wet to saturated zones.

25 mm (1.0 inch) diameter monitoring wells were installed in Boreholes 1 and 5 to measure the static groundwater level. The water level in Boreholes 1 and 5 was measured by CMT Inc. staff on August 24, 2023 and the groundwater was measured to be approximately 2.07 m below ground surface at Borehole 1 and 3.50 m below ground surface at Borehole 5.

The recorded groundwater elevation in the monitoring well, the approximate zone of very moist to saturated soils observed in all of the boreholes, as well as the ground surface and bottom of borehole elevations, are provided in the following table:

Borehole No.	Ground Surface Elevation (m)	Approximate Elevation of Water in the Monitoring Well (m) August 24, 2023 (Depth to Water)	Estimated Zone of Wet to Saturated Soil at the Time of Investigation Elevation (m)	Approximate Depth Below Ground Surface of Estimated Zone of Very Moist to Saturated Soil at the Time of Investigation (m)	Bottom of Borehole Elevation (m)
BH 1	462.43	460.36 (2.07)	460.91 to 458.11	1.52 to 4.32	457.86
BH 2	460.37	--	--	--	456.10
BH 3	458.65	--	458.45 to 455.45	0.20 to 3.20	453.47
BH 4	462.64	--	459.95 to 458.07	2.69 to 4.57	457.46
BH 5	457.60	454.10 (3.50)	453.46 to 452.42 (termination)	4.04 to 5.18 (termination)	452.42

Recommendations with respect to dewatering conditions are provided in Section 5.8 of this report.

The monitoring wells installed in Boreholes 1 and 5 must be decommissioned by a licensed well driller when the well is no longer required for monitoring the static water level or for sampling. CMT Drilling Inc. can provide decommissioning services when required.

5.0 DISCUSSION AND RECOMMENDATIONS

This section of the report provides an interpretation of the factual geotechnical data obtained during the investigation and is intended for the guidance of the owner and design engineer. Where comments are made on construction, they are provided only to highlight those aspects which could affect the design of the project. Contractors bidding on or undertaking the work should make their own independent interpretation of the factual subsurface information provided as it affects their proposed construction means and methods, equipment selection, scheduling, pricing, and the like.

Utilizing the information gathered during the geotechnical investigation and assuming that the borehole information is representative of the subsoil conditions throughout the site, the following comments and recommendations are provided.

5.1. Serviceability and Ultimate Limit Pressure

Based on the information obtained from the boreholes, the following table provides a summary of the estimated geotechnical reaction at the Serviceability Limit State (SLS) and the factored geotechnical resistance at the Ultimate Limit State (ULS) at the various elevations, including soil type:

Borehole No.	Ground Surface Elevation (m)	SLS kPa (psf)	ULS kPa (psf)	Estimated Highest Founding Elevation (m)	Depth to Highest Founding Elevation (m)	Soil Type
BH 1	462.43	150 (3,000)	225 (4,500)	461.67 to 459.38	0.76	Silty Gravelly Sand
		250 (5,000)	375 (7,500)	459.38 to 457.86 (termination)	3.05	Silty Gravelly Sand /Till
BH 2	460.37	150 (3,000)	225 (4,500)	459.61 to 458.08	0.76	Silty Gravelly Sand
		250 (5,000)	375 (7,500)	458.08 to 456.10 (termination)	2.29	Till

Borehole No.	Ground Surface Elevation (m)	SLS kPa (psf)	ULS kPa (psf)	Estimated Highest Founding Elevation (m)	Depth to Highest Founding Elevation (m)	Soil Type
BH 3	458.65	150 (3,000)	225 (4,500)	457.89 to 455.45	0.76	Silty Gravelly Sand
		250 (3,000)	375 (7,500)	455.45 to 453.47 (termination)	3.20	Till
BH 4	462.64	150 (3,000)	225 (4,500)	460.35 to 458.07	2.29	Silty Clay/Silty Gravelly Sand
		250 (3,000)	375 (7,500)	458.07 to 457.46 (termination)	4.57	Till
BH 5	457.60	150 (3,000)	225 (4,500)	455.24 to 452.42 (termination)	2.36	Sand and Gravel/Silty Clay/Silty Gravelly Sand

Based on the bearing capacities and elevations provided in the table above, native soils suitable to support conventional foundations designed with a minimum estimated bearing capacity of 150 kPa (3,000 psf) at SLS and 225 kPa (4,500 psf) at ULS were generally encountered underlying the topsoil and loose native soils encountered on the subject site ranging from depths of approximately 0.76 m to 2.29 m below the existing ground surface.

Should footings be designed to be constructed at elevations higher than the elevations indicated in the table above, then structural fill will be required in order to achieve the design grades for the proposed foundations. The serviceability limit pressure for good quality granular structural fill placed on suitable subgrade soils and compacted in accordance with Section 5.4.5 of this report is estimated to be at least 150 kPa (3,000 psf) at SLS and 225 kPa (4,500 psf) at ULS.

Footings founded on soil may be placed at a higher elevation relative to another footing provided that the slope between the outside face of the footings is separated by a minimum slope of 10 horizontal to 7 vertical (10H:7V) with an imaginary line projected from the underside of the footings.

When constructing new footings adjacent to existing footings, such as those from neighbouring buildings, all existing disturbed backfill material from the existing foundations must be subexcavated to ensure that new footings are founded on approved undisturbed soil. Any areas subexcavated to remove disturbed soils could be backfilled with mass concrete. It is imperative that excavations do not extend below any existing footings or the bottom of foundation walls without providing support to both the footing/underside of the foundation wall through shoring or underpinning, as well as support the foundation wall structure itself (as designed by the structural engineer).

It is recommended that structural foundation drawings be cross-referenced with site servicing drawings to ensure that service pipes do not conflict with building foundations (including the zone of influence down and away from the footings).

With respect to the Serviceability Limit State (SLS), the total and differential footing settlements are not expected to exceed the generally acceptable limits of 25 mm (1") and 19 mm (3/4") respectively.

All exterior footings must be provided with a minimum of 1.2 m of soil cover or equivalent thermal insulation in order to provide protection against frost action.

5.2. Seismic Site Classification

The site classification for seismic response in Table 4.1.8.4 of the 2012 Ontario Building Code relates to the average properties of the upper 30.0 m of strata. The information obtained in the geotechnical field investigation was gathered from the upper 4.27 m to 5.18 m of strata. Based on the information gathered in the geotechnical field investigation, the site classification for seismic site response would be considered Site Class D (stiff soils) for structures founded on the native soil soils at the recommended founding elevations are provided in Section 5.1 of this report. For foundations constructed on existing engineered fill or structural fill, placed in accordance with Section 5.4.5 of this report, the site classification for seismic site response would be considered Site Class D (stiff soil). The structural engineer responsible for the design of the structure should review the earthquake loads and effects.

5.3. Soil Design Parameters

The following table provides estimated soil design parameters for imported granular fill, as well as any existing fill and the native soils encountered on-site. It should be noted that earth pressure coefficients (Ka, Kp, Ko) provided are for flat ground surface conditions and will differ for areas with slopes or embankments.

The estimated soil design parameters can be utilized for the design of perimeter shoring, foundations and retaining walls, as required:

Soil Type	Soil Density (kg/m^3)	Friction Angle (Degree)	Coefficient of Active Pressure (K_a)	Coefficient of Passive Pressure (K_p)	Coefficient of At-Rest Pressure (K_o)	Coefficient of Friction (μ)	Cohesion (Undrained) (kPa)
Imported Granular 'A'/ (OPSS 1010)	2,100	34 °	0.28	3.54	0.44	0.45	0
Imported Granular 'B' (OPSS 1010)	2,050	32 °	0.31	3.25	0.47	0.41	0
Sand and Gravel	1,900	34°	0.28	3.54	0.44	0.45	0
Silty Clay	1,850	30°	0.34	3.01	0.50	0.39	5
Silty Gravelly Sand	1,850	32°	0.31	3.25	0.47	0.41	0
Silty Gravelly Sand Till	2,000	32°	0.31	3.25	0.47	0.41	0

5.4. Site Preparation

The site preparation for the proposed residential development is anticipated to include the removal of topsoil and vegetation, removal, or relocation of any existing services (if encountered), the subexcavation of all fill and native soils deemed not suitable for supporting of the design bearing capacity, followed by the placement of structural fill (as required) and site grading to achieve proposed grades.

5.4.1. Topsoil Stripping/Vegetation Grubbing

Any existing topsoil (including buried topsoil), vegetation (including tree roots and all loose/disturbed soils associated with tree roots) and unsuitable soils must be removed from within the proposed building envelope to expose approved competent subgrade soils. The topsoil or unsuitable soils may be used in landscaped areas where some settlement can be tolerated; otherwise, it should be properly disposed of off-site.

The volume of topsoil removed during the stripping process is also relative to the equipment utilized for the stripping process as well as the moisture conditions at the time of stripping.

5.4.2. Fill/Loose Native Soil Removal

Any existing fill (if encountered) as well as all native soils in a very loose to loose state would be deemed unsuitable to support foundations as well as interior slab-on-grades (without remedial action to improve the soil properties). Therefore, all existing fill (including any existing service trench backfill and backfill of any existing foundation walls), as well as any relatively loose native soils that are deemed to be unsuitable to support foundations or slab-on-grades, must be subexcavated from within the proposed building envelopes, exterior entranceways, perimeter sidewalks and concrete slab areas to expose approved competent subgrade soils. Should it be decided to leave any relatively loose soils under any proposed slab-on-grade, remedial action may be required to further consolidate any existing fill and/or loose native soils or soil stabilization through the use of geotextiles and/or geogrids may be required. Review of the subgrade, as required, will be addressed at the time of construction.

5.4.3. Removal/Relocation of Existing Services

Any existing underground services (including subdrains and/or field tiles) that may be located within the proposed building envelope(s) must be removed or relocated. If left in place, the location of existing services must be reviewed to ensure that they do not conflict with the proposed foundation locations. All terminated pipes must be completely sealed with watertight mechanical covers, concrete or grout at termination points to prevent the migration of soils into pipe voids which can result in potential settlement. All existing trench backfill material and any disturbed soils associated with the removal of any services must be subexcavated and the subsequent excavation must be backfilled with approved soils placed in accordance with Section 5.4.4 of this report.

5.4.4. Site Grading

Following the subexcavation of any fill and any relatively loose fill or native soils deemed unsuitable of supporting the design bearing capacity, the exposed subgrade must be proof-rolled, and any soft or unstable areas must be subexcavated and replaced with approved fill materials.

If structural fill placement is required, the fill materials required to achieve the design site grades should be placed according to the following procedures:

- It is imperative that excavations do not extend below any existing (neighbouring) footings or bottom of foundation walls without providing support to both the footings or the underside of the foundation wall through shoring or underpinning, as well as support the foundation wall structure itself (as directed by the structural engineer);

- Prior to placement of any structural fill (if required), the subgrade for the proposed buildings and/or structures and any hard surfaced areas must be prepared large enough to accommodate a 1:1 slope commencing a distance of 1.0 m beyond the outside edge of the proposed foundations or edge of asphalt/concrete down to the approved competent native founding soils;

- Soils approved for use as structural fill must be placed in loose lifts not exceeding 0.3 m (12") in depth for granular soils (recommended fill materials) and 0.2 m (8") in depth for silts and clays, or the capacity of the compactor (whichever is less). The wet to saturated native soils (non-organic) would generally be considered unsuitable for reuse as structural fill as it would be expected that significant air-drying would be required in order to achieve the specified density;

- Granular fill materials (OPSS 1010 Type II or Type III Granular 'B' is recommended for this application) can be compacted utilizing adequate heavy vibratory smooth drum or padfoot compaction equipment;

- Fine-grained silt and clay soils (not recommended) must be compacted utilizing adequate heavy padfoot vibratory compaction equipment;

- Approved fill materials must be at suitable moisture contents to achieve the specified compaction. Soil moisture will also be dependent on weather conditions at the time of construction. Granular soils may require the addition of water in order to achieve the specified compaction;

- Approved structural fill materials that will support structures (including foundations, interior slab-on-grades, sidewalks, and large expansive exterior slabs) must be compacted to 100% standard Proctor maximum dry density (SPMDD);

- Approved bulk fill (exterior foundation wall backfill in landscaped areas, bulk fill for driveways) must be compacted to a minimum 95% SPMDD. It would be expected that the relatively loose native soils may be suitable for use as bulk fill following air-drying;

- Granular 'B' subbase and Granular 'A' base materials for driveways must be compacted to 100% SPMDD.

It should be noted that some of the existing native soils were observed to become dense to very dense with depth. It is imperative that when the dense to very dense soils are utilized as backfill, the material must be broken down (pulverized) to minimize void space and reduce the potential for settlement. Problems associated with compacting dense to very dense soils include the potential for long-term settlement due to excessive void space caused by the generally blocky structure of the excavated soils. Therefore, it is not recommended to utilize this material as structural fill. The contractor must have equipment on-site that can effectively break down the dense to very dense excavated soil into workable sizes (as required). Backfilling utilizing this material must be performed in thin lifts with considerable compactive effort applied, thereby reducing the void space, and minimizing long-term settlement. This process could be difficult and time-consuming.

Excavated soils that are considered to be wet or saturated may require significant air-drying along with working of the soils in order to achieve the specified compaction of 100% SPMDD in building envelopes (including 1:1 as required). Utilizing the existing soils during site grading may be more achievable if work is completed during the generally drier summer months. It should be noted, however, that due to the nature of some of the soils, during hot dry weather, the addition of water might be required in order to achieve the specified compaction. Reuse of excavated soils on-site will be subject to approval from qualified geotechnical personnel.

5.5. Foundation Subgrade Preparation

The native soils encountered in the boreholes are sensitive to changes in moisture content and can become loose/soft if the soils are subjected to additional water from seepage or precipitation, as well as severe drying conditions. The native subgrade soils could also be easily disturbed if traveled on during construction. Once they become disturbed, they are no longer considered adequate for the support of shallow foundations.

To ensure and protect the integrity of the founding soils during construction operations, the following is recommended:

- During construction, the subgrade should be sloped/ditched to a sump (as required) located outside the building footprint (if feasible) in the excavation to promote surface drainage of rainwater or seepage and the collected water should be pumped out of the excavation. It is critical that all water be controlled (not allowed to pond) and that the subgrade and foundation preparation commence in dry conditions;

- Construction equipment travel and foot traffic on the founding soils should be minimized;

- If construction is to be undertaken during subzero weather conditions, the founding native soils and any potential fill materials must be maintained above freezing;

- Prior to placing concrete for the footings, the footing area must be cleaned of all disturbed or caved materials;

- The foundation formwork and concrete should be installed as soon as practical following the excavation, inspection, and approval of the founding soils. The longer that the excavated soils remain open to weather conditions and groundwater seepage, the greater the potential for construction problems to occur;

- If it is expected that the founding soils will be left open to exposure for an extended period of time, it is recommended that a 75 mm concrete mud slab be placed in order to protect the structural integrity of the founding soils.

5.6. Slab-on-Grade/Modulus of Subgrade Reaction

Prior to the placement of the granular base for the slab-on-grade construction, the subgrade soils should be proof-rolled. Any soft or weak zones, as well as the unsuitable fill or loose native soils in the subgrade, should be subexcavated and backfilled with approved fill materials (see Section 5.4.5 of this report).

The following table provides the estimated modulus of subgrade reaction (k) for imported granular fill, as well as the native soils encountered on-site:

Soil Type	Modulus of Subgrade Reaction (k)
Granular 'A'/Granular 'B' (OPSS 1010)	81,000 kN/m^3 (300 lb/in^3)
Sand and Gravel	68,000 kN/m^3 (250 lb/in^3)
Silty Clay	61,000 kN/m^3 (225 lb/in^3)
Silty Gravelly Sand	68,000 kN/m^3 (250 lb/in^3)
Silty Gravelly Sand Till	68,000 kN/m^3 (250 lb/in^3)

Any slabs-on-grade should be founded on a minimum thickness of 150 mm (6") of coarse clean granular material containing not more than 10% of material that will pass a 4 mm sieve in accordance with the current OBC. The clear crushed granular material should be consolidated to prevent future settlement. Utilizing clear crushed stone for the slab-on-grade base can assist in providing a moisture barrier. Compactive effort is required to consolidate the clear stone. The clean granular material (19 mm clear crushed stone) should meet the physical property and gradation requirements of OPSS 1004.

It is recommended that areas of extensive exterior slab-on-grade (sidewalks and accessibility ramps) be constructed with a Granular 'B' subbase (450 mm) and a Granular 'A' base (150 mm), as well as incorporating subdrains, to promote rapid drainage and reduce the effects of frost heaving. This is particularly critical at barrier-free access points. Alternatively, structural frost slabs could be designed and constructed, or sufficient thermal insulation could be provided, at all door entrances and areas of barrier-free access.

5.7. Excavations

All excavations must be carried out in accordance with Ontario Regulation 213/91 (Reg 213/91) of the Occupational Health and Safety Act and Regulations for Construction Projects.

Type 3 Soils - In general, any existing fill, as well as the native soils encountered in a drained state (not wet or saturated), would be classified as Type 3 soils under Reg 213/91. The Type 3 soils must be sloped from the bottom of the excavation at a minimum gradient of 1 horizontal to 1 vertical. All saturated soils encountered must be treated as Type 4 soils, as described below.

Type 4 Soils - In general, all wet to saturated soils including saturated soils encountered in the boreholes, would be classified as Type 4 soils under Reg 213/91. Type 4 soils must be sloped from the bottom of the excavation at a minimum gradient of 3 horizontal to 1 vertical.

If it is not practical to excavate according to the above requirements, then a trench support system (designed in accordance with the Ontario Health and Safety Act Regulations) may be utilized. When using a temporary trench support system consisting of trench boxes to reduce the lateral extent of the excavations, it should be noted that the support system is intended primarily to protect workers as opposed to controlling lateral soil movement. Any voids between the excavation walls and the support system should be immediately filled to reduce the potential for loss of ground and to provide support to existing adjacent utilities and structures, and it is recommended that the excavation be carried out in short sections, with the support system installed immediately upon excavation completion.

5.8. Construction Dewatering Considerations

Moist to saturated soils were observed throughout the majority of the boreholes. The founding elevations for the proposed development were not available at the time of the investigation, although it is expected that the excavations for the proposed buildings may extend into or through the very moist to saturated zones observed in the boreholes. Sloughing/caving of excavation walls should be expected when excavating into any very moist to saturated soils. The relatively dense to very dense soils have the potential to create perched water conditions overlying soils. As such, provisions for site dewatering should be part of the site development and construction process.

Seepage control requirements during construction will depend upon the area of work on the site, the depth of the excavations, the time of year, the amount of precipitation and the control of surface water. As required, seepage should generally be adequately controlled using conventional construction dewatering techniques such as pumping from sump pits. However, if heavy seepage occurs, it may be necessary to increase the number of pumps during construction.

Dewatering should be performed in accordance with OPSS 517 and the control of water must be in accordance with OPSS 518. It is the responsibility of the contractor to propose a suitable dewatering system based on the groundwater elevation at the time of construction. Collected water should discharge a sufficient distance away from the excavation to prevent re-entry. Sediment control measures must be installed at the discharge point of the dewatering system to avoid any potential adverse impacts on the environment.

5.9. Service Pipe Bedding

The native soils encountered in the geotechnical investigation are generally considered suitable for indirect support of the site service pipes. Should instability due to wet or saturated soil conditions be encountered, it may be necessary to increase the thickness of the granular base and utilize 19 mm clear stone to create an adequate supporting base for the service pipes and/or manholes. Pipe embedment, cover and backfill for both flexible and rigid pipes should be in accordance with all current and applicable OPSD, OPSS and OBC standards and guidelines and as follows:

Flexible Pipes – The pipe bedding should be shaped to receive the bottom of the pipe. If necessary, pipe culvert frost treatment should be undertaken in accordance with OPSD-803.031. The trench excavations should be symmetrical with respect to the centreline of the pipe. The granular material placed under the haunches of the pipe must be compacted to 95% SPMDD prior to the continued placement and compaction of the embedment material. The homogeneous granular material used for embedment should be placed and compacted uniformly around the pipe. Should wet conditions be encountered at the base of the trench, then the pipe bedding should consist of 19 mm clear stone (meeting OPS Specifications) wrapped completely in a geotextile fabric such as Terrafix 270 or equivalent.

Rigid Pipes - In general, the pipe installation recommendations for rigid pipes are the same as those for flexible pipes, except that the minimum bedding depth below a rigid pipe should be 0.15*D* (where *D* is the pipe diameter). In no case should this dimension be less than 150 mm or greater than 300 mm.

Any service pipes that are not provided with sufficient frost coverage must be protected with the necessary equivalent thermal insulation. The general contractor is responsible for protecting service piping from damage by heavy equipment.

5.10. Perimeter Building Drainage, Foundation Wall Backfill and Trench Backfill

In order to assist in maintaining a dry building with respect to surface water seepage, it is recommended that exterior grades around the buildings be sloped down and away at a 2% gradient or more, for a distance of at least 1.5 m. Any surface discharge rainwater leaders must be constructed with solid piping that discharges positive drainage at least 1.5 m away from the building foundations and/or beyond sidewalks to a drainage swale or appropriate storm drainage system.

Depending on the design, founding elevations and groundwater conditions at the time of construction, it may be necessary to install a granular drainage layer to provide a suitable base for the foundations as well as the slab-on-grade. The granular drainage layer must conform to the requirements of Section 9.14.4 of the OBC 2012. Any groundwater conditions should be expected to exist even following backfilling.

Should any of the proposed structures have basements, as anticipated, an exterior perimeter weeping tile system comprising perforated drainage pipe with a factory installed filter sock, bedded in 19 mm clear crushed stone, and wrapped in a geotextile filter fabric such as Terrafix 270R (or equivalent), must be installed at an elevation that is below any proposed basement slab elevations and provided with positive drainage into a sump pit or other suitable outlet. The portion of the piping that connects the exterior drainage system into the sump pit must comprise solid piping to prevent exterior water from being introduced into the interior subslab stone. Given the wet conditions encountered in the boreholes, it would be prudent to install perforated drainage pipe in any interior basement as well to provide an outlet for any water that may collect in the subslab stone. It is also recommended that a capped cleanout port(s) be extended up to the ground surface elevation to provide future access (if required). The rainwater leaders must not be connected to the perimeter weeping tile system.

It should be noted that based on the observations in the boreholes, there is potential for groundwater to be encountered. The construction of foundations, slabs-on-grade, and deep structures such as sump pits within or below zones of saturation will likely require design of site-specific waterproofing and dewatering systems constructed in accordance with the 2012 OBC. A waterproofing specialist should be consulted to provide site-specific recommendations. It is recommended that a good quality sump pump(s) be utilized, and that the system be equipped with a battery backup in the event of power failure.

In order to reduce the effects of surficial frost heave in areas that will be hard surfaced, it is recommended that the exterior foundation backfill consist of free-draining granular material such as approved Granular 'B' Type I or Type III (OPSS 1010), with a maximum aggregate size not exceeding 100 mm, and that it extend a minimum lateral distance of 600 mm out from the foundation walls and/or beyond perimeter sidewalks and entranceway slabs. It is critical that particles greater than 100 mm in diameter are not in contact with the foundation wall to prevent point loading and overstressing. The backfill material used against the foundation walls must be placed so that the allowable lateral capacities of the foundation walls are not exceeded. Where only one side of a foundation wall will be backfilled and the height of the wall is such that lateral support is required, or where the concrete strength has not been achieved, the wall must be braced or laterally supported prior to backfilling. The design of bracing and lateral supports must be provided by the project structural engineer. In situations where both sides of the wall are backfilled, the backfill should be placed in equal lifts, not exceeding 200 mm differential on each side during backfill operations and the backfill should be compacted to a minimum of 98% SPMDD.

The native soils, as well as approved fill materials (non-organic) are generally considered suitable for reuse as trench backfill, however, any wet soils may require air-drying in order to achieve the specified compaction. Air-drying cannot typically be achieved during winter construction; therefore, depending on the time of year that construction takes place, it may be more feasible to utilize an imported granular fill for this project.

Backfilling operations should be carried out with the following minimum requirements:

- Adequate heavy smooth drum or padfoot vibratory compaction equipment should be used for the compaction and to break down any large blocky pieces of soil;

- Loose lift thicknesses should not exceed 0.3 m (12") for granular soils or 0.2 m (8") for fine grained (silt/clay) soils or the capacity of the compactor (whichever is less);

- The soils must be at suitable moisture contents to achieve compaction to a minimum 95% SPMDD in non-structural bulk fill areas. Service trenches excavated within the zone of influence of footings for structures must be compacted to a minimum of 100% SPMDD;

- It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure that compaction requirements are achieved;

- Service trench backfill materials may consist of approved excavated soils with no particles greater than 100 mm and no topsoil or other deleterious materials;

- If construction operations are undertaken in the winter, strict consideration should be given to the condition of the backfill material to make certain that frozen material is not used.

As noted previously, the existing native soils were observed to become dense to very dense with depth. It is imperative that when the dense to very dense soils are utilized as backfill, the material must be broken down (pulverized) to minimize void space and reduce the potential for settlement.

5.11. Pavement Design/Drainage

Any soils containing buried topsoil, organics or other deleterious materials must be subexcavated from within the proposed driveway and parking areas. It is recommended to either subexcavate any existing loose subgrade materials or provide further consolidation with vibratory compaction equipment in order to prepare a proper, stable subgrade. Prior to placement of the granular base, the subgrade must be proof-rolled, and any soft or unstable areas should be subexcavated and replaced with suitable fill materials. The subgrade should be graded smooth (free of depressions) and properly crowned to ensure positive drainage, with a minimum grade of 3% toward the drainage outlet or curb line. When service pipes are installed, pipe bedding and backfilling should be undertaken as indicated in Sections 5.9 and 5.10 of this report.

Rapid drainage of the pavement structure is critical to ensure long-term performance. The existing subgrade soils are considered highly frost-susceptible; therefore, it is recommended to install subdrains for this project (provided gravity drainage to a suitable outlet can be provided). Subdrains should be designed and installed in accordance with OPSS 405 and OPSD 216.021. If Granular 'A' bedding (OPSS 1010) is utilized, the subdrains should be equipped with a factory installed filter sock. If 19 mm clear stone (OPSS 1004) is utilized as bedding for the subdrain (recommended for this application), then the bedding must be wrapped completely with geotextile filter fabric such as Terrafix 270R (or equivalent). Positive drainage through grade control of subdrains is critical, as improperly installed subdrains can turn drainage systems into reservoirs, which can fuel frost action. The subdrains will hasten the removal of water, thereby reducing the risk and effects of frost heaving and load transfer in saturated conditions. It is suggested that subdrains be installed at regular intervals (to be designed based on layout of catch basins and storm sewers) along any curb line of any proposed new roads as well as in low areas of the paved driveways and parking areas. It is also recommended to install subdrains through any areas that cannot tolerate differential frost heave such as accessibility ramps/sidewalks. The subdrains should be installed in a 0.3 m (1.0 ft) by 0.3 m (1.0 ft) trench in the subgrade and bedded approximately 50 mm (2") above the bottom of the trench. The subgrade must be prepared with positive drainage to the subdrains and the subdrains must be installed with positive drainage into a catch basin structure or other suitable outlet.

The native subgrade soils are sensitive to changes in moisture content and can become loose or soft if the soils are subject to inclement weather and seepage or severe drying. Furthermore, the subgrade soils could be easily disturbed if traveled on during construction. As such, where this material will be exposed, it is recommended that the granular subbase be placed immediately upon completion of the subgrade preparation to protect the integrity of the subgrade soils.

Should wet to saturated conditions be encountered during construction, site assessments may be required to determine what options can be undertaken to construct a modified pavement base. These options may include subexcavation of wet soils and increasing the thickness of the granular base, the use of reinforcing geotextiles or geogrids, or a combination of all.

It is understood that any proposed roads, driveways, loading areas and parking areas are to be for personal vehicles, delivery trucks and emergency vehicles and will be generally subject to light to moderate traffic and loading.

Based on the anticipated loading, the following pavement design is provided:

Material	Recommended Thickness For New Pavement
Asphaltic Concrete	HL3 surface course - 40 mm (1.5") HL4 or HL8 binder course - 50 mm (2.0")
Granular 'A' Base (OPSS 1010)	150 mm (6.0")
Granular 'B' Subbase (OPSS 1010)	400 mm (16.0")

The granular base and subbase materials must conform to the physical property and gradation requirements of OPSS 1010 and must be compacted to 100% SPMDD. Asphaltic concrete should be supplied, placed, and compacted to a minimum 92.0% Marshall maximum relative density, in accordance with OPSS 1150 and OPSS 310.

Construction joints in the surface and intermediate binder asphalt must be offset a minimum of 150 mm to 300 mm (6" to 12") from construction joints in the binder asphalt so that longitudinal joints do not coincide.

Where new asphalt is joined into any existing asphalt, it is recommended that the existing asphalt be sawcut in a straight line prior to being milled to a depth of 80 mm and a width of 300 mm as per OPSD 509.010. It is recommended that a tack coat in conformance with OPSS 308 be applied to the edge and surface of all milled asphalt prior to placement of new asphalt.

The pavement should be designed to ensure that water will not pond on the surface. If the surface asphalt is not placed within a reasonable time following placement of the binder asphalt, it is recommended that the catch basin lids are set at a lower elevation or apertures provided to allow surface water to drain into the catch basins and not accumulate around the catch basins. The strength of the pavement structure relies on all of the components to be in place in order to provide the design strength; therefore, it is strongly recommended that the surface asphalt and intermediate binder asphalt be placed shortly after placement of the binder asphalt so as to avoid undue stress on the binder asphalt by not having the complete pavement structure in place.

It should be noted that, currently, asphalt mixes tend to be more flexible and, as such, there is a tendency for damage to occur from vehicles turning their steering wheels or applying excessive brake pressure. The condition is further intensified during hot weather. In high traffic areas or areas subjected to frequent turning of heavy vehicles such as delivery trucks and tractor trailers, it is recommended that rigid Portland cement pavement be considered.

5.12. Slope Stability Assessment

In order to assess the current stability of the existing slope of the proposed development area, a slope stability analysis was completed. Two (2) slope cross-sections through the property (referenced as Cross-Sections A-A1 and B-B1) were analyzed. Based on measurements interpreted from a topographic survey provided by Van Harten Surveying Inc., the slope dimensions were analyzed. It was determined that the slope at Cross Section A-A1 generally extends over a distance of approximately 48.1 m with a change in elevation of approximately 8.5 m. As such, the steepness of the slope at Cross Section A-A1 was generally in the order of 5.66H:1.0V. It was determined that the slope at Cross Section B-B1 generally extends over a distance of approximately 37.9 m with a change in elevation of approximately 6.0 m. As such, the steepness of the slope at Cross Section B-B1 was generally in the order of 6.32H:1.0V. The location of the top of existing slope and the toe of existing slope are shown in Drawing 2.

CMT Inc. staff conducted a visual inspection of the existing slope conditions on July 24, 2023. In general, the slope was well-vegetated with large trees throughout and low-lying vegetation over the remainder of the area. There was seepage observed at the surface of the slope adjacent Borehole 3 with the majority of drainage over the slope. There were no signs of slope instability such as curved/angled trees, slumps, or tension cracks. Based on Table 4.2 – Slope Stability Rating Chart from *Technical Guide – River and Stream Systems: Erosion Hazard Limit, 2002* by the MNR), the slope was determined to have a total rating value of 23 and therefore the slope is considered to have low potential for slope instability (see Appendix D).

5.12.1. Stability Analysis

The stability of the slope was assessed using Bishop's simplified method. With this method, the factor of safety of a slope is determined by comparing the moment of the weight of a soil wedge about the centre of a slip circle, with the resisting moment provided by the shear stresses along the slip surface.

The following table shows the estimated soil parameters that were used for the slope stability analysis:

Soil Type	Unit Weight (kN/m^3)	Friction Angle	Cohesion (kPa)
Silty Clay	20.0	30°	5.0
Sand and Gravel	21.5	32°	0.0
Silty Gravelly Sand	21.5	32°	0.0
Silty Gravelly Sand Till	21.5	32°	0.0
Fill	19.0	28°	0.0

The above parameters are based on the information obtained from borehole advanced on the subject property.

The Factor of Safety of 1.0 is considered to represent a potential failure condition. As per Table 4.3 of *Technical Guide – River and Stream Systems: Erosion Hazard Limit, 2002* by the MNR, the land use of the site would be classified as "Active" (habitable or occupied structures near slope). A Factor of Safety of 1.5 is considered to be adequate for this site with respect to shallow and deep-seated (global) failure surfaces.

The slope stability analysis of the existing slope and the proposed grading was completed utilizing the SLIDE software package by Rocscience. Based on the analysis completed for Cross-Section A-A1 and B-B1, a minimum factor of safety of 1.697 was determined for the existing slope of Cross-Section A-A1 and a minimum safety factor of safety of 1.916 was determined for the existing slope of Cross-Section B-B1. As such, the existing slopes are considered to be stable in the existing condition. The results of the slope stability analyses including the safety factors achieved for the existing slope are provided in Drawings 4 and 7.

5.12.2. Other Valley lands Slope Analysis/Proposed Slope Conditions

The slope was also assessed with respect to the *GRCA Policies for the Administration of Development, Interference with Wetlands and Alternation to Shorelines & Watercourses Regulation (Ontario Regulation 150/06)*. The existing slope angle is flatter than 3H:1V and there are no signs of erosion at the toe of the slope. The Grand River is approximately 110 m to 160 m away from the toe of the slope, and as such, the toe of the slope is considered stable from erosion. Since no erosion is anticipated and the existing top of slope is in a stable condition, the slope would be considered stable in the long-term (100-year) slope condition.

Based on the analysis completed for Cross-Section A-A1 and B-B1, a minimum factor of safety of 1.776 was determined for the proposed grading of Cross-Section A-A1 and a minimum safety factor of safety of 1.843 was determined for the proposed grades of Cross-Section B-B1. As such, the proposed slope is determined to be stable with the construction of the proposed dwellings and retaining walls as per the proposed grading plan.

The results of the slope stability analysis including the safety factors achieved for the proposed grades are provided in Drawings 5 and 8. It should be noted that the analyses of the proposed slope was completed assuming the proposed dwellings and retaining walls would be constructed as cast in place concrete foundations and structures that would support the slope. These walls are to be designed by other qualified firms.

According to the *GRCA Policies for the Administration of Development, Interference with Wetlands and Alternation to Shorelines & Watercourses Regulation (Ontario Regulation 150/06),* the subject site is classified as – Apparent Valleys – Other Valleylands under the regulations as the slope inclination is greater than or equal to 15 per cent (6.7H:1V) but less than 20 per cent (5H:1V) to the top of slope. The site is outside of the Erosion Hazard of the Grand River and outside of the One Zone Flood Area, however, according to the GRCA Online Mapping, the Two Zone "Flood Fringe Area" does contact a small portion of the site at the southeast corner. The GRCA should be contacted to confirm the flood fringe elevation for this area. Regardless, this site would be considered as an Other Valleyland for the application of the GRCA policies.

Based on the definition above, Policy 8.3.2. of the *GRCA Policies for the Administration of Development, Interference with Wetlands and Alternation to Shorelines & Watercourses Regulation (Ontario Regulation 150/06)* applies.

8.3.2. - ***Development*** *in Other Valleylands and the associated allowance may be permitted in accordance with the policies in Sections 7.1.2-7.1.3 - General Policies, and where it can be demonstrated through a site-specific geotechnical or engineering assessment that*:

a) the proposed development is not subject to a Riverine Erosion Hazard or a Riverine Flooding Hazard,

The Grand River is approximately 110 m to 160 m away from the toe of the slope. The site is outside of the Erosion Hazard of the Grand River and outside of the One Zone Flood Area, however, according to the GRCA Online Mapping, the Two Zone "Flood Fringe Area" does contact a small portion of the site at the southeast corner. The GRCA should be contacted to confirm the flood fringe elevation for this area. The flood fringe is not anticipated to affect the stability of the slope, nor will it contribute to any long-term erosion on the site.

b) there is no impact on existing and future slope stability and bank stabilization, or erosion protection works are not required,

Based on the results of the slope stability analysis, the proposed developments have a negligible affect on existing and future slope stability.

c) the potential of increased loading forces is addressed through appropriate structural design,

The existing and proposed developments were conservatively modelled with a 100 kPa surcharge loading in the slope stability analysis.

d) access into and through the valley for preventative actions or maintenance or during an emergency will not be prevented,

Access to and through the valley will not be impeded as a result of the proposed development. Access will be maintained on the north and south sides of the development.

e) the potential for surficial erosion is addressed by a drainage plan where applicable,

Drainage and grading plans are to be completed by others (as required). CMT Inc. recommends continuing to use the best drainage practices (collect and divert runoff to catch basins, use of splash pads in vegetated areas, etc.).

As such, this proposed development would be considered suitable from a geotechnical and slope stability perspective, so long as all GRCA polies are followed.

5.13. Retaining Wall Recommendations

An engineer must design any proposed retaining wall for the site if any retaining walls are over 1.0 m in height. Retaining walls over 1.0 m in height would be considered a designated structure under the building code (OBC 1.3.1.1., 2012). In the past, cast in place concrete retaining walls, precast gravity segmental block retaining walls and mechanically stabilized earth (MSE) precast segmental block retaining walls have been cost effective methods for earth retention.

The site plans should ensure that if the retaining wall is retaining the neighboring property (subject site is on the low side and neighbor is on the high side) near the property line, sufficient space is left to keep the retaining wall structure (including all components such as geogrid and granular fill) and corresponding excavation entirely on the subject site (as per section 5.8. excavation requirements). The widths of retaining structures vary depending on the type and retained height. Generally, all trees should not be planted within 3.0 m from the back of the retaining wall structure or within a 1H:1V envelope measured from the back of the bottom of the retaining wall structure (whichever is greater), to reduce the probability of failure due to frost heave, root penetration, unaccounted for live/dead loads from the trees and other factors.

CMT Engineering Inc. would be pleased to offer consulting services on the feasibility of the proposed retaining wall heights and locations from a construction and long-term design perspective.

5.14. Chemical Analysis/Excess Soil Management

5.14.1. Chemical Testing

As requested, random representative samples of soil were obtained by CMT Inc. personnel and were submitted to ALS Laboratory Group in Waterloo, Ontario for chemical analyses including Sodium Absorption Ratio (SAR) testing. Samples were obtained from the following depths and locations:

- Borehole 1 - depth 0.76 m to 1.37 m (2.50 ft to 4.50 ft);
- Borehole 1 – depth 3.66 m to 4.57 m (12.00 ft to 15.00 ft); and
- Borehole 2 – depth 1.52 m to 2.13m (5.00 ft to 7.00 ft).

A duplicate sample was submitted from Borehole 1 for quality control/quality assurance purposes. It should be noted that the total volume of soils to be removed from the site were unknown at the time of the investigation. As such, additional sampling may be required if greater than 600 m^3 of excess soil is to be removed from site.

The samples were tested for the following various parameters:

- Electrical Conductivity and pH as per O.Reg. 406/19;
- Sodium Absorption Ratio (SAR) as per O.Reg. 406/19;
- Metals as per O.Reg. 406/19;
- VOC's as per O.Reg. 406/19;
- BTEX and PHC F1-F4 as per O.Reg. 406/19;
- PAH as per O.Reg. 406/19; and
- Corrosivity as per O.Reg. 406/19.

The chemical analysis results were compared to the site condition standard of Ontario Regulation 406/19. Specifically, the results are compared to; *T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use; T2.1-Volume Independent Soil – Res/Park/Inst Property Use.*

The samples from the boreholes did **not** exceed the guideline limits for parameters of the Table 1 and Table 2.1 standards noted in the testing completed by ALS Environmental August 1, 2023. Please refer to the chemical analysis test results in Appendix C for Guideline Limit Reference numbers.

The above test results are based on a single samples extracted from each borehole and does not constitute as a guarantee for the entire site. It is the responsibility of the contractor to notify the owner/consultant of any changes in site conditions such as odours or staining that would warrant further testing. The boreholes completed as part of the geotechnical investigation were advanced in areas that have not been subjected to excavation for existing service pipe installation.

5.14.2. Leachate Testing

A representative sample of soil was obtained by CMT Inc. personnel and was submitted to ALS Laboratory Group in Waterloo, Ontario for chemical analyses. The sample was obtained from the following depth and location:

- Borehole 1 – depth 0.76 m to 1.37 m (2.50 ft to 4.50 ft)

Sampling was conducted following the Ministry of Environment "Guideline on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario" protocol. The soil sample was tested for the following parameters:

- TCLP Metals; and
- TCLP VOC's.

The chemical analysis results were found to have **no** exceedances when compared to Ontario Ministry of the Environment, General Waste Control Regulation No. 347/90. The testing was completed by ALS Environmental on August 28, 2023. The laboratory testing has been attached for your reference.

5.15. Radon

According to information provided by Health Canada, radon is a radioactive gas that is naturally formed through the breakdown of uranium in soil, rock, and water. When radon escapes the earth outdoors, it mixes with fresh air, resulting in concentrations that are too low to be of concern. However, when radon enters an enclosed space, such as a building, high concentration of radon can accumulate and become a health concern. Health Canada indicates that most buildings and homes have some level of radon in them. Unfortunately, it is not possible to predict before construction whether or not a new building will have high radon levels as radon can only be detected by radon measurement devices, which would be installed in a building, post construction. Section 9.13.4.1 Soil Gas Control of the current 2012 Ontario Building Code (OBC) states that *"Where methane or radon gases are known to be a problem, construction shall comply with the requirements for soil gas control in MMAH Supplementary Standard SB-9, Requirements for Soil Gas Control"*.

6.0 SITE INSPECTION

Qualified geotechnical personnel should supervise excavation inspections as well as compaction testing for structural filling, site grading and site servicing. This will ensure that footings are founded in the proper strata and that proper material and techniques are used and the specified compaction is achieved. CMT Engineering Inc. would be pleased to review the design drawings and provide an inspection and testing program for the construction of the proposed development.

7.0 LIMITATIONS OF THE INVESTIGATION

This report is intended for the Client named herein and for their Client. The report should be read in its entirety, and no portion of this report may be used as a separate entity. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review our recommendations when the drawings and specifications are complete, or if the proposed construction should differ from that mentioned in this report.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments are based on the results obtained at the test locations only. It is therefore assumed that these results are representative of the subsoil conditions across the site. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations.

It should be noted that this report specifically addresses geotechnical aspects of the project and does not include any investigations or assessments relating to potential subsurface contamination. As such, there should be no assumptions or conclusions derived from this report with respect to potential soil or water contamination. Soil or water contamination is generally caused by the presence of xenobiotic (human-made) chemicals or other alteration processes in the natural soil and groundwater environment. If necessary, the investigation, assessment and rehabilitation of soil and water contaminants should be undertaken by qualified environmental specialists.

The samples obtained during the geotechnical investigation will be stored for a period of three months, after which time they will be disposed of unless alternative arrangements are made.

We trust that this report meets with your present requirements. Should you have any questions, please do not hesitate to contact our office.

Prepared by:

Brandon Figg

Brandon R Figg, C.Tech.
Senior Soil Technician

Reviewed by:

Nathan Chortos, P.Eng.
Senior Geotech. Engineer

ht

NOTES:

1. BASE MAP PROVIDED BY GOOGLE EARTH

N

NO.	DESCRIPTION	DATE

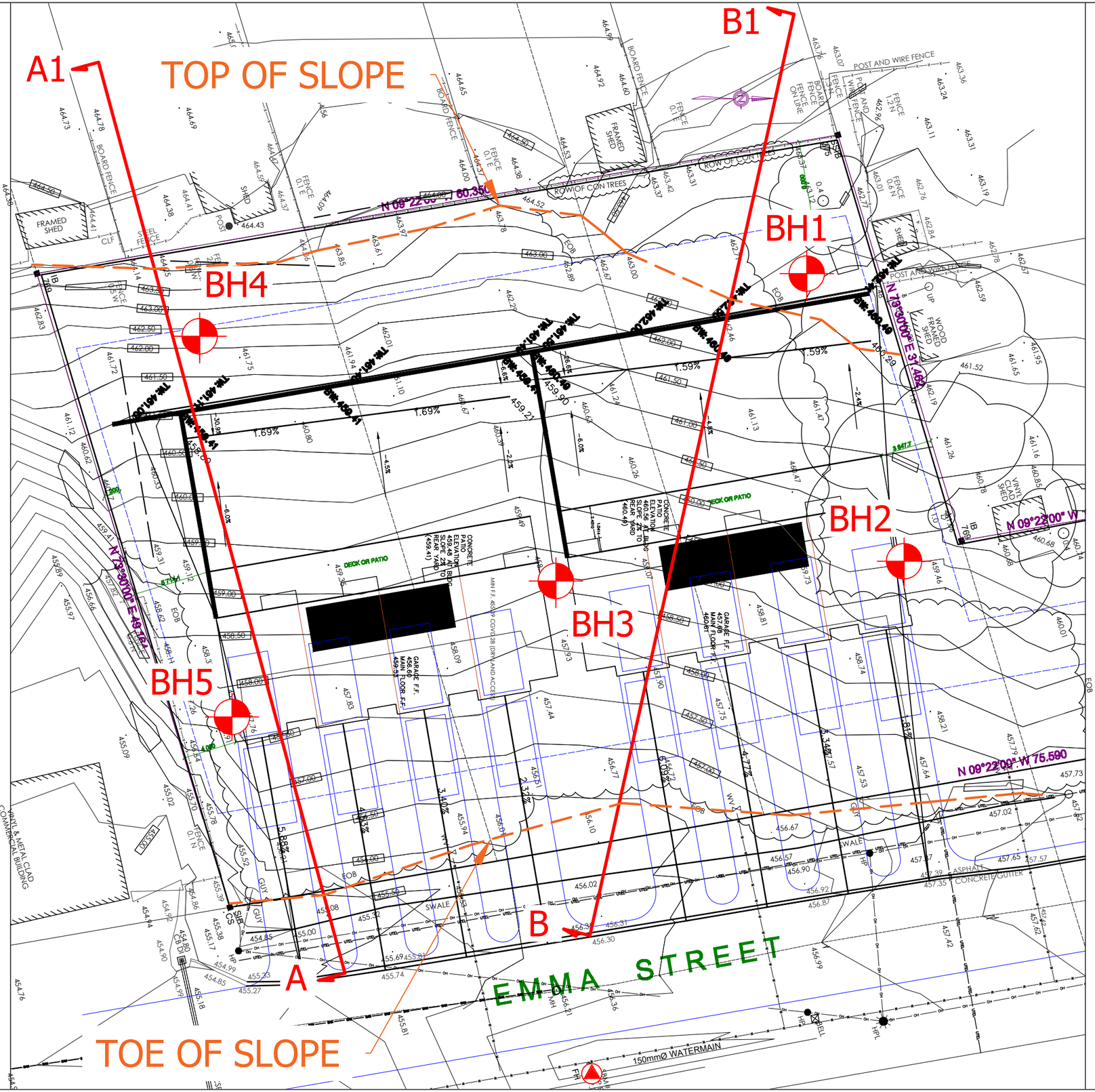
REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

PROJECT:
GEOTECHNICAL INVESTIGATION & SLOPE STABILITY ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
40-60 Emma Street South,
Grand Valley, Ontario

DRAWING TITLE:
SITE LOCATION MAP

PROJECT NO.:	DATE:
23-146	August 28, 2023
SCALE: N.T.S.	DRAWING NO. 1



NOTES:

1. PROPOSED GRADING PLAN PROVIDED BY CLIENT

LEGEND

- CMT Borehole - 2023
- Temporary Benchmark (TBM)
- Top/Toe of Slope

N

NO.	DESCRIPTION	DATE

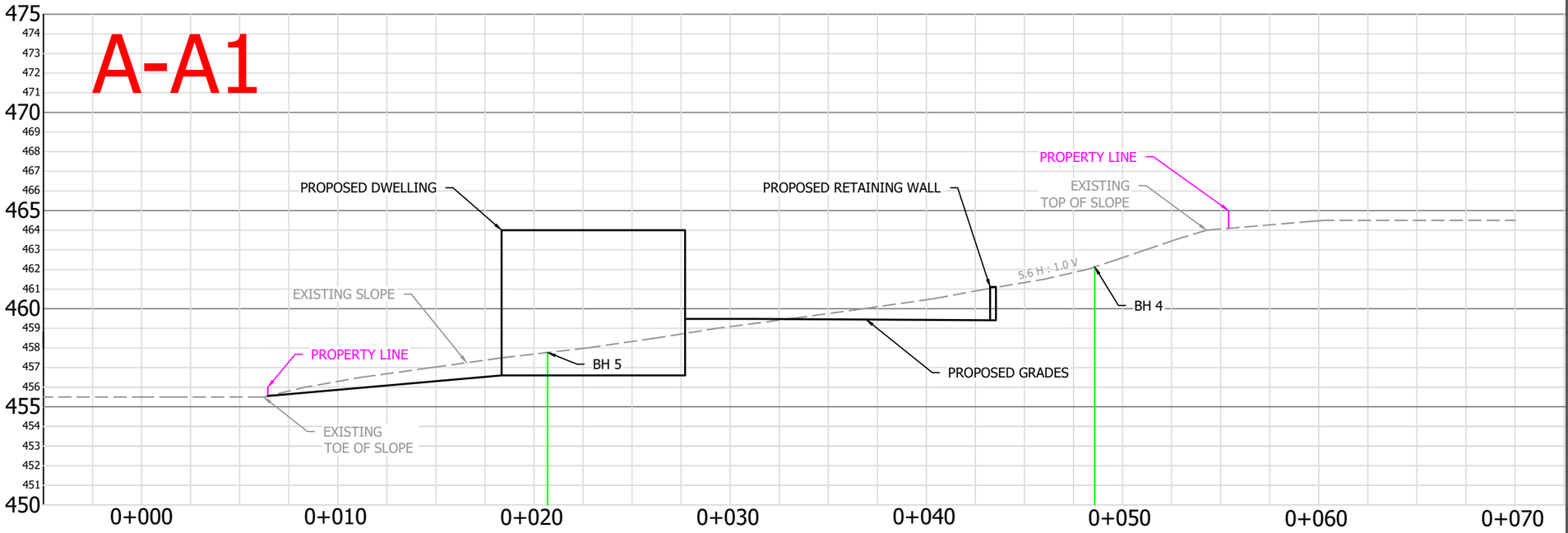
REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

PROJECT:
GEOTECHNICAL INVESTIGATION & SLOPE STABILITY ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
40-60 Emma Street South,
Grand Valley, Ontario

DRAWING TITLE:
PROPOSED GRADING PLAN SHOWING BOREHOLES AND CROSS SECTION LOCATIONS

PROJECT NO.:	DATE:
23-146	August 28, 2023
SCALE:	DRAWING NO.
1:300	2



NOTES:

1. SLOPE CROSS-SECTION AS PER PROPOSED GRADES DRAWING PROVIDED BY CLIENT.

LEGEND

- EXISTING GRADE
- PROPOSED GRADE
- BOREHOLE

NO.	DESCRIPTION	DATE

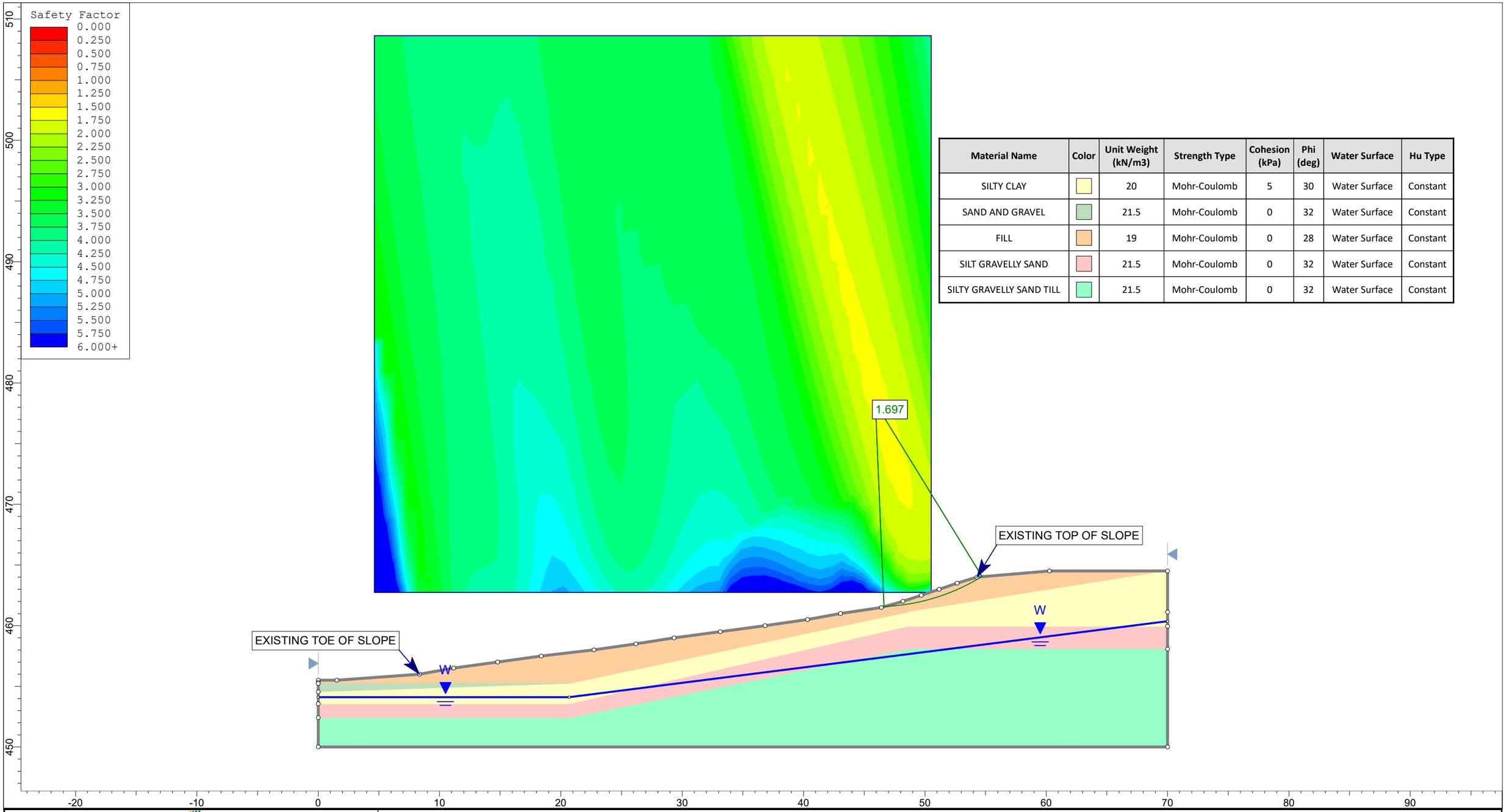
REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

PROJECT:
GEOTECHNICAL INVESTIGATION & SLOPE STABILITY ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
40-60 Emma Street South,
Grand Valley, Ontario

DRAWING TITLE:
SLOPE CROSS-SECTION
A-A1

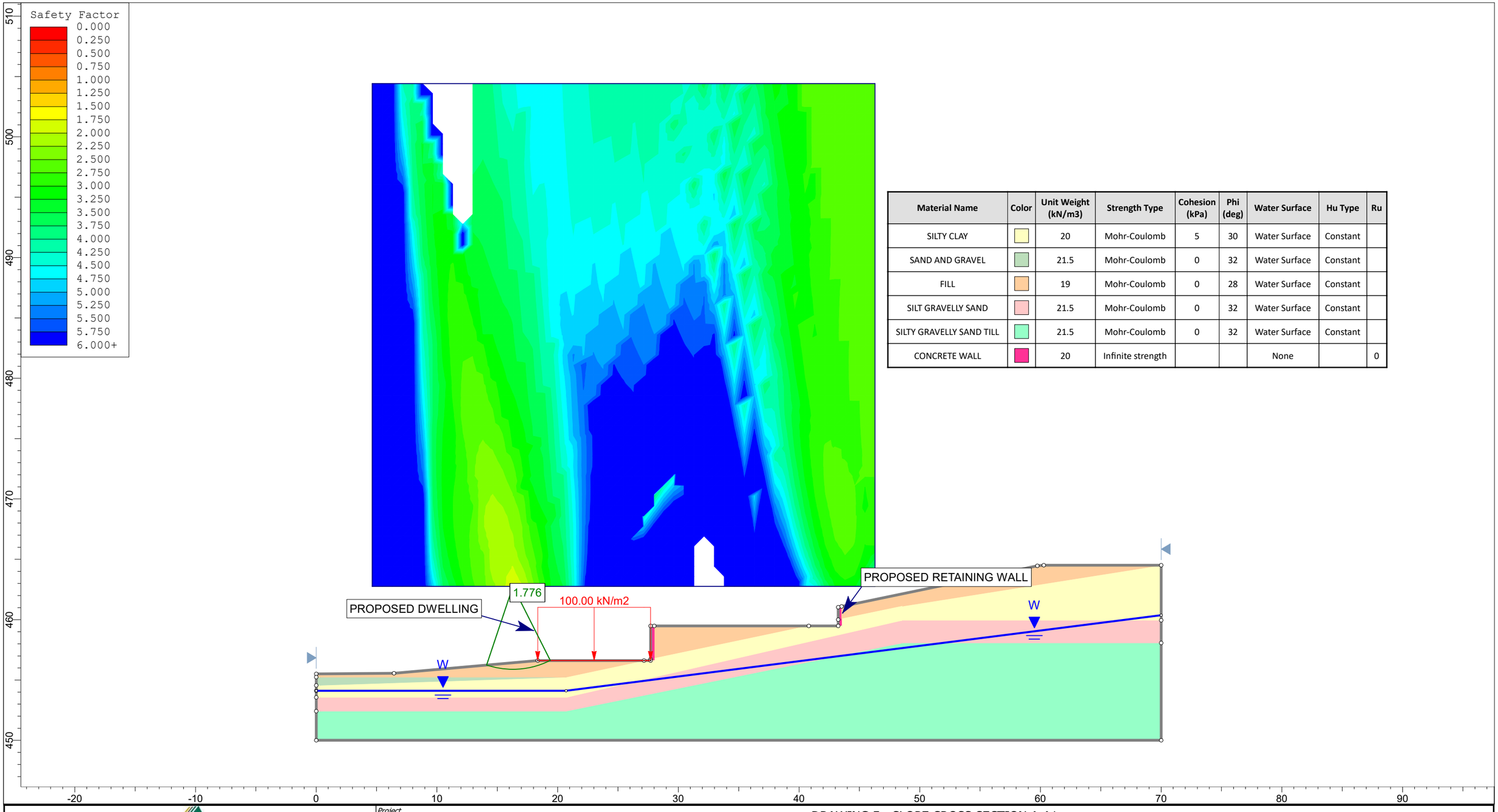
PROJECT NO.:	DATE:
23-146	August 28, 2023
SCALE:	DRAWING NO.
1:250	3



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
SILTY CLAY		20	Mohr-Coulomb	5	30	Water Surface	Constant
SAND AND GRAVEL		21.5	Mohr-Coulomb	0	32	Water Surface	Constant
FILL		19	Mohr-Coulomb	0	28	Water Surface	Constant
SILT GRAVELLY SAND		21.5	Mohr-Coulomb	0	32	Water Surface	Constant
SILTY GRAVELLY SAND TILL		21.5	Mohr-Coulomb	0	32	Water Surface	Constant

CMT ENGINEERING INC.

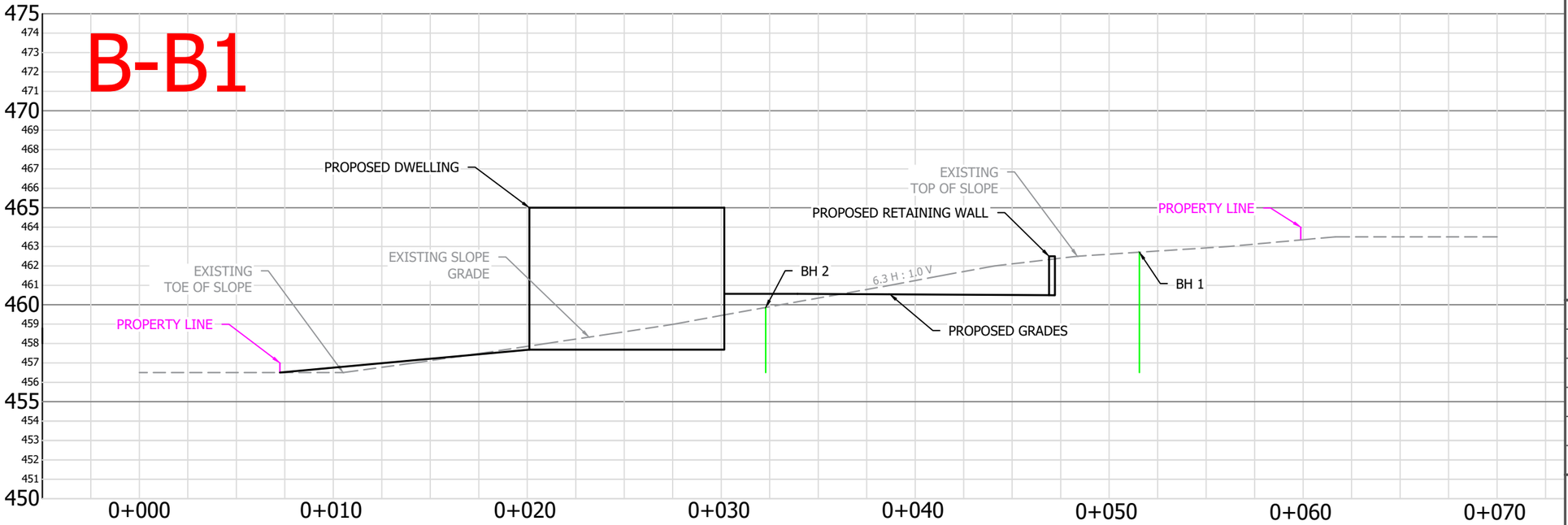
Project	DRAWING 4 - SLOPE CROSS SECTION A-A1 SHOWING MINIMUM FACTORS OF SAFETY (LESS THAN 1.5) FOR EXISTING SLOPE CONDITIONS			
Location	40-60 Emma Street South, Grand Valley, ON			
Drawn By	BRF	*Scale*	1:300	*Company* CMT ENGINEERING INC
Date	August 28, 2023			*Job Number* 23-146



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Ru
SILTY CLAY		20	Mohr-Coulomb	5	30	Water Surface	Constant	
SAND AND GRAVEL		21.5	Mohr-Coulomb	0	32	Water Surface	Constant	
FILL		19	Mohr-Coulomb	0	28	Water Surface	Constant	
SILT GRAVELLY SAND		21.5	Mohr-Coulomb	0	32	Water Surface	Constant	
SILTY GRAVELLY SAND TILL		21.5	Mohr-Coulomb	0	32	Water Surface	Constant	
CONCRETE WALL		20	Infinite strength			None		0

CMT ENGINEERING INC.

Project	DRAWING 5 - SLOPE CROSS SECTION A-A1 SHOWING MINIMUM FACTORS OF SAFETY (LESS THAN 1.5) FOR PROPOSED LONG TERM SLOPE CONDITIONS		
Location	40-60 Emma Street South, Grand Valley, ON		
Drawn By	BRF	*Scale* 1:300	*Company* CMT ENGINEERING INC
Date	August 28, 2023		*Job Number* 23-146



NOTES:

1. SLOPE CROSS-SECTION AS PER PROPOSED GRADES DRAWING PROVIDED BY CLIENT.

LEGEND

- EXISTING GRADE
- PROPOSED GRADE
- BOREHOLE

NO.	DESCRIPTION	DATE

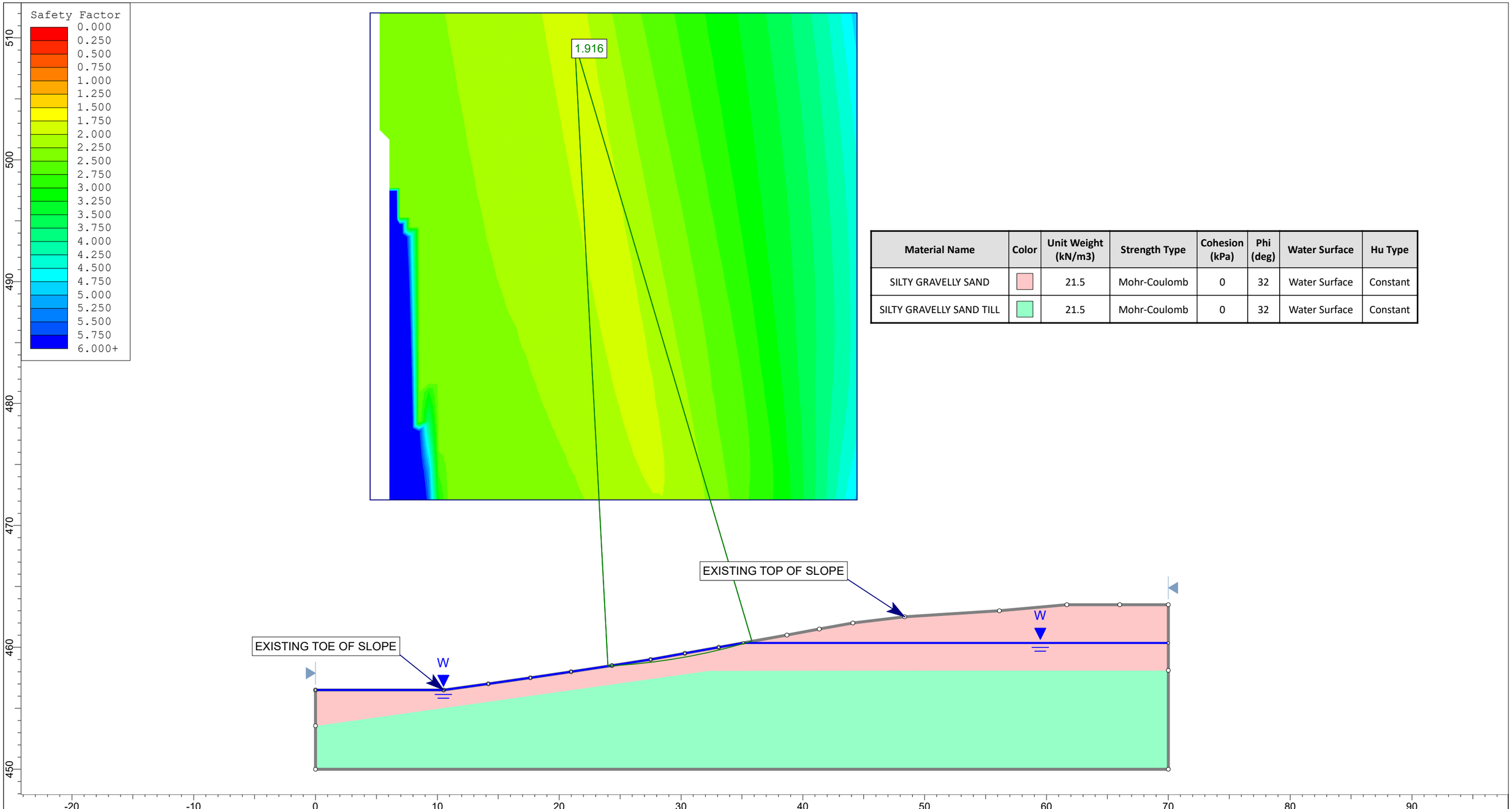
REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

PROJECT:
GEOTECHNICAL INVESTIGATION & SLOPE STABILITY ASSESSMENT
PROPOSED RESIDENTIAL DEVELOPMENT
40-60 Emma Street South,
Grand Valley, Ontario

DRAWING TITLE:
SLOPE CROSS-SECTION
B-B1

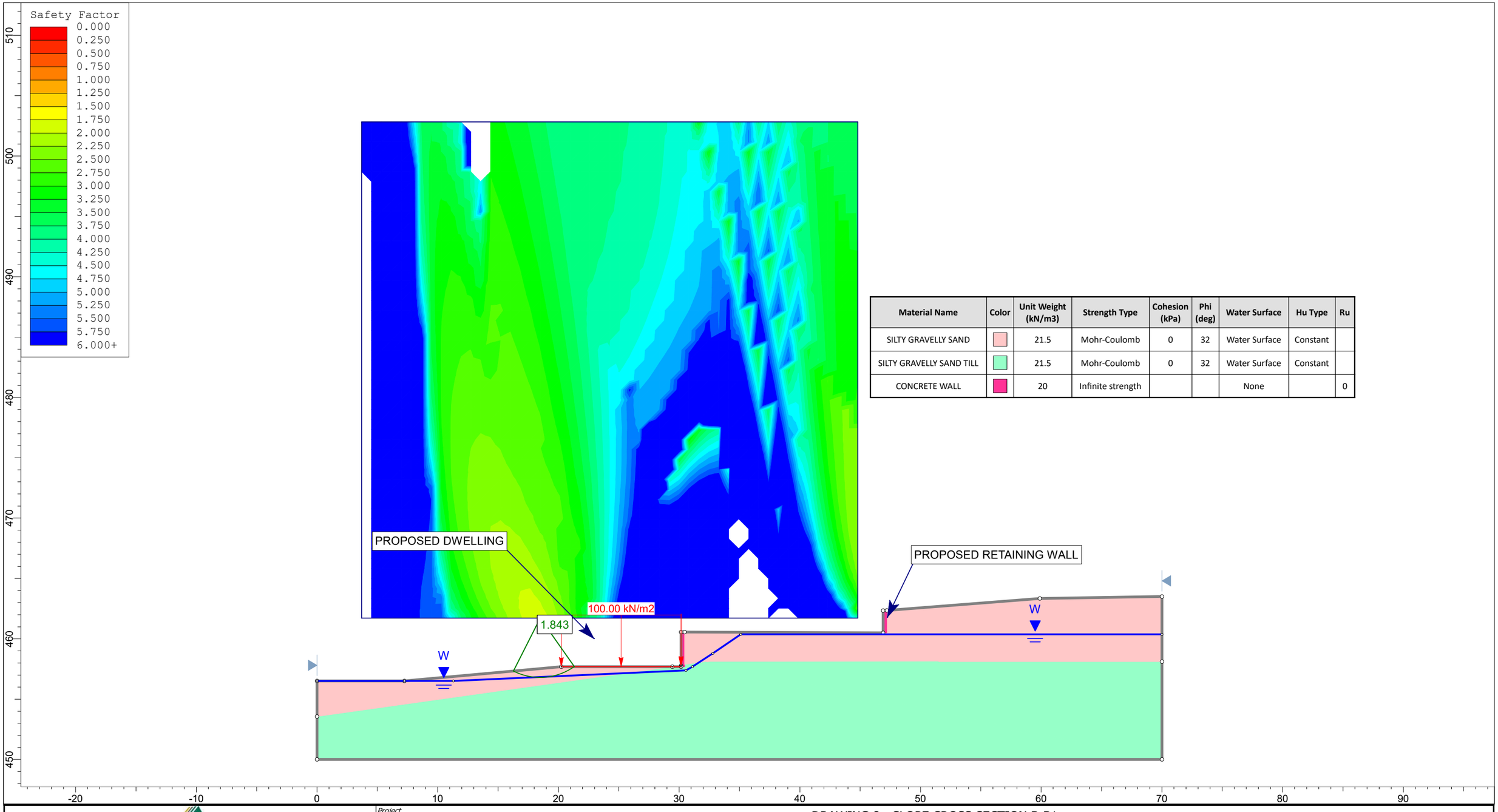
PROJECT NO.:	DATE:
23-146	August 28, 2023
SCALE:	DRAWING NO.
1:250	6



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type
SILTY GRAVELLY SAND		21.5	Mohr-Coulomb	0	32	Water Surface	Constant
SILTY GRAVELLY SAND TILL		21.5	Mohr-Coulomb	0	32	Water Surface	Constant

CMT ENGINEERING INC.

Project	DRAWING 7 - SLOPE CROSS SECTION B-B1 SHOWING MINIMUM FACTORS OF SAFETY (LESS THAN 1.5) FOR EXISTING SLOPE CONDITIONS			
Location	40-60 Emma Street South, Grand Valley, ON			
Drawn By	BRF	Scale	1:300	Company: CMT ENGINEERING INC
Date	August 28, 2023			Job Number: 23-146



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Ru
SILTY GRAVELLY SAND		21.5	Mohr-Coulomb	0	32	Water Surface	Constant	
SILTY GRAVELLY SAND TILL		21.5	Mohr-Coulomb	0	32	Water Surface	Constant	
CONCRETE WALL		20	Infinite strength			None		0

CMT ENGINEERING INC.

Project	DRAWING 8 - SLOPE CROSS SECTION B-B1 SHOWING MINIMUM FACTORS OF SAFETY (LESS THAN 1.5) FOR PROPOSED LONG TERM SLOPE CONDITIONS		
Location	40-60 Emma Street South, Grand Valley, ON		
Drawn By	BRF	*Scale* 1:300	*Company* CMT ENGINEERING INC
Date	August 28, 2023		*Job Number* 23-146

APPENDIX A

BOREHOLE LOGS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Telephone: 519-699-5775
Fax: 519-699-4664

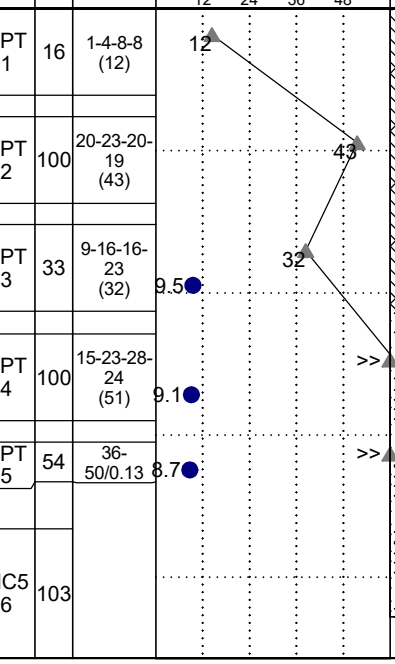
BOREHOLE NUMBER BH1

PROJECT: Proposed Residential Development
PROJECT ADDRESS: 40-60 Emma Street South
PROJECT NUMBER: 23-146
PROJECT LOCATION: Grand Valley, ON
DRILLING DATE: 7-24-23
GROUND ELEVATION: 462.43 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT/MC5

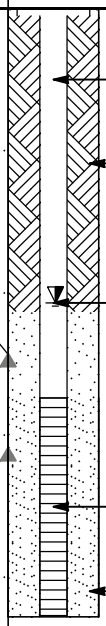
DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
	TOPSOIL: Compact, dark brown, silty organic topsoil, moist (100 mm)	0.00, 462.43			
	SILTY GRAVELLY SAND: Compact, light brown, silty gravelly sand, some clay, moist	0.10, 462.33	SPT 1	16	1-4-8-8 (12)
1	becoming dense	0.76, 461.67	SPT 2	100	20-23-20-19 (43)
2	becoming very moist	1.52, 460.91	SPT 3	33	9-16-16-23 (32)
	becoming very dense, wet	2.29, 460.14	SPT 4	100	15-23-28-24 (51)
3	becoming very moist	3.05, 459.38	SPT 5	54	36-50/0.13
4			MC5 6	103	
	SILTY GRAVELLY SAND TILL: Very dense, brown, silty gravelly sand till, some clay, moist	4.32, 458.11			

Bottom of borehole at 4.57 m, Elevation 457.86 m.

SPT N VALUE: 10 20 30 40
POCKET PEN. (kPa): 90 180 270 360
MOISTURE CONTENT (%): 12 24 36 48



WELL DIAGRAM



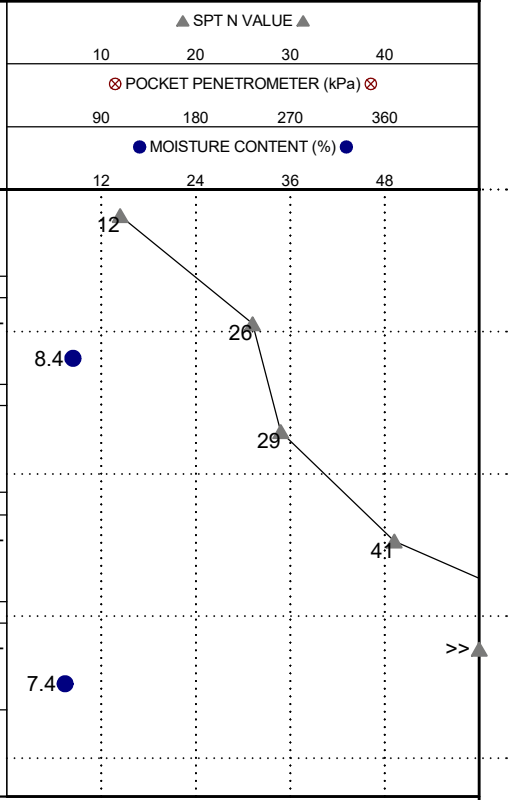
- 25mm Riser
- Bentonite Seal
- Groundwater was measured at 2.07 m below ground surface (El. 460.36 m) on August 24, 2023
- 25mm Screen
- #2 Sand Pack

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Telephone: 519-699-5775
Fax: 519-699-4664

BOREHOLE NUMBER BH2

PROJECT: Proposed Residential Development
PROJECT ADDRESS: 40-60 Emma Street South
PROJECT NUMBER: 23-146
PROJECT LOCATION: Grand Valley, ON
DRILLING DATE: 7-24-23
GROUND ELEVATION: 460.37 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT/MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
	TOPSOIL: Compact, dark brown, silty organic topsoil, moist (100 mm)	0.00, 460.37			
		0.10, 460.27	SPT 1	33	2-4-8-10 (12)
	SAND AND GRAVEL FILL: Compact, brown, sand and gravel fill, moist	0.20, 460.17			
1	**SILTY GRAVELLY SAND:** Compact, light brown, silty gravelly sand, some clay, moist		SPT 2	75	13-13-13-12 (26)
2			SPT 3	87	8-12-17-20 (29)
	SILTY GRAVELLY SAND TILL: Dense, brown, silty gravelly sand till, some clay, moist	2.29, 458.08	SPT 4	75	15-16-25-36 (41)
3	becoming very dense	3.05, 457.32	SPT 5	87	28-26-41-40 (67)
4			MC5 6	100	



Refusal on very dense till was encountered at a depth of 4.27 m (El. 456.10 m) below ground surface. Caving was encountered at a depth of 4.09 m (El. 456.28 m) below ground surface upon completion of the borehole.

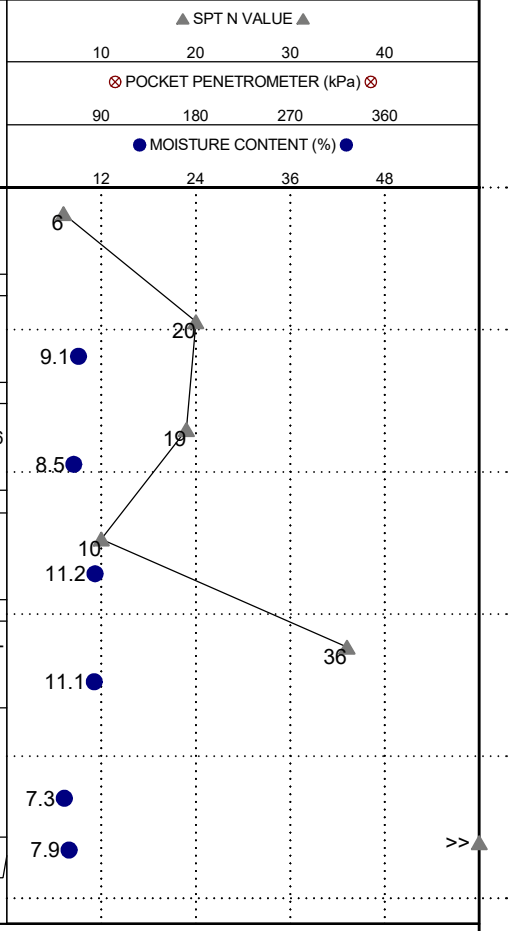
Bottom of borehole at 4.27 m, Elevation 456.10 m.

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Telephone: 519-699-5775
Fax: 519-699-4664

BOREHOLE NUMBER BH3

PROJECT: Proposed Residential Development
PROJECT ADDRESS: 40-60 Emma Street South
PROJECT NUMBER: 23-146
PROJECT LOCATION: Grand Valley, ON
DRILLING DATE: 7-24-23
GROUND ELEVATION: 458.65 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT/MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
	TOPSOIL: Loose, dark brown, silty organic topsoil, moist (200 mm)	0.00, 458.65			
		0.20, 458.45	SPT 1	33	1-3-3-9 (6)
	SILTY GRAVELLY SAND: Loose, brown, silty gravelly sand, some clay, saturated				
1	becoming compact	0.76, 457.89	SPT 2	46	12-11-9-12 (20)
	becoming wet	1.52, 457.13	SPT 3	87	17-11-8-6 (19)
2			SPT 4	100	1-4-6-6 (10)
3	**SILTY GRAVELLY SAND TILL:**Dense, brown, silty gravelly sand till, some clay, moist	3.20, 455.45	SPT 5	87	13-11-25-33 (36)
4			MC5 6	87	
	becoming very dense	4.57, 454.08	SPT 7	77	31-50/-0.02
5					



Caving was encountered at a depth of 0.61 m (El. 458.04 m) below ground surface upon completion of the borehole.

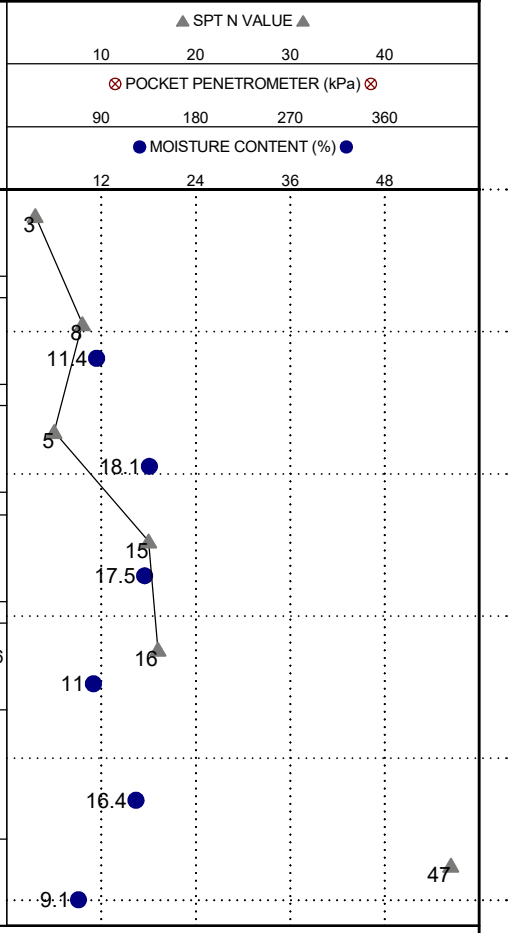
Bottom of borehole at 5.18 m, Elevation 453.47 m.

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Telephone: 519-699-5775
Fax: 519-699-4664

BOREHOLE NUMBER BH4

PROJECT: Proposed Residential Development
PROJECT ADDRESS: 40-60 Emma Street South
PROJECT NUMBER: 23-146
PROJECT LOCATION: Grand Valley, ON
DRILLING DATE: 7-24-23
GROUND ELEVATION: 462.64 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT/MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
	TOPSOIL: Very loose, dark brown, silty organic topsoil, moist (325 mm)	0.00, 462.64	SPT 1	54	2-2-1-2 (3)
	SILTY SAND FILL: Very loose, brown, silty sand fill, moist	0.33, 462.32			
1	becoming loose	0.76, 461.88	SPT 2	8	5-5-3-3 (8)
	SILTY CLAY: Loose, dark brown, silty clay, some sand, trace gravel, moist	1.52, 461.12	SPT 3	100	1-2-3-3 (5)
2	becoming compact	2.29, 460.35	SPT 4	100	6-8-7-9 (15)
	SILTY GRAVELLY SAND: Compact, brown, silty gravelly sand, some clay, wet	2.69, 459.95	SPT 5	46	10-5-11-6 (16)
3	becoming saturated	3.66, 458.98	MC5 6	100	
	SILTY GRAVELLY SAND TILL: Dense, brown, silty gravelly sand till, moist	4.57, 458.07	SPT 7	49	7-14-33-33 (47)
4					
5					



Caving was encountered at a depth of 3.66 m (El. 458.98 m) below ground surface upon completion of the borehole.

Bottom of borehole at 5.18 m, Elevation 457.46 m.

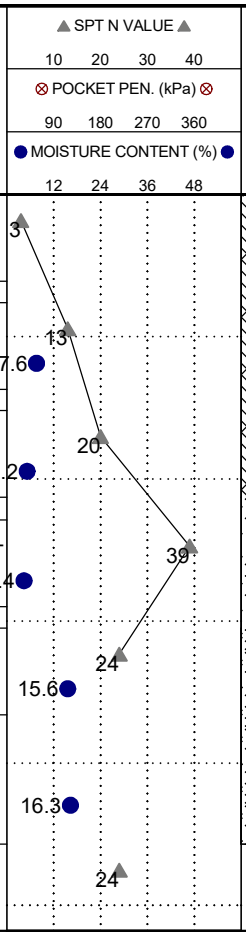
CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Telephone: 519-699-5775
Fax: 519-699-4664

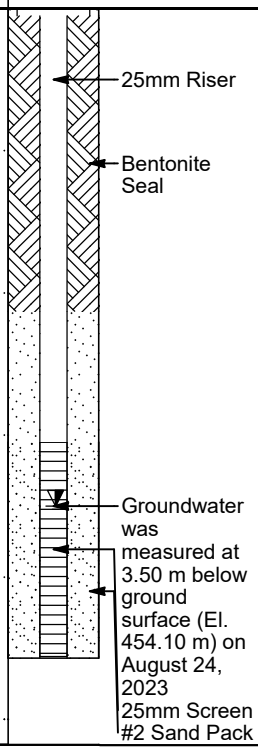
BOREHOLE NUMBER BH5

PROJECT: Proposed Residential Development
PROJECT ADDRESS: 40-60 Emma Street South
PROJECT NUMBER: 23-146
PROJECT LOCATION: Grand Valley, ON
DRILLING DATE: 7-24-23
GROUND ELEVATION: 457.60 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: BRF
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT/MC5

DEPTH (m)	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
	TOPSOIL: Very loose, dark brown, silty organic topsoil, moist (325 mm)	0.00, 457.60	SPT 1	62	1-1-2-1 (3)
	SILTY SAND FILL: Very loose, brown, silty sand fill, moist	0.33, 457.28			
1	**SAND AND GRAVEL FILL:** Compact, brown, sand and gravel fill, moist	0.76, 456.84	SPT 2	33	8-8-5-9 (13)
2			SPT 3	75	14-13-7-15 (20)
	SILTY SAND FILL: Dense, dark brown, silty sand, moist	2.29, 455.31	SPT 4	46	11-27-12-17 (39)
3	**SAND AND GRAVEL:** Dense, brown, sand and gravel, moist	2.36, 455.24			
	SILTY CLAY: Compact, brown, silty clay, some sand, trace gravel, moist	3.05, 454.55	SPT 5	100	6-10-14-12 (24)
4			MC5 6	76	
	SILTY GRAVELLY SAND: Compact, brown, silty gravelly sand, wet	4.04, 453.56			
5			SPT 7	5	7-12-12-12 (24)

Bottom of borehole at 5.18 m, Elevation 452.42 m.

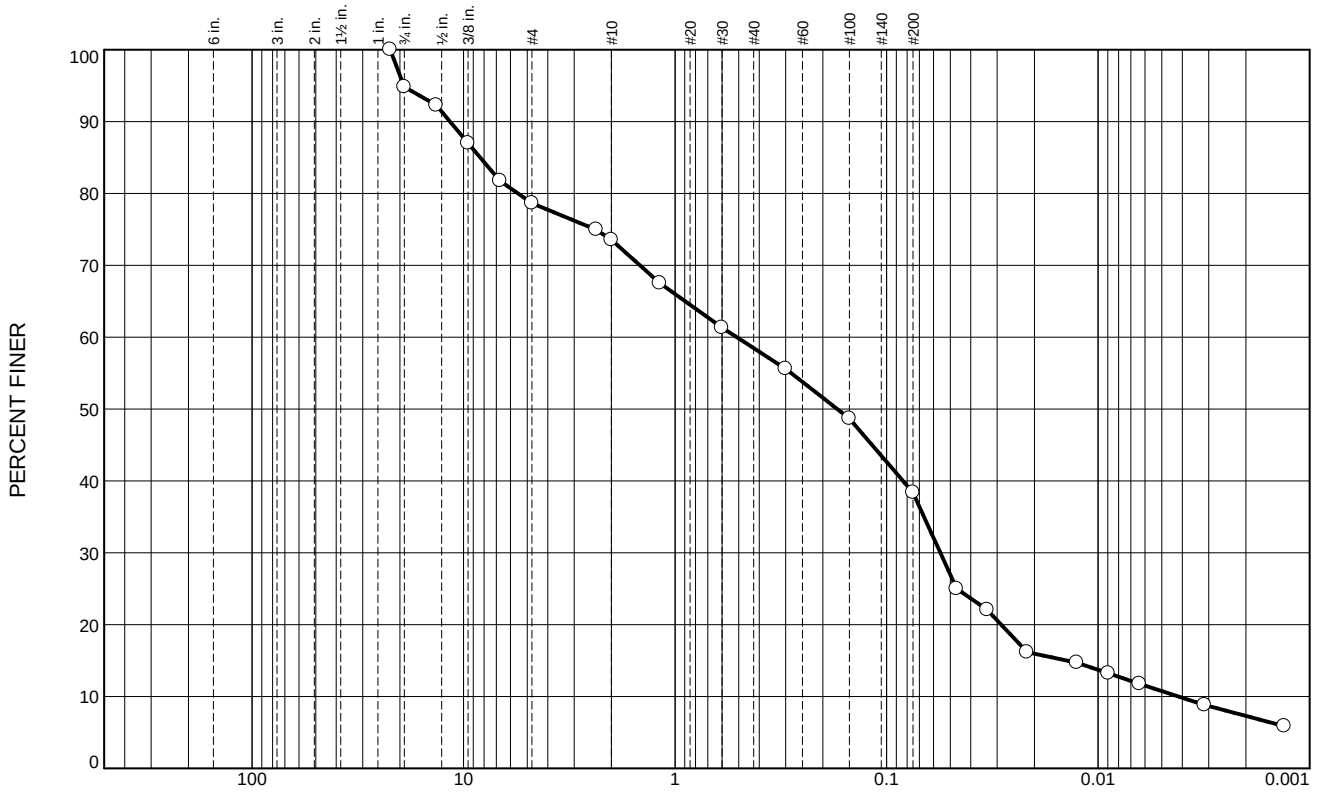




APPENDIX B

GRAIN SIZE ANALYSES
AND
ATTERBERG LIMITS

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	5.2	16.2	5.1	15.0	20.1	27.6	10.8

SOIL DATA					
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH1	4	2.29-2.90	silty, gravelly sand, some clay	SM
				Sampled by BRF of CMT Engineering Inc. July 25, 2023	
				Tested by JM of CMT Engineering Inc. July 27, 2023	

CMT Engineering Inc.

St. Clements, ON

Client: Sheldon Creek Developments

Project: Residential Development
40-60 Emma Street South, Grand Valley, Ontario

Project No.: 23-146 **Figure** 1

Particle Size Distribution Report

	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.9	1.2	5.1	12.3	33.1	45.4

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH4	3	1.52-2.13m	silty clay, some sand, trace gravel	CL
				Sampled by BRF of CMT Engineering Inc. July 25, 2023	
				Tested by JM of CMT Engineering Inc. July 27, 2023	

CMT Engineering Inc.

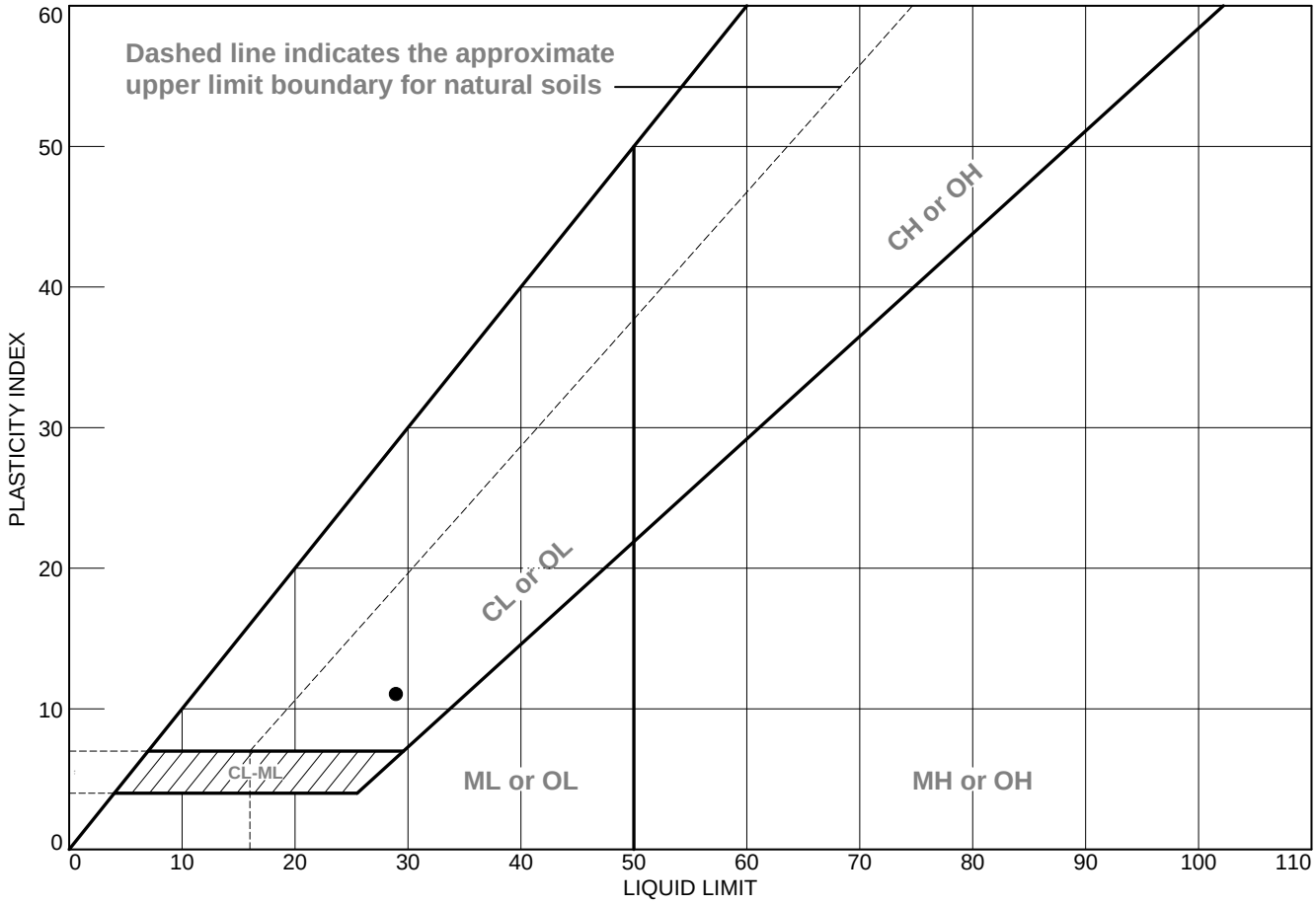
St. Clements, ON

Client: Sheldon Creek Developments

Project: Residential Development
40-60 Emma Street South, Grand Valley, Ontario

Project No.: 23-146 **Figure** 2

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	BH4	3	1.52-2.13m		18	29	11	CL

CMT Engineering Inc.

St. Clements, ON

Client: Sheldon Creek Developments

Project: Residential Development
40-60 Emma Street South, Grand Valley, Ontario

Project No.: 23-146 **Figure** 3

APPENDIX C

CHEMICAL RESULTS

ALS Canada Ltd.

right solutions.
right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2322748**	Page	: 1 of 7
Client	: **CMT Engineering Inc.**	Laboratory	: ALS Environmental - Waterloo
Contact	: Jake Feeney	Account Manager	: Mathy Mahadeva
Address	: 1011 Industrial Crescent Unit 1 St. Clements ON Canada N0B 2M0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 699 5775	Telephone	: +1 519 886 6910
Project	: 23-146 Emma St. S. Grand Valley	Date Samples Received	: 25-Jul-2023 16:50
PO	: ----	Date Analysis Commenced	: 25-Jul-2023
C-O-C number	: 1043096	Issue Date	: 01-Aug-2023 16:52
Sampler	: Client		
Site	: ----		
Quote number	: Standing Offer 2023 Pricing		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Organics, Waterloo, Ontario
Niral Patel		Centralized Prep, Waterloo, Ontario
Sarah Birch	VOC Section Supervisor	VOC, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Metals, Waterloo, Ontario

No Breaches Found

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	no units
%	percent
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
mS/cm	millisiemens per centimetre
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	BH 1 SAM 2	BH 1 SAM 6	BH 2 SAM 3	Duplicate 1	----	----	----
				Sampling date/time	24-Jul-2023 09:25	24-Jul-2023 10:05	24-Jul-2023 10:55	24-Jul-2023 00:00	----	----	----
				Sub-Matrix	Soil	Soil	Soil	Soil	----	----	----
					WT2322748-001	WT2322748-002	WT2322748-003	WT2322748-004	--------	--------	--------
Physical Tests											
Conductivity (1:2 leachate)	----	E100-L/WT			0.124	0.147	0.0986	0.102	----	----	----
Moisture	----	E144/WT	%		7.75	9.10	6.89	6.70	----	----	----
pH (1:2 soil:CaCl2-aq)	----	E108A/WT			8.30	8.04	8.01	8.10	----	----	----
Cyanides											
Cyanide, weak acid dissociable	----	E336A/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Fixed-Ratio Extractables											
Calcium, soluble ion content	7440-70-2	E484/WT			3.41	4.68	3.12	2.96	----	----	----
Magnesium, soluble ion content	7439-95-4	E484/WT	mg/L		1.71	1.99	0.90	0.96	----	----	----
Sodium, soluble ion content	17341-25-2	E484/WT			2.64	3.64	0.73	1.22	----	----	----
Sodium adsorption ratio [SAR]	----	E484/WT	-		0.29	0.36	<0.10	0.16	----	----	----
Metals											
Antimony	7440-36-0	E440C/WT			<0.10	<0.10	<0.10	<0.10	----	----	----
Arsenic	7440-38-2	E440C/WT	mg/kg		1.72	2.28	2.76	2.95	----	----	----
Barium	7440-39-3	E440C/WT			8.59	31.8	32.3	46.1	----	----	----
Beryllium	7440-41-7	E440C/WT	mg/kg		0.10	0.28	0.35	0.38	----	----	----
Boron	7440-42-8	E440C/WT			6.4	11.5	11.9	13.3	----	----	----
Boron, hot water soluble	7440-42-8	E487/WT	mg/kg		<0.10	0.12	<0.10	<0.10	----	----	----
Cadmium	7440-43-9	E440C/WT			0.106	0.118	0.166	0.188	----	----	----
Chromium	7440-47-3	E440C/WT	mg/kg		5.30	10.4	12.4	13.6	----	----	----
Cobalt	7440-48-4	E440C/WT			1.29	3.80	3.95	5.15	----	----	----
Copper	7440-50-8	E440C/WT	mg/kg		5.14	9.92	12.4	13.1	----	----	----
Lead	7439-92-1	E440C/WT			7.53	10.4	12.7	15.8	----	----	----
Mercury	7439-97-6	E510C/WT	mg/kg		0.0058	0.0058	0.0070	0.0077	----	----	----
Molybdenum	7439-98-7	E440C/WT			0.39	0.35	0.68	0.34	----	----	----
Nickel	7440-02-0	E440C/WT	mg/kg		3.61	8.64	9.43	11.7	----	----	----
Selenium	7782-49-2	E440C/WT			<0.20	<0.20	<0.20	<0.20	----	----	----
Silver	7440-22-4	E440C/WT	mg/kg		<0.10	<0.10	<0.10	<0.10	----	----	----
Thallium	7440-28-0	E440C/WT			<0.050	0.065	0.069	0.097	----	----	----

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	BH 1 SAM 2	BH 1 SAM 6	BH 2 SAM 3	Duplicate 1	----	----	----
				Sampling date/time	24-Jul-2023 09:25	24-Jul-2023 10:05	24-Jul-2023 10:55	24-Jul-2023 00:00	----	----	----
				Sub-Matrix	Soil	Soil	Soil	Soil	----	----	----
					WT2322748-001	WT2322748-002	WT2322748-003	WT2322748-004	--------	--------	--------
Metals											
Uranium	7440-61-1	E440C/WT	mg/kg		0.538	0.650	0.654	0.713	----	----	----
Vanadium	7440-62-2	E440C/WT			9.00	15.2	16.7	20.4	----	----	----
Zinc	7440-66-6	E440C/WT	mg/kg		33.9	42.1	56.3	67.6	----	----	----
Speciated Metals											
Chromium, hexavalent [Cr VI]	18540-29-9	E532/WT			<0.10	<0.10	<0.10	<0.10	----	----	----
Volatile Organic Compounds											
Acetone	67-64-1	E611D/WT	mg/kg		<0.50	<0.50	<0.50	<0.50	----	----	----
Benzene	71-43-2	E611D/WT			0.0122	<0.0050	<0.0050	0.0056	----	----	----
Bromodichloromethane	75-27-4	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Bromoform	75-25-2	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Bromomethane	74-83-9	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Carbon tetrachloride	56-23-5	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Chlorobenzene	108-90-7	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Chloroform	67-66-3	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Dibromochloromethane	124-48-1	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Dibromoethane, 1,2-	106-93-4	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Dichlorobenzene, 1,2-	95-50-1	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Dichlorobenzene, 1,3-	541-73-1	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Dichlorobenzene, 1,4-	106-46-7	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Dichlorodifluoromethane	75-71-8	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Dichloroethane, 1,1-	75-34-3	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Dichloroethane, 1,2-	107-06-2	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Dichloroethylene, 1,1-	75-35-4	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Dichloroethylene, cis-1,2-	156-59-2	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Dichloroethylene, trans-1,2-	156-60-5	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Dichloromethane	75-09-2	E611D/WT			<0.045	<0.045	<0.045	<0.045	----	----	----
Dichloropropane, 1,2-	78-87-5	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Dichloropropylene, cis+trans-1,3-	542-75-6	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Dichloropropylene, cis-1,3-	10061-01-5	E611D/WT	mg/kg		<0.030	<0.030	<0.030	<0.030	----	----	----

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	BH 1 SAM 2	BH 1 SAM 6	BH 2 SAM 3	Duplicate 1	----	----	----
				Sampling date/time	24-Jul-2023 09:25	24-Jul-2023 10:05	24-Jul-2023 10:55	24-Jul-2023 00:00	----	----	----
				Sub-Matrix	Soil	Soil	Soil	Soil	----	----	----
					WT2322748-001	WT2322748-002	WT2322748-003	WT2322748-004	--------	--------	--------
Volatile Organic Compounds											
Dichloropropylene, trans-1,3-	10061-02-6	E611D/WT			<0.030	<0.030	<0.030	<0.030	----	----	----
Ethylbenzene	100-41-4	E611D/WT	mg/kg		<0.015	<0.015	<0.015	<0.015	----	----	----
Hexane, n-	110-54-3	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Methyl ethyl ketone [MEK]	78-93-3	E611D/WT	mg/kg		<0.50	<0.50	<0.50	<0.50	----	----	----
Methyl isobutyl ketone [MIBK]	108-10-1	E611D/WT			<0.50	<0.50	<0.50	<0.50	----	----	----
Methyl-tert-butyl ether [MTBE]	1634-04-4	E611D/WT	mg/kg		<0.040	<0.040	<0.040	<0.040	----	----	----
Styrene	100-42-5	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Tetrachloroethane, 1,1,1,2-	630-20-6	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Tetrachloroethane, 1,1,2,2-	79-34-5	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Tetrachloroethylene	127-18-4	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Toluene	108-88-3	E611D/WT			0.056	<0.050	<0.050	<0.050	----	----	----
Trichloroethane, 1,1,1-	71-55-6	E611D/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Trichloroethane, 1,1,2-	79-00-5	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Trichloroethylene	79-01-6	E611D/WT	mg/kg		<0.010	<0.010	<0.010	<0.010	----	----	----
Trichlorofluoromethane	75-69-4	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Vinyl chloride	75-01-4	E611D/WT	mg/kg		<0.020	<0.020	<0.020	<0.020	----	----	----
Xylene, m+p-	179601-23-1	E611D/WT			<0.030	<0.030	<0.030	<0.030	----	----	----
Xylene, o-	95-47-6	E611D/WT	mg/kg		<0.030	<0.030	<0.030	<0.030	----	----	----
Xylenes, total	1330-20-7	E611D/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
BTEX, total	----	E611D/WT	mg/kg		<0.10	<0.10	<0.10	<0.10	----	----	----
Hydrocarbons											
F1 (C6-C10)	----	E581.F1/WT			<5.0	<5.0	<5.0	<5.0	----	----	----
F2 (C10-C16)	----	E601.SG-L/WT	mg/kg		<10	<10	<10	<10	----	----	----
F2-Naphthalene	----	EC600/WT			<25	<25	<25	<25	----	----	----
F3 (C16-C34)	----	E601.SG-L/WT	mg/kg		<50	<50	<50	<50	----	----	----
F3-PAH	n/a	EC600/WT			<50	<50	<50	<50	----	----	----
F4 (C34-C50)	----	E601.SG-L/WT	mg/kg		<50	<50	<50	<50	----	----	----
F1-BTEX	----	EC580/WT			<5.0	<5.0	<5.0	<5.0	----	----	----
Hydrocarbons, total (C6-C50)	----	EC581/WT	mg/kg		<80	<80	<80	<80	----	----	----

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	BH 1 SAM 2	BH 1 SAM 6	BH 2 SAM 3	Duplicate 1	----	----	----
				Sampling date/time	24-Jul-2023 09:25	24-Jul-2023 10:05	24-Jul-2023 10:55	24-Jul-2023 00:00	----	----	----
				Sub-Matrix	Soil	Soil	Soil	Soil	----	----	----
					WT2322748-001	WT2322748-002	WT2322748-003	WT2322748-004	--------	--------	--------
Hydrocarbons											
Chromatogram to baseline at nC50	n/a	E601.SG-L/WT			YES	YES	YES	YES	----	----	----
Hydrocarbons Surrogates											
Bromobenzotrifluoride, 2- (F2-F4 surrogate)	392-83-6	E601.SG-L/WT	%		97.5	101	97.7	97.6	----	----	----
Dichlorotoluene, 3,4-	95-75-0	E581.F1/WT			90.1	91.1	85.5	88.5	----	----	----
Volatile Organic Compounds Surrogates											
Bromofluorobenzene, 4-	460-00-4	E611D/WT	%		98.1	94.2	86.7	86.5	----	----	----
Difluorobenzene, 1,4-	540-36-3	E611D/WT			112	107	98.6	97.5	----	----	----
Polycyclic Aromatic Hydrocarbons											
Acenaphthene	83-32-9	E641A/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Acenaphthylene	208-96-8	E641A/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Anthracene	120-12-7	E641A/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Benz(a)anthracene	56-55-3	E641A/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Benzo(a)pyrene	50-32-8	E641A/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Benzo(b+j)fluoranthene	n/a	E641A/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Benzo(g,h,i)perylene	191-24-2	E641A/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Benzo(k)fluoranthene	207-08-9	E641A/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Chrysene	218-01-9	E641A/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Dibenz(a,h)anthracene	53-70-3	E641A/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Fluoranthene	206-44-0	E641A/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Fluorene	86-73-7	E641A/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Indeno(1,2,3-c,d)pyrene	193-39-5	E641A/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Methylnaphthalene, 1-	90-12-0	E641A/WT			<0.030	<0.030	<0.030	<0.030	----	----	----
Methylnaphthalene, 1+2-	----	E641A/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Methylnaphthalene, 2-	91-57-6	E641A/WT			<0.030	<0.030	<0.030	<0.030	----	----	----
Naphthalene	91-20-3	E641A/WT	mg/kg		<0.010	<0.010	<0.010	<0.010	----	----	----
Phenanthrene	85-01-8	E641A/WT			<0.050	<0.050	<0.050	<0.050	----	----	----
Pyrene	129-00-0	E641A/WT	mg/kg		<0.050	<0.050	<0.050	<0.050	----	----	----
Polycyclic Aromatic Hydrocarbons Surrogates											
Acridine-d9	34749-75-2	E641A/WT			83.7	83.0	84.4	85.6	----	----	----

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Method/Lab	Unit	Client sample ID	BH 1 SAM 2	BH 1 SAM 6	BH 2 SAM 3	Duplicate 1	----	----	----
				Sampling date/time	24-Jul-2023 09:25	24-Jul-2023 10:05	24-Jul-2023 10:55	24-Jul-2023 00:00	----	----	----
				Sub-Matrix	Soil	Soil	Soil	Soil	----	----	----
					WT2322748-001	WT2322748-002	WT2322748-003	WT2322748-004	--------	--------	--------
Polycyclic Aromatic Hydrocarbons Surrogates											
Chrysene-d12	1719-03-5	E641A/WT	%		107	121	116	120	----	----	----
Naphthalene-d8	1146-65-2	E641A/WT			95.0	105	95.0	96.6	----	----	----
Phenanthrene-d10	1517-22-2	E641A/WT	%		93.7	101	96.0	96.6	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Key:

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2322748**	Page	: 1 of 15
Client	: **CMT Engineering Inc.**	Laboratory	: ALS Environmental - Waterloo
Contact	: Jake Feeney	Account Manager	: Mathy Mahadeva
Address	: 1011 Industrial Crescent Unit 1 St. Clements ON Canada N0B 2M0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 699 5775	Telephone	: +1 519 886 6910
Project	: 23-146 Emma St. S. Grand Valley	Date Samples Received	: 25-Jul-2023 16:50
PO	: ----	Issue Date	: 01-Aug-2023 16:49
C-O-C number	: 1043096		
Sampler	: Client		
Site	: ----		
Quote number	: Standing Offer 2023 Pricing		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Soil/Solid**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Polycyclic Aromatic Hydrocarbons	QC-1055995-002	----	Naphthalene	91-20-3	E641A	51.7 % LCS-L	60.0-130%	Recovery less than lower control limit

Result Qualifiers

Qualifier	Description
LCS-L	*Lab Control Sample recovery was below ALS DQO. Reference Material and/or Matrix Spike results were acceptable. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E336A	24-Jul-2023	26-Jul-2023	14 days	2 days	✓	27-Jul-2023	14 days	1 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E336A	24-Jul-2023	26-Jul-2023	14 days	2 days	✓	27-Jul-2023	14 days	1 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E336A	24-Jul-2023	26-Jul-2023	14 days	2 days	✓	27-Jul-2023	14 days	1 days	✓
Cyanides : WAD Cyanide (0.01M NaOH Extraction)										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E336A	24-Jul-2023	26-Jul-2023	14 days	2 days	✓	27-Jul-2023	14 days	1 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E484	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E484	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	180 days	0 days	✓
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E484	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	180 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Fixed-Ratio Extractables : Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E484	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	180 days	0 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP]										
BH 1 SAM 2	E581.F1	24-Jul-2023	27-Jul-2023	14 days	3 days	✓	27-Jul-2023	40 days	0 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP]										
BH 1 SAM 6	E581.F1	24-Jul-2023	27-Jul-2023	14 days	3 days	✓	27-Jul-2023	40 days	0 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP]										
BH 2 SAM 3	E581.F1	24-Jul-2023	27-Jul-2023	14 days	3 days	✓	27-Jul-2023	40 days	0 days	✓
Hydrocarbons : CCME PHC - F1 by Headspace GC-FID										
Glass soil methanol vial [ON MECP]										
Duplicate 1	E581.F1	24-Jul-2023	27-Jul-2023	14 days	3 days	✓	27-Jul-2023	40 days	0 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E601.SG-L	24-Jul-2023	26-Jul-2023	14 days	2 days	✓	31-Jul-2023	40 days	5 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E601.SG-L	24-Jul-2023	26-Jul-2023	14 days	2 days	✓	31-Jul-2023	40 days	5 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E601.SG-L	24-Jul-2023	26-Jul-2023	14 days	2 days	✓	31-Jul-2023	40 days	5 days	✓
Hydrocarbons : CCME PHCs - F2-F4 by GC-FID (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E601.SG-L	24-Jul-2023	26-Jul-2023	14 days	2 days	✓	31-Jul-2023	40 days	5 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E487	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E487	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E487	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	180 days	0 days	✓
Metals : Boron-Hot Water Extractable by ICPOES										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E487	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	180 days	0 days	✓
Metals : Mercury in Soil/Solid by CVAAS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E510C	24-Jul-2023	27-Jul-2023	28 days	3 days	✓	28-Jul-2023	25 days	1 days	✓
Metals : Mercury in Soil/Solid by CVAAS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E510C	24-Jul-2023	27-Jul-2023	28 days	3 days	✓	28-Jul-2023	25 days	1 days	✓
Metals : Mercury in Soil/Solid by CVAAS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E510C	24-Jul-2023	27-Jul-2023	28 days	3 days	✓	28-Jul-2023	25 days	1 days	✓
Metals : Mercury in Soil/Solid by CVAAS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E510C	24-Jul-2023	27-Jul-2023	28 days	3 days	✓	28-Jul-2023	25 days	1 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E440C	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	177 days	0 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E440C	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	177 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E440C	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	177 days	0 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS (<355 µm)										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E440C	24-Jul-2023	27-Jul-2023	180 days	3 days	✓	27-Jul-2023	177 days	0 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E100-L	24-Jul-2023	27-Jul-2023	30 days	3 days	✓	27-Jul-2023	27 days	0 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E100-L	24-Jul-2023	27-Jul-2023	30 days	3 days	✓	27-Jul-2023	27 days	0 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E100-L	24-Jul-2023	27-Jul-2023	30 days	3 days	✓	27-Jul-2023	27 days	0 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E100-L	24-Jul-2023	27-Jul-2023	30 days	3 days	✓	27-Jul-2023	27 days	0 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E144	24-Jul-2023	----	----	----		25-Jul-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E144	24-Jul-2023	----	----	----		25-Jul-2023	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E144	24-Jul-2023	----	----	----		25-Jul-2023	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E144	24-Jul-2023	----	----	----		25-Jul-2023	----	----	
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E108A	24-Jul-2023	26-Jul-2023	30 days	2 days	✓	26-Jul-2023	28 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E108A	24-Jul-2023	26-Jul-2023	30 days	2 days	✓	26-Jul-2023	28 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E108A	24-Jul-2023	26-Jul-2023	30 days	2 days	✓	26-Jul-2023	28 days	0 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E108A	24-Jul-2023	26-Jul-2023	30 days	2 days	✓	26-Jul-2023	28 days	0 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E641A	24-Jul-2023	26-Jul-2023	60 days	2 days	✓	27-Jul-2023	40 days	1 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E641A	24-Jul-2023	26-Jul-2023	60 days	2 days	✓	27-Jul-2023	40 days	1 days	✓
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E641A	24-Jul-2023	26-Jul-2023	60 days	2 days	✓	27-Jul-2023	40 days	1 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Polycyclic Aromatic Hydrocarbons : PAHs by Hex:Ace GC-MS										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E641A	24-Jul-2023	26-Jul-2023	60 days	2 days	✓	27-Jul-2023	40 days	1 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 2	E532	24-Jul-2023	26-Jul-2023	30 days	2 days	✓	27-Jul-2023	7 days	1 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 1 SAM 6	E532	24-Jul-2023	26-Jul-2023	30 days	2 days	✓	27-Jul-2023	7 days	1 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap [ON MECP]										
BH 2 SAM 3	E532	24-Jul-2023	26-Jul-2023	30 days	2 days	✓	27-Jul-2023	7 days	1 days	✓
Speciated Metals : Hexavalent Chromium (Cr VI) by IC										
Glass soil jar/Teflon lined cap [ON MECP]										
Duplicate 1	E532	24-Jul-2023	26-Jul-2023	30 days	2 days	✓	27-Jul-2023	7 days	1 days	✓
Volatile Organic Compounds : VOCs (Eastern Canada List) by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH 1 SAM 2	E611D	24-Jul-2023	27-Jul-2023	14 days	3 days	✓	27-Jul-2023	40 days	0 days	✓
Volatile Organic Compounds : VOCs (Eastern Canada List) by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH 1 SAM 6	E611D	24-Jul-2023	27-Jul-2023	14 days	3 days	✓	27-Jul-2023	40 days	0 days	✓
Volatile Organic Compounds : VOCs (Eastern Canada List) by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
BH 2 SAM 3	E611D	24-Jul-2023	27-Jul-2023	14 days	3 days	✓	27-Jul-2023	40 days	0 days	✓
Volatile Organic Compounds : VOCs (Eastern Canada List) by Headspace GC-MS										
Glass soil methanol vial [ON MECP]										
Duplicate 1	E611D	24-Jul-2023	27-Jul-2023	14 days	3 days	✓	27-Jul-2023	40 days	0 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Boron-Hot Water Extractable by ICPOES	E487	1056915	1	9	11.1	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	1058714	1	20	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	1055996	1	13	7.6	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	1056913	1	14	7.1	5.0	✓
Hexavalent Chromium (Cr VI) by IC	E532	1055972	1	13	7.6	5.0	✓
Mercury in Soil/Solid by CVAAS (<355 µm)	E510C	1056919	1	8	12.5	5.0	✓
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C	1056918	1	16	6.2	5.0	✓
Moisture Content by Gravimetry	E144	1055970	1	19	5.2	5.0	✓
PAHs by Hex:Ace GC-MS	E641A	1055995	1	11	9.0	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	1055997	1	13	7.6	5.0	✓
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484	1056914	1	12	8.3	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	1058713	1	20	5.0	5.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	1055971	1	16	6.2	5.0	✓
Laboratory Control Samples (LCS)							
Boron-Hot Water Extractable by ICPOES	E487	1056915	2	9	22.2	10.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	1058714	1	20	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	1055996	1	13	7.6	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	1056913	2	14	14.2	10.0	✓
Hexavalent Chromium (Cr VI) by IC	E532	1055972	2	13	15.3	10.0	✓
Mercury in Soil/Solid by CVAAS (<355 µm)	E510C	1056919	2	8	25.0	10.0	✓
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C	1056918	4	16	25.0	10.0	✓
Moisture Content by Gravimetry	E144	1055970	1	19	5.2	5.0	✓
PAHs by Hex:Ace GC-MS	E641A	1055995	1	11	9.0	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	1055997	1	13	7.6	5.0	✓
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484	1056914	2	12	16.6	10.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	1058713	1	20	5.0	5.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	1055971	1	16	6.2	5.0	✓
Method Blanks (MB)							
Boron-Hot Water Extractable by ICPOES	E487	1056915	1	9	11.1	5.0	✓
CCME PHC - F1 by Headspace GC-FID	E581.F1	1058714	1	20	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	1055996	1	13	7.6	5.0	✓
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	1056913	1	14	7.1	5.0	✓
Hexavalent Chromium (Cr VI) by IC	E532	1055972	1	13	7.6	5.0	✓
Mercury in Soil/Solid by CVAAS (<355 µm)	E510C	1056919	1	8	12.5	5.0	✓
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C	1056918	2	16	12.5	5.0	✓

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Moisture Content by Gravimetry	E144	1055970	1	19	5.2	5.0	✓
PAHs by Hex:Ace GC-MS	E641A	1055995	1	11	9.0	5.0	✓
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484	1056914	1	12	8.3	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	1058713	1	20	5.0	5.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	1055971	1	16	6.2	5.0	✓
Matrix Spikes (MS)							
CCME PHC - F1 by Headspace GC-FID	E581.F1	1058714	1	20	5.0	5.0	✓
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L	1055996	1	13	7.6	5.0	✓
PAHs by Hex:Ace GC-MS	E641A	1055995	1	11	9.0	5.0	✓
VOCs (Eastern Canada List) by Headspace GC-MS	E611D	1058713	1	20	5.0	5.0	✓
WAD Cyanide (0.01M NaOH Extraction)	E336A	1055971	1	16	6.2	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L ALS Environmental - Waterloo	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Conductance is measured in the fluid that is observed in the upper layer.
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A ALS Environmental - Waterloo	Soil/Solid	MECP E3137A	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode.
Moisture Content by Gravimetry	E144 ALS Environmental - Waterloo	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
WAD Cyanide (0.01M NaOH Extraction)	E336A ALS Environmental - Waterloo	Soil/Solid	APHA 4500-CN I (mod)	Weak Acid Dissociable (WAD) cyanide is determined after extraction by Continuous Flow Analyzer (CFA) with in-line distillation followed by colourmetric analysis.
Metals in Soil/Solid by CRC ICPMS (<355 µm)	E440C ALS Environmental - Waterloo	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may be environmentally available. Samples are dried, then sieved through a 355 µm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may be only partially recovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile forms of sulfur (including sulfide) may not be captured, as they may be lost during sampling, storage, or digestion. This method does not adequately recover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
Sodium Adsorption Ratio (SAR) - 1:2 Soil:Water (Dry)	E484 ALS Environmental - Waterloo	Soil/Solid	SW846 6010C	A dried, disaggregated solid sample is extracted with deionized water, the aqueous extract is separated from the solid, acidified and then analyzed using a ICP/OES. The concentrations of Na, Ca and Mg are reported as per CALA requirements for calculated parameters. These individual parameters are not for comparison to any guideline.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Boron-Hot Water Extractable by ICPOES	E487 ALS Environmental - Waterloo	Soil/Solid	HW EXTR, EPA 6010B	A dried solid sample is extracted with calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).
Mercury in Soil/Solid by CVAAS (<355 µm)	E510C ALS Environmental - Waterloo	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples are sieved through a 355 µm sieve, and digested with HNO_3 and HCl, followed by CVAAS analysis.
Hexavalent Chromium (Cr VI) by IC	E532 ALS Environmental - Waterloo	Soil/Solid	APHA 3500-CR C	Instrumental analysis is performed by ion chromatography with UV detection.
CCME PHC - F1 by Headspace GC-FID	E581.F1 ALS Environmental - Waterloo	Soil/Solid	CCME PHC in Soil - Tier 1	CCME Fraction 1 (F1) is analyzed by static headspace GC-FID. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law. Analytical methods for CCME Petroleum Hydrocarbons (PHCs) are validated to comply fully with the Reference Method for the Canada-Wide Standard for PHC. Test results are expressed on a dry weight basis. Unless qualified, all required quality control criteria of the CCME PHC method have been met, including response factor and linearity requirements.
CCME PHCs - F2-F4 by GC-FID (Low Level)	E601.SG-L ALS Environmental - Waterloo	Soil/Solid	CCME PHC in Soil - Tier 1	Sample extracts are subjected to in-situ silica gel treatment prior to analysis by GC-FID for CCME hydrocarbon fractions (F2-F4). Analytical methods for CCME Petroleum Hydrocarbons (PHCs) are validated to comply fully with the Reference Method for the Canada-Wide Standard for PHC. Test results are expressed on a dry weight basis. Unless qualified, all required quality control criteria of the CCME PHC method have been met, including response factor and linearity requirements.
VOCs (Eastern Canada List) by Headspace GC-MS	E611D ALS Environmental - Waterloo	Soil/Solid	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PAHs by Hex:Ace GC-MS	E641A ALS Environmental - Waterloo	Soil/Solid	EPA 8270E (mod)	Polycyclic Aromatic Hydrocarbons (PAHs) are extracted with hexane/acetone and analyzed by GC-MS. If reported, IACR (index of additive cancer risk, unitless) and B(a)P toxic potency equivalent (in soil concentration units) are calculated as per CCME PAH Soil Quality Guidelines fact sheet (2010) or ABT1.
F1-BTEX	EC580 ALS Environmental - Waterloo	Soil/Solid	CCME PHC in Soil - Tier 1	F1-BTEX is calculated as follows: F1-BTEX = F1 (C6-C10) minus benzene, toluene, ethylbenzene and xylenes (BTEX).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sum F1 to F4 (C6-C50)	EC581 ALS Environmental - Waterloo	Soil/Solid	CCME PHC in Soil - Tier 1	Hydrocarbons, total (C6-C50) is the sum of CCME Fractions F1(C6-C10), F2(C10-C16), F3(C16-C34), and F4(C34-C50). F4G-sg is not used within this calculation due to overlap with other fractions.
F2 to F3 minus PAH	EC600 ALS Environmental - Waterloo	Soil/Solid	CCME PHC in Soil - Tier 1	F2-PAH = CCME Fraction 2 (C10-C16) minus Naphthalene F3-PAH = CCME Fraction 3 (C16-C34) minus select Polycyclic Aromatic Hydrocarbons (PAH) as per CCME Soil Tier 1

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 ALS Environmental - Waterloo	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Leach 1:2 Soil : 0.01CaCl2 - As Received for pH	EP108A ALS Environmental - Waterloo	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.
Cyanide Extraction for CFA (0.01M NaOH)	EP333A ALS Environmental - Waterloo	Soil/Solid	ON MECP E3015 (mod)	Extraction for various cyanide analysis is by rotary extraction of the soil with 0.01M Sodium Hydroxide.
Digestion for Metals and Mercury (355 µm Sieve)	EP440C ALS Environmental - Waterloo	Soil/Solid	EPA 200.2 (mod)	Samples are sieved through a 355 µm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
Boron-Hot Water Extractable	EP487 ALS Environmental - Waterloo	Soil/Solid	HW EXTR, EPA 6010B	A dried solid sample is extracted with weak calcium chloride, the sample undergoes a heating process. After cooling the sample is filtered and analyzed by ICP/OES. Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011)
Preparation of Hexavalent Chromium (Cr VI) for IC	EP532 ALS Environmental - Waterloo	Soil/Solid	EPA 3060A	Field moist samples are digested with a sodium hydroxide/sodium carbonate solution as described in EPA 3060A.
VOCs Methanol Extraction for Headspace Analysis	EP581 ALS Environmental - Waterloo	Soil/Solid	EPA 5035A (mod)	VOCs in samples are extracted with methanol. Extracts are then prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
PHCs and PAHs Hexane-Acetone Tumbler Extraction	EP601 ALS Environmental - Waterloo	Soil/Solid	CCME PHC in Soil - Tier 1 (mod)	Samples are subsampled and Petroleum Hydrocarbons (PHC) and PAHs are extracted with 1:1 hexane:acetone using a rotary extractor.

QUALITY CONTROL REPORT

Work Order	: **WT2322748**	Page	: 1 of 19
Client	: CMT Engineering Inc.	Laboratory	: ALS Environmental - Waterloo
Contact	: Jake Feeney	Account Manager	: Mathy Mahadeva
Address	: 1011 Industrial Crescent Unit 1 St. Clements ON Canada N0B 2M0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 23-146 Emma St. S. Grand Valley	Date Samples Received	: 25-Jul-2023 16:50
PO	: ----	Date Analysis Commenced	: 25-Jul-2023
C-O-C number	: 1043096	Issue Date	: 01-Aug-2023 16:49
Sampler	: Client 519 699 5775		
Site	: ----		
Quote number	: Standing Offer 2023 Pricing		
No. of samples received	: 4		
No. of samples analysed	: 4		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Jeremy Gingras	Team Leader - Semi-Volatile Instrumentation	Waterloo Organics, Waterloo, Ontario
Niral Patel		Waterloo Centralized Prep, Waterloo, Ontario
Sarah Birch	VOC Section Supervisor	Waterloo VOC, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Walt Kippenhuck	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 1055970)											
WT2322515-001	Anonymous	Moisture	----	E144	0.25	%	9.37	8.70	7.43%	20%	----
Physical Tests (QC Lot: 1055997)											
WT2322611-001	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	8.37	8.49	1.42%	5%	----
Physical Tests (QC Lot: 1056913)											
WT2322569-005	Anonymous	Conductivity (1:2 leachate)	----	E100-L	5.00	µS/cm	0.0963 mS/cm	94.2	2.20%	20%	----
Cyanides (QC Lot: 1055971)											
WT2322567-019	Anonymous	Cyanide, weak acid dissociable	----	E336A	0.050	mg/kg	<0.050 µg/g	<0.050	0	Diff <2x LOR	----
Metals (QC Lot: 1056914)											
WT2322569-005	Anonymous	Calcium, soluble ion content	7440-70-2	E484	0.50	mg/L	4.36	4.33	0.690%	30%	----
		Magnesium, soluble ion content	7439-95-4	E484	0.50	mg/L	0.57	0.55	0.02	Diff <2x LOR	----
		Sodium, soluble ion content	17341-25-2	E484	0.50	mg/L	0.71	0.64	0.08	Diff <2x LOR	----
Metals (QC Lot: 1056915)											
WT2322611-002	Anonymous	Boron, hot water soluble	7440-42-8	E487	0.10	mg/kg	<0.10	<0.10	0	Diff <2x LOR	----
Metals (QC Lot: 1056918)											
WT2321722-010	Anonymous	Antimony	7440-36-0	E440C	0.10	mg/kg	1.20 µg/g	1.19	0.722%	30%	----
		Arsenic	7440-38-2	E440C	0.10	mg/kg	3.94 µg/g	3.72	5.81%	30%	----
		Barium	7440-39-3	E440C	0.50	mg/kg	44.9 µg/g	44.4	1.03%	40%	----
		Beryllium	7440-41-7	E440C	0.10	mg/kg	0.28 µg/g	0.25	0.03	Diff <2x LOR	----
		Boron	7440-42-8	E440C	5.0	mg/kg	6.8 µg/g	6.9	0.04	Diff <2x LOR	----
		Cadmium	7440-43-9	E440C	0.020	mg/kg	1.14 µg/g	1.11	2.53%	30%	----
		Chromium	7440-47-3	E440C	0.50	mg/kg	18.3 µg/g	17.3	5.55%	30%	----
		Cobalt	7440-48-4	E440C	0.10	mg/kg	4.54 µg/g	4.10	10.3%	30%	----
		Copper	7440-50-8	E440C	0.50	mg/kg	40.1 µg/g	37.4	6.94%	30%	----
		Lead	7439-92-1	E440C	0.50	mg/kg	83.3 µg/g	78.5	5.96%	40%	----
		Molybdenum	7439-98-7	E440C	0.10	mg/kg	1.68 µg/g	1.30	25.4%	40%	----
		Nickel	7440-02-0	E440C	0.50	mg/kg	12.3 µg/g	12.6	2.35%	30%	----
		Selenium	7782-49-2	E440C	0.20	mg/kg	<0.20 µg/g	<0.20	0	Diff <2x LOR	----
		Silver	7440-22-4	E440C	0.10	mg/kg	0.36 µg/g	0.39	0.03	Diff <2x LOR	----
		Thallium	7440-28-0	E440C	0.050	mg/kg	0.114 µg/g	0.102	0.012	Diff <2x LOR	----
		Uranium	7440-61-1	E440C	0.050	mg/kg	0.443 µg/g	0.449	1.26%	30%	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 1056918) - continued											
WT2321722-010	Anonymous	Vanadium	7440-62-2	E440C	0.20	mg/kg	18.1 µg/g	18.4	1.76%	30%	----
		Zinc	7440-66-6	E440C	2.0	mg/kg	350 µg/g	317	9.89%	30%	----
Metals (QC Lot: 1056919)											
WT2322611-002	Anonymous	Mercury	7439-97-6	E510C	0.0050	mg/kg	<0.0050	<0.0050	0	Diff <2x LOR	----
Speciated Metals (QC Lot: 1055972)											
WT2322611-001	Anonymous	Chromium, hexavalent [Cr VI]	18540-29-9	E532	0.10	mg/kg	0.13	0.11	0.02	Diff <2x LOR	----
Volatile Organic Compounds (QC Lot: 1058713)											
WP2316652-001	Anonymous	Acetone	67-64-1	E611D	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----
		Benzene	71-43-2	E611D	0.0050	mg/kg	<0.0050	<0.0050	0	Diff <2x LOR	----
		Bromodichloromethane	75-27-4	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Bromoform	75-25-2	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Bromomethane	74-83-9	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Carbon tetrachloride	56-23-5	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Chlorobenzene	108-90-7	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Chloroform	67-66-3	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dibromochloromethane	124-48-1	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dibromoethane, 1,2-	106-93-4	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichlorobenzene, 1,2-	95-50-1	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichlorobenzene, 1,3-	541-73-1	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichlorobenzene, 1,4-	106-46-7	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichlorodifluoromethane	75-71-8	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichloroethane, 1,1-	75-34-3	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichloroethane, 1,2-	107-06-2	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichloroethylene, 1,1-	75-35-4	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichloroethylene, cis-1,2-	156-59-2	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichloroethylene, trans-1,2-	156-60-5	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichloromethane	75-09-2	E611D	0.045	mg/kg	<0.045	<0.045	0	Diff <2x LOR	----
		Dichloropropane, 1,2-	78-87-5	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dichloropropylene, cis-1,3-	10061-01-5	E611D	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
		Dichloropropylene, trans-1,3-	10061-02-6	E611D	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
		Ethylbenzene	100-41-4	E611D	0.015	mg/kg	<0.015	<0.015	0	Diff <2x LOR	----
		Hexane, n-	110-54-3	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Methyl ethyl ketone [MEK]	78-93-3	E611D	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----
		Methyl isobutyl ketone [MIBK]	108-10-1	E611D	0.50	mg/kg	<0.50	<0.50	0	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Volatile Organic Compounds (QC Lot: 1058713) - continued											
WP2316652-001	Anonymous	Methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	0.040	mg/kg	<0.040	<0.040	0	Diff <2x LOR	----
		Styrene	100-42-5	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Tetrachloroethane, 1,1,1,2-	630-20-6	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Tetrachloroethylene	127-18-4	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Toluene	108-88-3	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Trichloroethane, 1,1,1-	71-55-6	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Trichloroethane, 1,1,2-	79-00-5	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Trichloroethylene	79-01-6	E611D	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		Trichlorofluoromethane	75-69-4	E611D	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Vinyl chloride	75-01-4	E611D	0.020	mg/kg	<0.020	<0.020	0	Diff <2x LOR	----
		Xylene, m+p-	179601-23-1	E611D	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
		Xylene, o-	95-47-6	E611D	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 1055996)											
WT2322611-001	Anonymous	F2 (C10-C16)	----	E601.SG-L	10	mg/kg	<10	<10	0	Diff <2x LOR	----
		F3 (C16-C34)	----	E601.SG-L	50	mg/kg	<50	<50	0	Diff <2x LOR	----
		F4 (C34-C50)	----	E601.SG-L	50	mg/kg	<50	<50	0	Diff <2x LOR	----
Hydrocarbons (QC Lot: 1058714)											
WP2316652-001	Anonymous	F1 (C6-C10)	----	E581.F1	5.0	mg/kg	<5.0	<5.0	0	Diff <2x LOR	----
Polycyclic Aromatic Hydrocarbons (QC Lot: 1055995)											
WT2322611-001	Anonymous	Acenaphthene	83-32-9	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Acenaphthylene	208-96-8	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Anthracene	120-12-7	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Benz(a)anthracene	56-55-3	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Benzo(a)pyrene	50-32-8	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Benzo(b+j)fluoranthene	n/a	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Benzo(g,h,i)perylene	191-24-2	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Benzo(k)fluoranthene	207-08-9	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Chrysene	218-01-9	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Dibenz(a,h)anthracene	53-70-3	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Fluoranthene	206-44-0	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Fluorene	86-73-7	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Methylnaphthalene, 1-	90-12-0	E641A	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Polycyclic Aromatic Hydrocarbons (QC Lot: 1055995) - continued											
WT2322611-001	Anonymous	Methylnaphthalene, 2-	91-57-6	E641A	0.030	mg/kg	<0.030	<0.030	0	Diff <2x LOR	----
		Naphthalene	91-20-3	E641A	0.010	mg/kg	<0.010	<0.010	0	Diff <2x LOR	----
		Phenanthrene	85-01-8	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----
		Pyrene	129-00-0	E641A	0.050	mg/kg	<0.050	<0.050	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 1055970)						
Moisture	----	E144	0.25	%	<0.25	----
Physical Tests (QCLot: 1056913)						
Conductivity (1:2 leachate)	----	E100-L	5	µS/cm	<5.00	----
Cyanides (QCLot: 1055971)						
Cyanide, weak acid dissociable	----	E336A	0.05	mg/kg	<0.050	----
Metals (QCLot: 1056914)						
Calcium, soluble ion content	7440-70-2	E484	0.5	mg/L	<0.50	----
Magnesium, soluble ion content	7439-95-4	E484	0.5	mg/L	<0.50	----
Sodium, soluble ion content	17341-25-2	E484	0.5	mg/L	<0.50	----
Metals (QCLot: 1056915)						
Boron, hot water soluble	7440-42-8	E487	0.1	mg/kg	<0.10	----
Metals (QCLot: 1056918)						
Antimony	7440-36-0	E440C	0.1	mg/kg	<0.10	----
Arsenic	7440-38-2	E440C	0.1	mg/kg	<0.10	----
Barium	7440-39-3	E440C	0.5	mg/kg	<0.50	----
Beryllium	7440-41-7	E440C	0.1	mg/kg	<0.10	----
Boron	7440-42-8	E440C	5	mg/kg	<5.0	----
Cadmium	7440-43-9	E440C	0.02	mg/kg	<0.020	----
Chromium	7440-47-3	E440C	0.5	mg/kg	<0.50	----
Cobalt	7440-48-4	E440C	0.1	mg/kg	<0.10	----
Copper	7440-50-8	E440C	0.5	mg/kg	<0.50	----
Lead	7439-92-1	E440C	0.5	mg/kg	<0.50	----
Molybdenum	7439-98-7	E440C	0.1	mg/kg	<0.10	----
Nickel	7440-02-0	E440C	0.5	mg/kg	<0.50	----
Selenium	7782-49-2	E440C	0.2	mg/kg	<0.20	----
Silver	7440-22-4	E440C	0.1	mg/kg	<0.10	----
Thallium	7440-28-0	E440C	0.05	mg/kg	<0.050	----
Uranium	7440-61-1	E440C	0.05	mg/kg	<0.050	----
Vanadium	7440-62-2	E440C	0.2	mg/kg	<0.20	----
Zinc	7440-66-6	E440C	2	mg/kg	<2.0	----
Metals (QCLot: 1056919)						
Mercury	7439-97-6	E510C	0.005	mg/kg	<0.0050	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Speciated Metals (QCLot: 1055972)						
Chromium, hexavalent [Cr VI]	18540-29-9	E532	0.1	mg/kg	<0.10	----
Volatile Organic Compounds (QCLot: 1058713)						
Acetone	67-64-1	E611D	0.5	mg/kg	<0.50	----
Benzene	71-43-2	E611D	0.005	mg/kg	<0.0050	----
Bromodichloromethane	75-27-4	E611D	0.05	mg/kg	<0.050	----
Bromoform	75-25-2	E611D	0.05	mg/kg	<0.050	----
Bromomethane	74-83-9	E611D	0.05	mg/kg	<0.050	----
Carbon tetrachloride	56-23-5	E611D	0.05	mg/kg	<0.050	----
Chlorobenzene	108-90-7	E611D	0.05	mg/kg	<0.050	----
Chloroform	67-66-3	E611D	0.05	mg/kg	<0.050	----
Dibromochloromethane	124-48-1	E611D	0.05	mg/kg	<0.050	----
Dibromoethane, 1,2-	106-93-4	E611D	0.05	mg/kg	<0.050	----
Dichlorobenzene, 1,2-	95-50-1	E611D	0.05	mg/kg	<0.050	----
Dichlorobenzene, 1,3-	541-73-1	E611D	0.05	mg/kg	<0.050	----
Dichlorobenzene, 1,4-	106-46-7	E611D	0.05	mg/kg	<0.050	----
Dichlorodifluoromethane	75-71-8	E611D	0.05	mg/kg	<0.050	----
Dichloroethane, 1,1-	75-34-3	E611D	0.05	mg/kg	<0.050	----
Dichloroethane, 1,2-	107-06-2	E611D	0.05	mg/kg	<0.050	----
Dichloroethylene, 1,1-	75-35-4	E611D	0.05	mg/kg	<0.050	----
Dichloroethylene, cis-1,2-	156-59-2	E611D	0.05	mg/kg	<0.050	----
Dichloroethylene, trans-1,2-	156-60-5	E611D	0.05	mg/kg	<0.050	----
Dichloromethane	75-09-2	E611D	0.045	mg/kg	<0.045	----
Dichloropropane, 1,2-	78-87-5	E611D	0.05	mg/kg	<0.050	----
Dichloropropylene, cis-1,3-	10061-01-5	E611D	0.03	mg/kg	<0.030	----
Dichloropropylene, trans-1,3-	10061-02-6	E611D	0.03	mg/kg	<0.030	----
Ethylbenzene	100-41-4	E611D	0.015	mg/kg	<0.015	----
Hexane, n-	110-54-3	E611D	0.05	mg/kg	<0.050	----
Methyl ethyl ketone [MEK]	78-93-3	E611D	0.5	mg/kg	<0.50	----
Methyl isobutyl ketone [MIBK]	108-10-1	E611D	0.5	mg/kg	<0.50	----
Methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	0.04	mg/kg	<0.040	----
Styrene	100-42-5	E611D	0.05	mg/kg	<0.050	----
Tetrachloroethane, 1,1,1,2-	630-20-6	E611D	0.05	mg/kg	<0.050	----
Tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.05	mg/kg	<0.050	----
Tetrachloroethylene	127-18-4	E611D	0.05	mg/kg	<0.050	----
Toluene	108-88-3	E611D	0.05	mg/kg	<0.050	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Volatile Organic Compounds (QCLot: 1058713) - continued						
Trichloroethane, 1,1,1-	71-55-6	E611D	0.05	mg/kg	<0.050	----
Trichloroethane, 1,1,2-	79-00-5	E611D	0.05	mg/kg	<0.050	----
Trichloroethylene	79-01-6	E611D	0.01	mg/kg	<0.010	----
Trichlorofluoromethane	75-69-4	E611D	0.05	mg/kg	<0.050	----
Vinyl chloride	75-01-4	E611D	0.02	mg/kg	<0.020	----
Xylene, m+p-	179601-23-1	E611D	0.03	mg/kg	<0.030	----
Xylene, o-	95-47-6	E611D	0.03	mg/kg	<0.030	----
Hydrocarbons (QCLot: 1055996)						
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	<10	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	<50	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	<50	----
Hydrocarbons (QCLot: 1058714)						
F1 (C6-C10)	----	E581.F1	5	mg/kg	<5.0	----
Polycyclic Aromatic Hydrocarbons (QCLot: 1055995)						
Acenaphthene	83-32-9	E641A	0.05	mg/kg	<0.050	----
Acenaphthylene	208-96-8	E641A	0.05	mg/kg	<0.050	----
Anthracene	120-12-7	E641A	0.05	mg/kg	<0.050	----
Benz(a)anthracene	56-55-3	E641A	0.05	mg/kg	<0.050	----
Benzo(a)pyrene	50-32-8	E641A	0.05	mg/kg	<0.050	----
Benzo(b+j)fluoranthene	n/a	E641A	0.05	mg/kg	<0.050	----
Benzo(g,h,i)perylene	191-24-2	E641A	0.05	mg/kg	<0.050	----
Benzo(k)fluoranthene	207-08-9	E641A	0.05	mg/kg	<0.050	----
Chrysene	218-01-9	E641A	0.05	mg/kg	<0.050	----
Dibenz(a,h)anthracene	53-70-3	E641A	0.05	mg/kg	<0.050	----
Fluoranthene	206-44-0	E641A	0.05	mg/kg	<0.050	----
Fluorene	86-73-7	E641A	0.05	mg/kg	<0.050	----
Indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.05	mg/kg	<0.050	----
Methylnaphthalene, 1-	90-12-0	E641A	0.03	mg/kg	<0.030	----
Methylnaphthalene, 2-	91-57-6	E641A	0.03	mg/kg	<0.030	----
Naphthalene	91-20-3	E641A	0.01	mg/kg	<0.010	----
Phenanthrene	85-01-8	E641A	0.05	mg/kg	<0.050	----
Pyrene	129-00-0	E641A	0.05	mg/kg	<0.050	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1055970)									
Moisture	----	E144	0.25	%	50 %	98.4	90.0	110	----
Physical Tests (QCLot: 1055997)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 1056913)									
Conductivity (1:2 leachate)	----	E100-L	5	µS/cm	1409 µS/cm	101	90.0	110	----
Cyanides (QCLot: 1055971)									
Cyanide, weak acid dissociable	----	E336A	0.05	mg/kg	1.25 mg/kg	95.2	80.0	120	----
Metals (QCLot: 1056914)									
Calcium, soluble ion content	7440-70-2	E484	0.5	mg/L	300 mg/L	114	80.0	120	----
Magnesium, soluble ion content	7439-95-4	E484	0.5	mg/L	50 mg/L	108	80.0	120	----
Sodium, soluble ion content	17341-25-2	E484	0.5	mg/L	50 mg/L	109	80.0	120	----
Metals (QCLot: 1056915)									
Boron, hot water soluble	7440-42-8	E487	0.1	mg/kg	1.33333 mg/kg	105	70.0	130	----
Metals (QCLot: 1056918)									
Antimony	7440-36-0	E440C	0.1	mg/kg	100 mg/kg	99.6	80.0	120	----
Arsenic	7440-38-2	E440C	0.1	mg/kg	100 mg/kg	113	80.0	120	----
Barium	7440-39-3	E440C	0.5	mg/kg	25 mg/kg	109	80.0	120	----
Beryllium	7440-41-7	E440C	0.1	mg/kg	10 mg/kg	112	80.0	120	----
Boron	7440-42-8	E440C	5	mg/kg	100 mg/kg	107	80.0	120	----
Cadmium	7440-43-9	E440C	0.02	mg/kg	10 mg/kg	108	80.0	120	----
Chromium	7440-47-3	E440C	0.5	mg/kg	25 mg/kg	107	80.0	120	----
Cobalt	7440-48-4	E440C	0.1	mg/kg	25 mg/kg	108	80.0	120	----
Copper	7440-50-8	E440C	0.5	mg/kg	25 mg/kg	106	80.0	120	----
Lead	7439-92-1	E440C	0.5	mg/kg	50 mg/kg	112	80.0	120	----
Molybdenum	7439-98-7	E440C	0.1	mg/kg	25 mg/kg	114	80.0	120	----
Nickel	7440-02-0	E440C	0.5	mg/kg	50 mg/kg	107	80.0	120	----
Selenium	7782-49-2	E440C	0.2	mg/kg	100 mg/kg	109	80.0	120	----
Silver	7440-22-4	E440C	0.1	mg/kg	10 mg/kg	96.3	80.0	120	----
Thallium	7440-28-0	E440C	0.05	mg/kg	100 mg/kg	111	80.0	120	----
Uranium	7440-61-1	E440C	0.05	mg/kg	0.5 mg/kg	104	80.0	120	----
Vanadium	7440-62-2	E440C	0.2	mg/kg	50 mg/kg	111	80.0	120	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Metals (QCLot: 1056918) - continued									
Zinc	7440-66-6	E440C	2	mg/kg	50 mg/kg	105	80.0	120	----
Metals (QCLot: 1056919)									
Mercury	7439-97-6	E510C	0.005	mg/kg	0.1 mg/kg	113	80.0	120	----
Speciated Metals (QCLot: 1055972)									
Chromium, hexavalent [Cr VI]	18540-29-9	E532	0.1	mg/kg	0.8 mg/kg	104	80.0	120	----
Volatile Organic Compounds (QCLot: 1058713)									
Acetone	67-64-1	E611D	0.5	mg/kg	3.475 mg/kg	133	60.0	140	----
Benzene	71-43-2	E611D	0.005	mg/kg	3.475 mg/kg	107	70.0	130	----
Bromodichloromethane	75-27-4	E611D	0.05	mg/kg	3.475 mg/kg	119	50.0	140	----
Bromoform	75-25-2	E611D	0.05	mg/kg	3.475 mg/kg	85.9	70.0	130	----
Bromomethane	74-83-9	E611D	0.05	mg/kg	3.475 mg/kg	112	50.0	140	----
Carbon tetrachloride	56-23-5	E611D	0.05	mg/kg	3.475 mg/kg	107	70.0	130	----
Chlorobenzene	108-90-7	E611D	0.05	mg/kg	3.475 mg/kg	111	70.0	130	----
Chloroform	67-66-3	E611D	0.05	mg/kg	3.475 mg/kg	121	70.0	130	----
Dibromochloromethane	124-48-1	E611D	0.05	mg/kg	3.475 mg/kg	99.6	60.0	130	----
Dibromoethane, 1,2-	106-93-4	E611D	0.05	mg/kg	3.475 mg/kg	110	70.0	130	----
Dichlorobenzene, 1,2-	95-50-1	E611D	0.05	mg/kg	3.475 mg/kg	106	70.0	130	----
Dichlorobenzene, 1,3-	541-73-1	E611D	0.05	mg/kg	3.475 mg/kg	109	70.0	130	----
Dichlorobenzene, 1,4-	106-46-7	E611D	0.05	mg/kg	3.475 mg/kg	109	70.0	130	----
Dichlorodifluoromethane	75-71-8	E611D	0.05	mg/kg	3.475 mg/kg	70.8	50.0	140	----
Dichloroethane, 1,1-	75-34-3	E611D	0.05	mg/kg	3.475 mg/kg	116	60.0	130	----
Dichloroethane, 1,2-	107-06-2	E611D	0.05	mg/kg	3.475 mg/kg	120	60.0	130	----
Dichloroethylene, 1,1-	75-35-4	E611D	0.05	mg/kg	3.475 mg/kg	120	60.0	130	----
Dichloroethylene, cis-1,2-	156-59-2	E611D	0.05	mg/kg	3.475 mg/kg	120	70.0	130	----
Dichloroethylene, trans-1,2-	156-60-5	E611D	0.05	mg/kg	3.475 mg/kg	126	60.0	130	----
Dichloromethane	75-09-2	E611D	0.045	mg/kg	3.475 mg/kg	124	70.0	130	----
Dichloropropane, 1,2-	78-87-5	E611D	0.05	mg/kg	3.475 mg/kg	113	70.0	130	----
Dichloropropylene, cis-1,3-	10061-01-5	E611D	0.03	mg/kg	3.475 mg/kg	98.2	70.0	130	----
Dichloropropylene, trans-1,3-	10061-02-6	E611D	0.03	mg/kg	3.475 mg/kg	100	70.0	130	----
Ethylbenzene	100-41-4	E611D	0.015	mg/kg	3.475 mg/kg	98.8	70.0	130	----
Hexane, n-	110-54-3	E611D	0.05	mg/kg	3.475 mg/kg	106	70.0	130	----
Methyl ethyl ketone [MEK]	78-93-3	E611D	0.5	mg/kg	3.475 mg/kg	98.0	60.0	140	----
Methyl isobutyl ketone [MIBK]	108-10-1	E611D	0.5	mg/kg	3.475 mg/kg	96.6	60.0	140	----
Methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	0.04	mg/kg	3.475 mg/kg	108	70.0	130	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 1058713) - continued									
Styrene	100-42-5	E611D	0.05	mg/kg	3.475 mg/kg	95.7	70.0	130	----
Tetrachloroethane, 1,1,1,2-	630-20-6	E611D	0.05	mg/kg	3.475 mg/kg	104	60.0	130	----
Tetrachloroethane, 1,1,2,2-	79-34-5	E611D	0.05	mg/kg	3.475 mg/kg	116	60.0	130	----
Tetrachloroethylene	127-18-4	E611D	0.05	mg/kg	3.475 mg/kg	98.0	60.0	130	----
Toluene	108-88-3	E611D	0.05	mg/kg	3.475 mg/kg	100	70.0	130	----
Trichloroethane, 1,1,1-	71-55-6	E611D	0.05	mg/kg	3.475 mg/kg	116	60.0	130	----
Trichloroethane, 1,1,2-	79-00-5	E611D	0.05	mg/kg	3.475 mg/kg	117	60.0	130	----
Trichloroethylene	79-01-6	E611D	0.01	mg/kg	3.475 mg/kg	107	60.0	130	----
Trichlorofluoromethane	75-69-4	E611D	0.05	mg/kg	3.475 mg/kg	109	50.0	140	----
Vinyl chloride	75-01-4	E611D	0.02	mg/kg	3.475 mg/kg	108	60.0	140	----
Xylene, m+p-	179601-23-1	E611D	0.03	mg/kg	6.95 mg/kg	100	70.0	130	----
Xylene, o-	95-47-6	E611D	0.03	mg/kg	3.475 mg/kg	97.7	70.0	130	----
Hydrocarbons (QCLot: 1055996)									
F2 (C10-C16)	----	E601.SG-L	10	mg/kg	821.775 mg/kg	88.4	70.0	130	----
F3 (C16-C34)	----	E601.SG-L	50	mg/kg	1151.486 mg/kg	128	70.0	130	----
F4 (C34-C50)	----	E601.SG-L	50	mg/kg	719.6893 mg/kg	104	70.0	130	----
Hydrocarbons (QCLot: 1058714)									
F1 (C6-C10)	----	E581.F1	5	mg/kg	69.1875 mg/kg	97.3	80.0	120	----
Polycyclic Aromatic Hydrocarbons (QCLot: 1055995)									
Acenaphthene	83-32-9	E641A	0.05	mg/kg	0.5 mg/kg	86.3	60.0	130	----
Acenaphthylene	208-96-8	E641A	0.05	mg/kg	0.5 mg/kg	86.4	60.0	130	----
Anthracene	120-12-7	E641A	0.05	mg/kg	0.5 mg/kg	98.3	60.0	130	----
Benz(a)anthracene	56-55-3	E641A	0.05	mg/kg	0.5 mg/kg	108	60.0	130	----
Benzo(a)pyrene	50-32-8	E641A	0.05	mg/kg	0.5 mg/kg	96.4	60.0	130	----
Benzo(b+j)fluoranthene	n/a	E641A	0.05	mg/kg	0.5 mg/kg	102	60.0	130	----
Benzo(g,h,i)perylene	191-24-2	E641A	0.05	mg/kg	0.5 mg/kg	104	60.0	130	----
Benzo(k)fluoranthene	207-08-9	E641A	0.05	mg/kg	0.5 mg/kg	96.6	60.0	130	----
Chrysene	218-01-9	E641A	0.05	mg/kg	0.5 mg/kg	111	60.0	130	----
Dibenz(a,h)anthracene	53-70-3	E641A	0.05	mg/kg	0.5 mg/kg	91.4	60.0	130	----
Fluoranthene	206-44-0	E641A	0.05	mg/kg	0.5 mg/kg	94.4	60.0	130	----
Fluorene	86-73-7	E641A	0.05	mg/kg	0.5 mg/kg	93.7	60.0	130	----
Indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.05	mg/kg	0.5 mg/kg	101	60.0	130	----
Methylnaphthalene, 1-	90-12-0	E641A	0.03	mg/kg	0.5 mg/kg	65.6	60.0	130	----
Methylnaphthalene, 2-	91-57-6	E641A	0.03	mg/kg	0.5 mg/kg	61.6	60.0	130	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 1055995) - continued									
Naphthalene	91-20-3	E641A	0.01	mg/kg	0.5 mg/kg	# 51.7	60.0	130	LCS-L
Phenanthrene	85-01-8	E641A	0.05	mg/kg	0.5 mg/kg	93.2	60.0	130	----
Pyrene	129-00-0	E641A	0.05	mg/kg	0.5 mg/kg	91.2	60.0	130	----

Qualifiers

Qualifier	Description
LCS-L	*Lab Control Sample recovery was below ALS DQO. Reference Material and/or Matrix Spike results were acceptable. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.*

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Cyanides (QCLot: 1055971)										
WT2322567-019	Anonymous	Cyanide, weak acid dissociable	----	E336A	1.26 mg/kg	1.25 mg/kg	100	70.0	130	----
Volatile Organic Compounds (QCLot: 1058713)										
WP2316652-001	Anonymous	Acetone	67-64-1	E611D	2.56 mg/kg	3.125 mg/kg	109	50.0	140	----
		Benzene	71-43-2	E611D	2.23 mg/kg	3.125 mg/kg	94.7	50.0	140	----
		Bromodichloromethane	75-27-4	E611D	2.51 mg/kg	3.125 mg/kg	106	50.0	140	----
		Bromoform	75-25-2	E611D	1.84 mg/kg	3.125 mg/kg	77.9	50.0	140	----
		Bromomethane	74-83-9	E611D	2.59 mg/kg	3.125 mg/kg	110	50.0	140	----
		Carbon tetrachloride	56-23-5	E611D	2.30 mg/kg	3.125 mg/kg	97.4	50.0	140	----
		Chlorobenzene	108-90-7	E611D	2.40 mg/kg	3.125 mg/kg	102	50.0	140	----
		Chloroform	67-66-3	E611D	2.56 mg/kg	3.125 mg/kg	109	50.0	140	----
		Dibromochloromethane	124-48-1	E611D	2.04 mg/kg	3.125 mg/kg	86.7	50.0	140	----
		Dibromoethane, 1,2-	106-93-4	E611D	2.30 mg/kg	3.125 mg/kg	97.6	50.0	140	----
		Dichlorobenzene, 1,2-	95-50-1	E611D	2.30 mg/kg	3.125 mg/kg	97.7	50.0	140	----
		Dichlorobenzene, 1,3-	541-73-1	E611D	2.35 mg/kg	3.125 mg/kg	99.6	50.0	140	----
		Dichlorobenzene, 1,4-	106-46-7	E611D	2.35 mg/kg	3.125 mg/kg	99.5	50.0	140	----
		Dichlorodifluoromethane	75-71-8	E611D	1.94 mg/kg	3.125 mg/kg	82.0	50.0	140	----
		Dichloroethane, 1,1-	75-34-3	E611D	2.43 mg/kg	3.125 mg/kg	103	50.0	140	----
		Dichloroethane, 1,2-	107-06-2	E611D	2.47 mg/kg	3.125 mg/kg	104	50.0	140	----
		Dichloroethylene, 1,1-	75-35-4	E611D	2.69 mg/kg	3.125 mg/kg	114	50.0	140	----
		Dichloroethylene, cis-1,2-	156-59-2	E611D	2.56 mg/kg	3.125 mg/kg	108	50.0	140	----
		Dichloroethylene, trans-1,2-	156-60-5	E611D	2.73 mg/kg	3.125 mg/kg	116	50.0	140	----
		Dichloromethane	75-09-2	E611D	2.54 mg/kg	3.125 mg/kg	108	50.0	140	----
		Dichloropropane, 1,2-	78-87-5	E611D	2.37 mg/kg	3.125 mg/kg	100	50.0	140	----
		Dichloropropylene, cis-1,3-	10061-01-5	E611D	2.06 mg/kg	3.125 mg/kg	87.4	50.0	140	----
		Dichloropropylene, trans-1,3-	10061-02-6	E611D	2.23 mg/kg	3.125 mg/kg	94.7	50.0	140	----
		Ethylbenzene	100-41-4	E611D	2.22 mg/kg	3.125 mg/kg	94.1	50.0	140	----
		Hexane, n-	110-54-3	E611D	2.44 mg/kg	3.125 mg/kg	103	50.0	140	----
		Methyl ethyl ketone [MEK]	78-93-3	E611D	1.99 mg/kg	3.125 mg/kg	84.4	50.0	140	----
		Methyl isobutyl ketone [MIBK]	108-10-1	E611D	1.96 mg/kg	3.125 mg/kg	83.0	50.0	140	----
		Methyl-tert-butyl ether [MTBE]	1634-04-4	E611D	2.36 mg/kg	3.125 mg/kg	100	50.0	140	----
		Styrene	100-42-5	E611D	2.00 mg/kg	3.125 mg/kg	84.7	50.0	140	----

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Volatile Organic Compounds (QCLot: 1058713) - continued										
WP2316652-001	Anonymous	Tetrachloroethane, 1,1,1,2-	630-20-6	E611D	2.24 mg/kg	3.125 mg/kg	94.9	50.0	140	----
		Tetrachloroethane, 1,1,2,2-	79-34-5	E611D	2.46 mg/kg	3.125 mg/kg	104	50.0	140	----
		Tetrachloroethylene	127-18-4	E611D	2.14 mg/kg	3.125 mg/kg	90.8	50.0	140	----
		Toluene	108-88-3	E611D	2.20 mg/kg	3.125 mg/kg	93.1	50.0	140	----
		Trichloroethane, 1,1,1-	71-55-6	E611D	2.53 mg/kg	3.125 mg/kg	107	50.0	140	----
		Trichloroethane, 1,1,2-	79-00-5	E611D	2.46 mg/kg	3.125 mg/kg	104	50.0	140	----
		Trichloroethylene	79-01-6	E611D	2.31 mg/kg	3.125 mg/kg	97.9	50.0	140	----
		Trichlorofluoromethane	75-69-4	E611D	2.52 mg/kg	3.125 mg/kg	107	50.0	140	----
		Vinyl chloride	75-01-4	E611D	2.39 mg/kg	3.125 mg/kg	101	50.0	140	----
		Xylene, m+p-	179601-23-1	E611D	4.51 mg/kg	6.25 mg/kg	95.6	50.0	140	----
		Xylene, o-	95-47-6	E611D	2.20 mg/kg	3.125 mg/kg	93.2	50.0	140	----
Hydrocarbons (QCLot: 1055996)										
WT2322611-001	Anonymous	F2 (C10-C16)	----	E601.SG-L	580 mg/kg	821.775 mg/kg	88.8	60.0	140	----
		F3 (C16-C34)	----	E601.SG-L	1190 mg/kg	1151.486 mg/kg	130	60.0	140	----
		F4 (C34-C50)	----	E601.SG-L	664 mg/kg	719.6893 mg/kg	116	60.0	140	----
Hydrocarbons (QCLot: 1058714)										
WP2316652-001	Anonymous	F1 (C6-C10)	----	E581.F1	42.1 mg/kg	62.5 mg/kg	89.3	60.0	140	----
Polycyclic Aromatic Hydrocarbons (QCLot: 1055995)										
WT2322611-001	Anonymous	Acenaphthene	83-32-9	E641A	0.366 mg/kg	0.5 mg/kg	91.6	50.0	140	----
		Acenaphthylene	208-96-8	E641A	0.369 mg/kg	0.5 mg/kg	92.5	50.0	140	----
		Anthracene	120-12-7	E641A	0.402 mg/kg	0.5 mg/kg	101	50.0	140	----
		Benz(a)anthracene	56-55-3	E641A	0.424 mg/kg	0.5 mg/kg	106	50.0	140	----
		Benzo(a)pyrene	50-32-8	E641A	0.383 mg/kg	0.5 mg/kg	96.0	50.0	140	----
		Benzo(b+j)fluoranthene	n/a	E641A	0.395 mg/kg	0.5 mg/kg	99.0	50.0	140	----
		Benzo(g,h,i)perylene	191-24-2	E641A	0.403 mg/kg	0.5 mg/kg	101	50.0	140	----
		Benzo(k)fluoranthene	207-08-9	E641A	0.388 mg/kg	0.5 mg/kg	97.1	50.0	140	----
		Chrysene	218-01-9	E641A	0.435 mg/kg	0.5 mg/kg	109	50.0	140	----
		Dibenz(a,h)anthracene	53-70-3	E641A	0.359 mg/kg	0.5 mg/kg	90.0	50.0	140	----
		Fluoranthene	206-44-0	E641A	0.375 mg/kg	0.5 mg/kg	94.0	50.0	140	----
		Fluorene	86-73-7	E641A	0.385 mg/kg	0.5 mg/kg	96.3	50.0	140	----
		Indeno(1,2,3-c,d)pyrene	193-39-5	E641A	0.400 mg/kg	0.5 mg/kg	100	50.0	140	----
		Methylnaphthalene, 1-	90-12-0	E641A	0.341 mg/kg	0.5 mg/kg	85.5	50.0	140	----
		Methylnaphthalene, 2-	91-57-6	E641A	0.332 mg/kg	0.5 mg/kg	83.1	50.0	140	----
		Naphthalene	91-20-3	E641A	0.318 mg/kg	0.5 mg/kg	79.6	50.0	140	----

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Polycyclic Aromatic Hydrocarbons (QCLot: 1055995) - continued										
WT2322611-001	Anonymous	Phenanthrene	85-01-8	E641A	0.374 mg/kg	0.5 mg/kg	93.7	50.0	140	----
		Pyrene	129-00-0	E641A	0.364 mg/kg	0.5 mg/kg	91.3	50.0	140	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

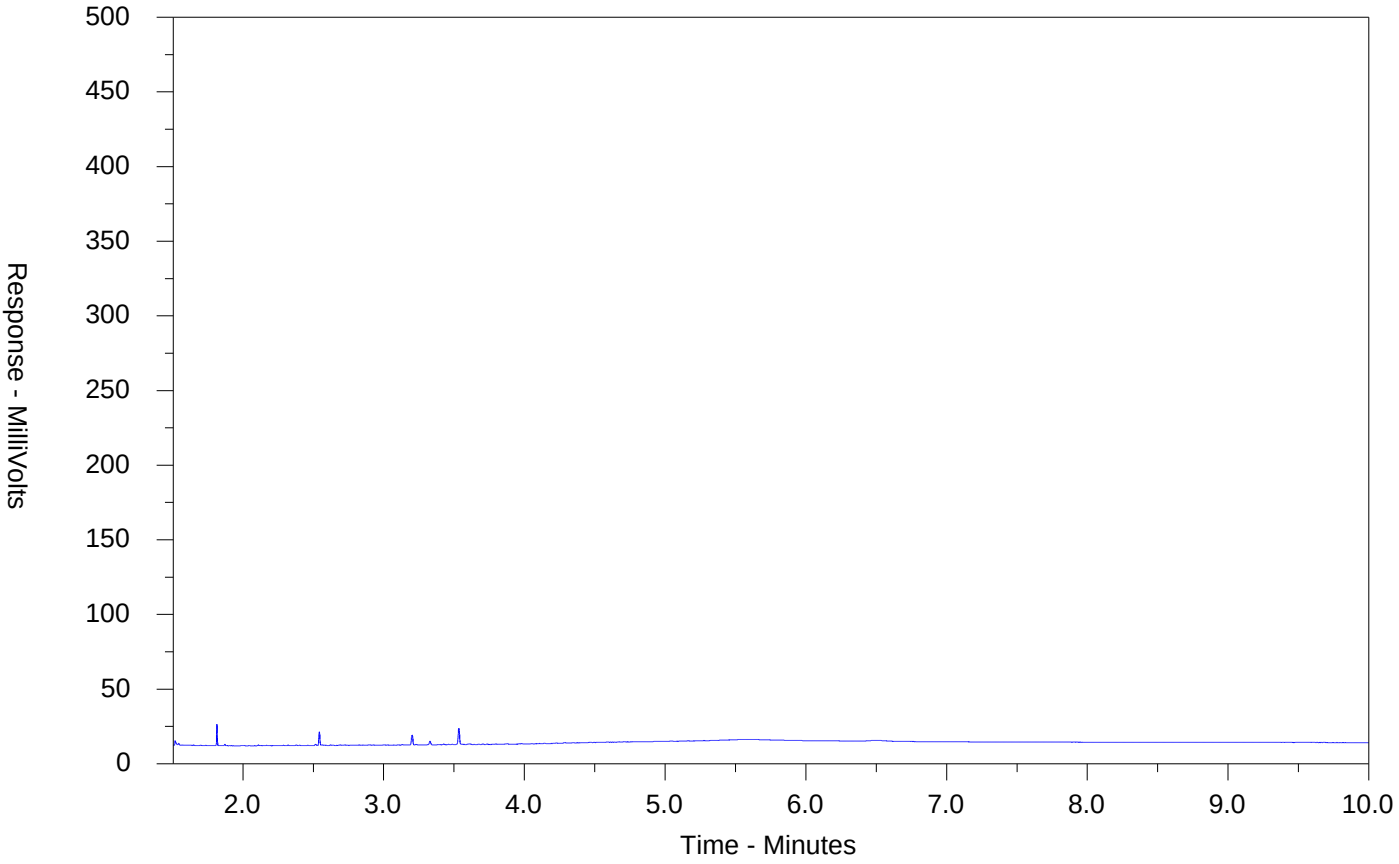
					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 1056913)									
	RM	Conductivity (1:2 leachate)	----	E100-L	1725.6 µS/cm	103	70.0	130	----
Metals (QCLot: 1056914)									
	RM	Calcium, soluble ion content	7440-70-2	E484	78.94 mg/L	107	70.0	130	----
	RM	Magnesium, soluble ion content	7439-95-4	E484	24.16 mg/L	106	70.0	130	----
	RM	Sodium, soluble ion content	17341-25-2	E484	72.46 mg/L	104	70.0	130	----
Metals (QCLot: 1056915)									
	RM	Boron, hot water soluble	7440-42-8	E487	1.6542 mg/kg	110	60.0	140	----
Metals (QCLot: 1056918)									
	RM	Antimony	7440-36-0	E440C	3.99 mg/kg	88.6	70.0	130	----
	RM	Arsenic	7440-38-2	E440C	3.73 mg/kg	102	70.0	130	----
	RM	Barium	7440-39-3	E440C	105 mg/kg	114	70.0	130	----
	RM	Beryllium	7440-41-7	E440C	0.349 mg/kg	115	70.0	130	----
	RM	Boron	7440-42-8	E440C	8.5 mg/kg	116	70.0	130	----
	RM	Cadmium	7440-43-9	E440C	0.91 mg/kg	102	70.0	130	----
	RM	Chromium	7440-47-3	E440C	101 mg/kg	100	70.0	130	----
	RM	Cobalt	7440-48-4	E440C	6.9 mg/kg	107	70.0	130	----
	RM	Copper	7440-50-8	E440C	123 mg/kg	107	70.0	130	----
	RM	Lead	7439-92-1	E440C	267 mg/kg	113	70.0	130	----
	RM	Molybdenum	7439-98-7	E440C	1.03 mg/kg	112	70.0	130	----
	RM	Nickel	7440-02-0	E440C	26.7 mg/kg	108	70.0	130	----
	RM	Silver	7440-22-4	E440C	4.06 mg/kg	96.1	70.0	130	----
	RM	Thallium	7440-28-0	E440C	0.0786 mg/kg	99.1	70.0	130	----
	RM	Uranium	7440-61-1	E440C	0.52 mg/kg	94.5	70.0	130	----
	RM	Vanadium	7440-62-2	E440C	32.7 mg/kg	105	70.0	130	----
	RM	Zinc	7440-66-6	E440C	297 mg/kg	104	70.0	130	----
Metals (QCLot: 1056919)									
	RM	Mercury	7439-97-6	E510C	0.0585 mg/kg	117	70.0	130	----
Speciated Metals (QCLot: 1055972)									

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Speciated Metals (QCLot: 1055972) - continued									
	RM	Chromium, hexavalent [Cr VI]	18540-29-9	E532	172 mg/kg	90.3	70.0	130	----

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2322748-001-E601.SG-L
Client Sample ID: BH 1 SAM 2



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →		← Motor Oils/Lube Oils/Grease →	
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

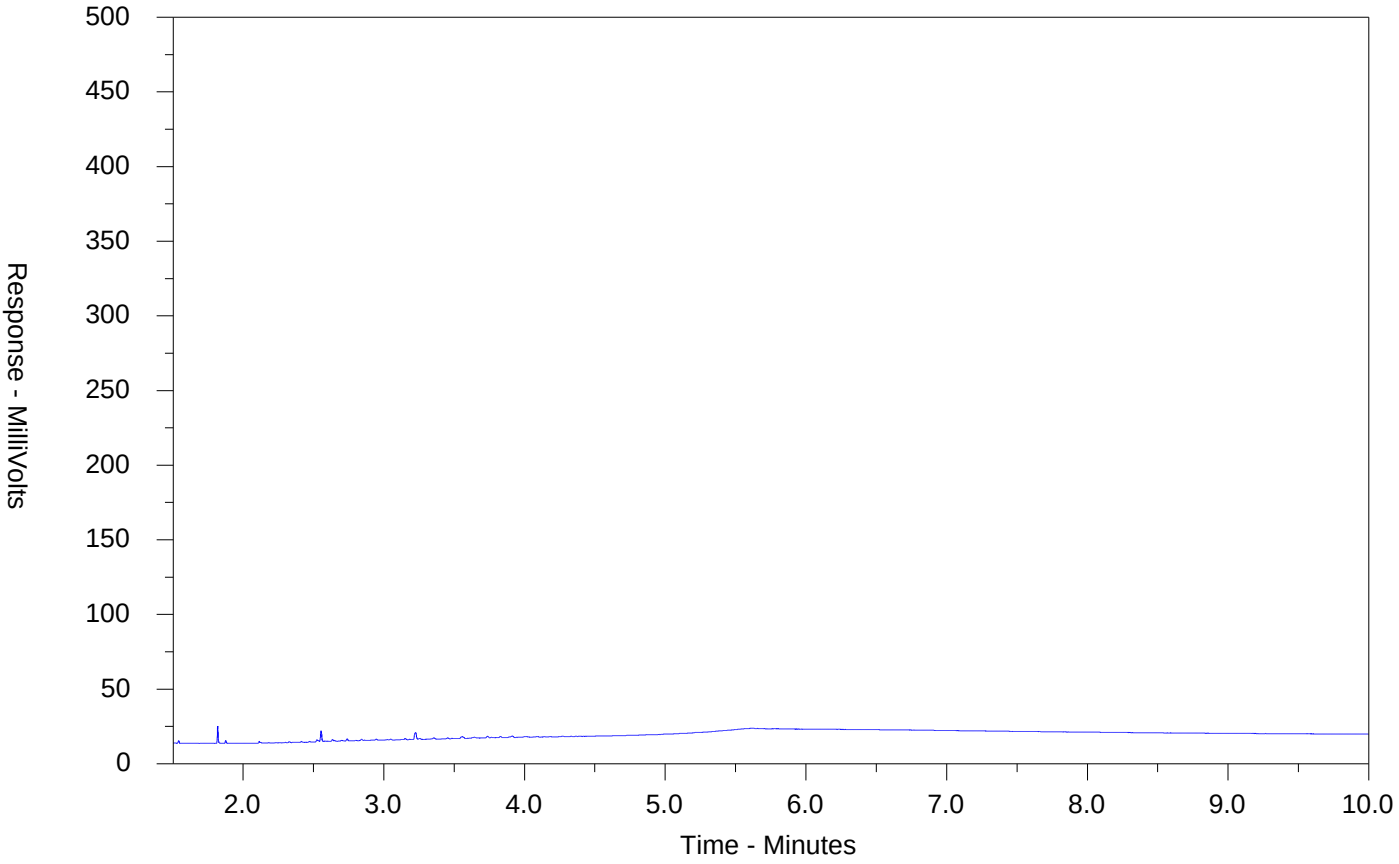
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2322748-002-E601.SG-L
Client Sample ID: BH 1 SAM 6



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

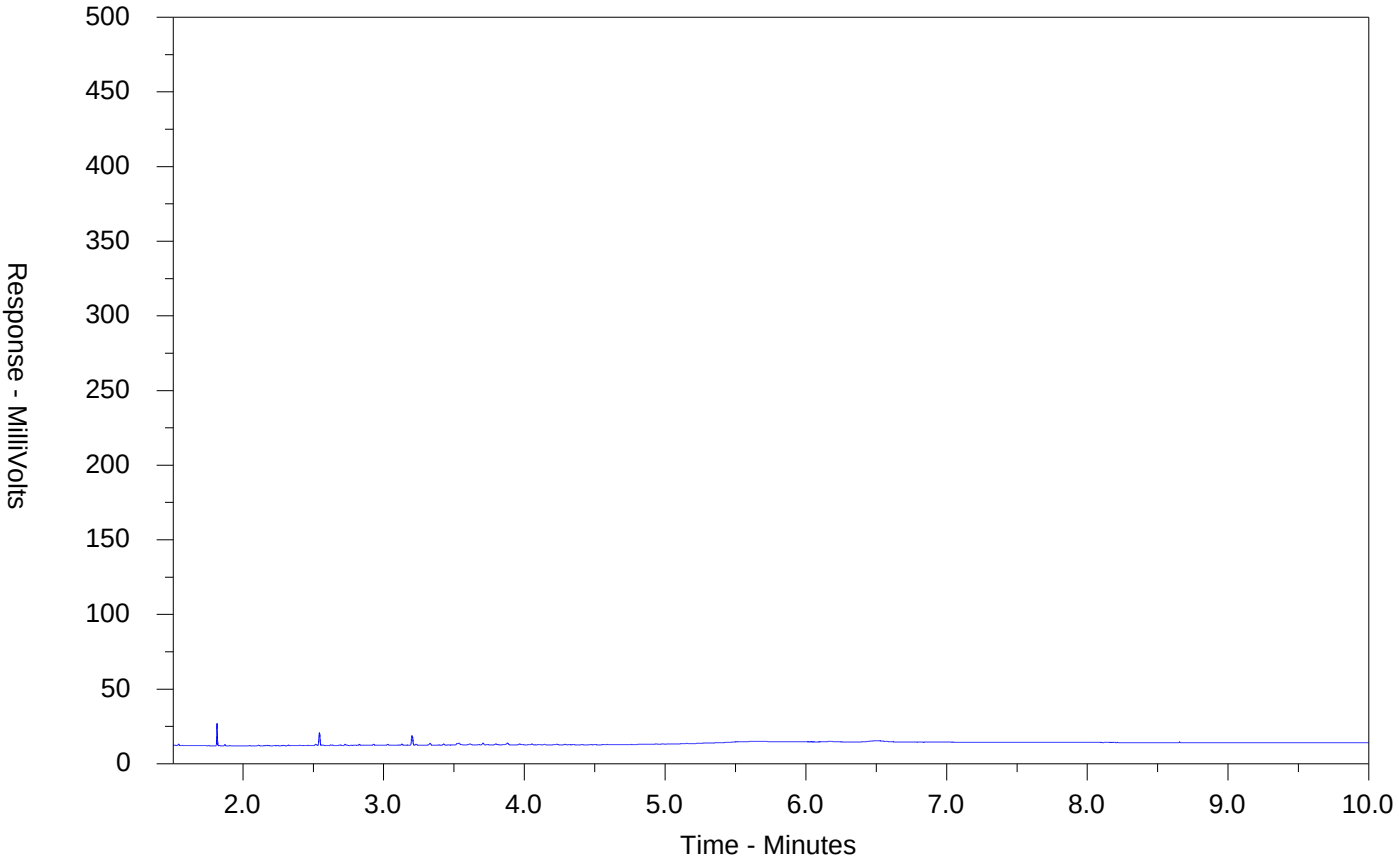
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2322748-003-E601.SG-L
Client Sample ID: BH 2 SAM 3



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

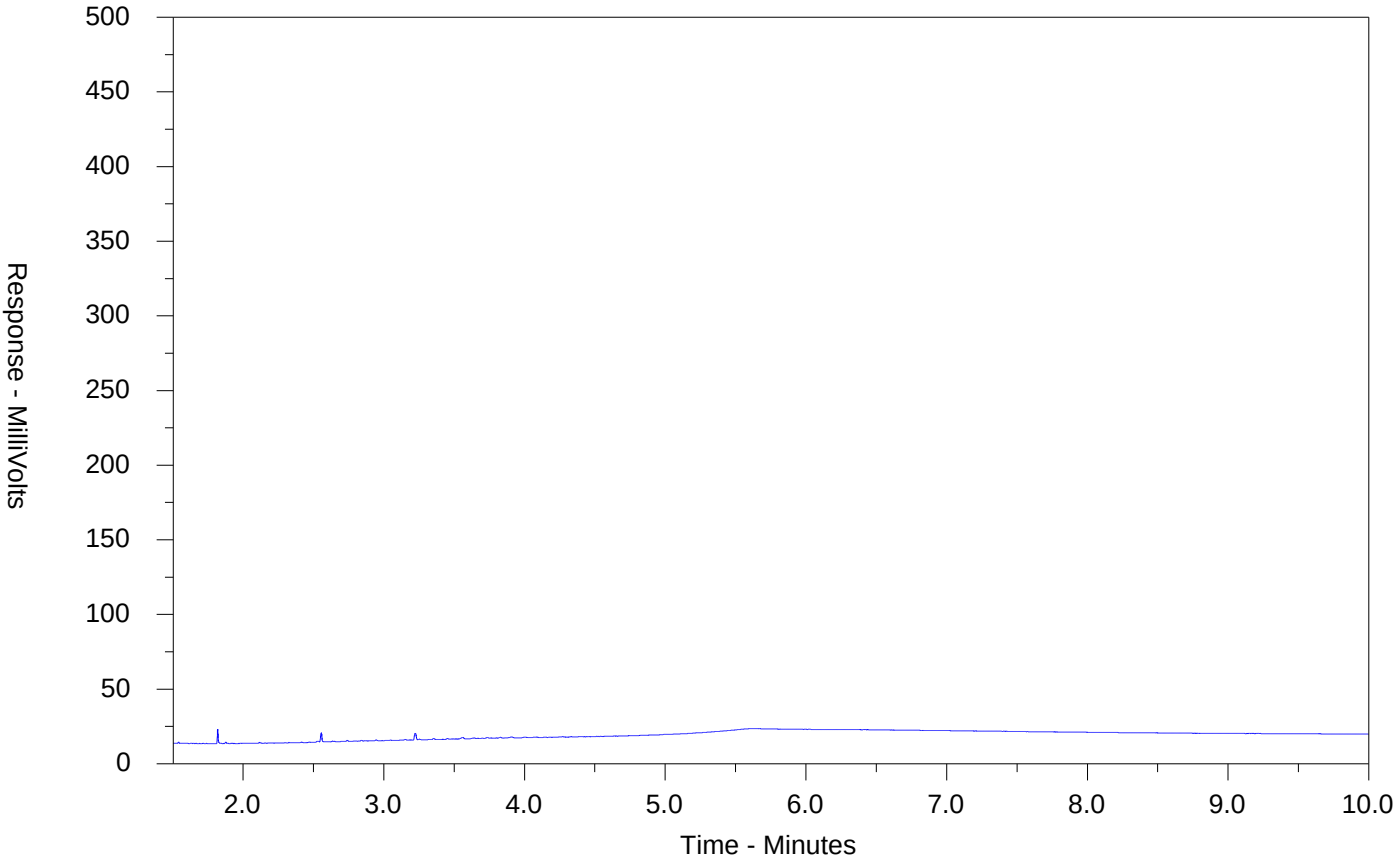
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: WT2322748-004-E601.SG-L
Client Sample ID: Duplicate 1



←F2→	←F3→	←F4→	
nC10	nC16	nC34	nC50
174°C	287°C	481°C	575°C
346°F	549°F	898°F	1067°F
Gasoline →	← Motor Oils/Lube Oils/Grease →		
← Diesel/Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor and the scale at the left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR Library can be found at www.alsglobal.com.

Chain of Custody (COC) / Analytical Request Form

COC Number: 20

Environmental Division Waterloo

Work Order Reference WT2322748

Canada Toll Free: 1 800 668 9878

Page

www.alsglobal.com

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	CMT ENG. INC.
Contact:	BRANDON R FILL / JAKE FEENEY
Phone:	519-699-5775
	Company address below will appear on the final report
Street:	1011 INDUSTRIAL CRES UNIT 1
City/Province:	ST. CLEMENTS, ON
Postal Code:	N0B 2M0
Invoice To	Same as Report To ☐ YES ☒ NO
	Copy of Invoice with Report ☐ YES ☒ NO
Company:	CMT ENG. INC.
Contact:	JAKE FEENEY

Reports / Recipients

Select Report Format: ☒ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☒ YES ☐ NO ☐ N/A

☒ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bfigg@cmtinc.net

Email 2 jfeeney@cmtinc.net

Email 3 rchantler@cmtinc.net

Invoice Recipients

Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax eqibbs@cmtinc.net

Email 2 jfeeney@cmtinc.net

Turnaround Time (TAT) Requested

☒ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additior may apply to rush requests on weekends, statutory holidays and non-routi

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please contact your AM to confirm availability.

Project Information

ALS Account # / Quote #:

Job #: 23-146 EMMA ST S. GRANDVALLEY

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (ALS use only): WT2322748 CM

ALS Contact: Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	METALS W/O Hg (F/P)	SAR	EC	PH	BTEX	F1-F4	VOC	PAH	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH 1 SAM 2	24-July-23	9:25		6	X	X	X	X	X	X	X	X			
	BH 1 SAM 6	24-July-23	10:05		6	X	X	X	X	X	X	X	X			
	BH 2 SAM 3	24-July-23	10:55		6	X	X	X	X	X	X	X	X			
	DUPLICATE 1	24-July-23	-		5	X	X	X	X	X	X	X	X			

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

O. REG 406/19

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☒ NONE ☐ ICE ☒ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	12.7

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: Cm	Date: July 25/23	Time: 16:50

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

VS-248 EC

SOL-632 SOL-634

ALS Canada Ltd.

right solutions.
right partner.

CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: **WT2326299**	Page	: 1 of 7
Client	: **CMT Engineering Inc.**	Laboratory	: ALS Environmental - Waterloo
Contact	: Jake Feeney	Account Manager	: Mathy Mahadeva
Address	: 1011 Industrial Crescent Unit 1 St. Clements ON Canada N0B 2M0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 699 5775	Telephone	: +1 519 886 6910
Project	: 23-146 Emma St. S. Grand Valley	Date Samples Received	: 22-Aug-2023 15:44
PO	: ----	Date Analysis Commenced	: 24-Aug-2023
C-O-C number	: ----	Issue Date	: 28-Aug-2023 17:06
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer 2023 Pricing		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Andrea Armstrong	Department Manager - Air Quality and Volatiles	VOC, Waterloo, Ontario
Nik Perkio	Inorganics Analyst	Metals, Waterloo, Ontario
Robert Braun	Soils Team Supervisor	Inorganics, Waterloo, Ontario

No Breaches Found

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.
Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	*Description*
mg/L	milligrams per litre
pH units	pH units

>: greater than.
<: less than.
Red shading is applied where the result or the LOR is greater than the Guideline Upper Limit (or lower than the Guideline Lower Limit, if applicable).
For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit.

Workorder Comments

Amendment (17-AUG-23): This report has been amended and re-released to allow additional criteria to be added to the report. All analysis results are as per the previous report.

Accreditation

Accreditation	Description	Laboratory	Address
A	CALA ISO/IEC 17025:2017	WT ALS Environmental - Waterloo	60 Northland Road, Unit 1, Waterloo, ON

Applicable accreditations are indicated in the Method/Lab column as superscripts.

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Method/Lab		Unit	Client sample ID: BH 1 SAM 2	----	----	----	----	----	----
					Sampling date/time: 24-Jul-2023 09:25	----	----	----	----	----	----
					Sub-Matrix: Soil	----	----	----	----	----	----
					WT2326299-001	--------	--------	--------	--------	--------	--------
TCLP Metals											
pH, TCLP 1st preliminary	----	EPP444/WT			9.93	----	----	----	----	----	----
pH, TCLP 2nd preliminary	----	EPP444/WT		pH units	5.76	----	----	----	----	----	----
pH, TCLP extraction fluid initial	----	EPP444/WT			2.88	----	----	----	----	----	----
pH, TCLP final	----	EPP444/WT		pH units	5.49	----	----	----	----	----	----
Antimony, TCLP	7440-36-0	E444/WT	A		<0.10	----	----	----	----	----	----
Arsenic, TCLP	7440-38-2	E444/WT	A	mg/L	<1.0	----	----	----	----	----	----
Barium, TCLP	7440-39-3	E444/WT	A		<2.5	----	----	----	----	----	----
Beryllium, TCLP	7440-41-7	E444/WT	A	mg/L	<0.025	----	----	----	----	----	----
Boron, TCLP	7440-42-8	E444/WT	A		<0.50	----	----	----	----	----	----
Cadmium, TCLP	7440-43-9	E444/WT	A	mg/L	<0.050	----	----	----	----	----	----
Calcium, TCLP	7440-70-2	E444/WT	A		1140	----	----	----	----	----	----
Chromium, TCLP	7440-47-3	E444/WT	A	mg/L	<0.25	----	----	----	----	----	----
Cobalt, TCLP	7440-48-4	E444/WT			<0.050	----	----	----	----	----	----
Copper, TCLP	7440-50-8	E444/WT		mg/L	<0.050	----	----	----	----	----	----
Iron, TCLP	7439-89-6	E444/WT	A		<5.0	----	----	----	----	----	----
Lead, TCLP	7439-92-1	E444/WT	A	mg/L	<0.25	----	----	----	----	----	----
Magnesium, TCLP	7439-95-4	E444/WT	A		105	----	----	----	----	----	----
Mercury, TCLP	7439-97-6	E512/WT	A	mg/L	<0.0010	----	----	----	----	----	----
Nickel, TCLP	7440-02-0	E444/WT			<0.25	----	----	----	----	----	----
Selenium, TCLP	7782-49-2	E444/WT	A	mg/L	<0.10	----	----	----	----	----	----
Silver, TCLP	7440-22-4	E444/WT	A		<0.050	----	----	----	----	----	----
Thallium, TCLP	7440-28-0	E444/WT	A	mg/L	<1.0	----	----	----	----	----	----
Uranium, TCLP	7440-61-1	E444/WT			<0.20	----	----	----	----	----	----
Vanadium, TCLP	7440-62-2	E444/WT		mg/L	<0.15	----	----	----	----	----	----
Zinc, TCLP	7440-66-6	E444/WT	A		<0.50	----	----	----	----	----	----
Zirconium, TCLP	7440-67-7	E444/WT	A	mg/L	<10	----	----	----	----	----	----
TCLP VOCs											
Benzene, TCLP	71-43-2	E615B/WT	A		<0.0050	----	----	----	----	----	----

Analytical Results Evaluation

Matrix: **Soil**

Analyte	CAS Number	Method/Lab		Unit	Client sample ID						
					BH 1 SAM 2	----	----	----	----	----	----
					Sampling date/time						
					24-Jul-2023 09:25	----	----	----	----	----	----
					Sub-Matrix						
					Soil	----	----	----	----	----	----
					WT2326299-001	--------	--------	--------	--------	--------	--------
TCLP VOCs											
Carbon tetrachloride, TCLP	56-23-5	E615B/WT	A	mg/L	<0.025	----	----	----	----	----	----
Chlorobenzene, TCLP	108-90-7	E615B/WT			<0.025	----	----	----	----	----	----
Chloroform, TCLP	67-66-3	E615B/WT	A	mg/L	<0.10	----	----	----	----	----	----
Dichlorobenzene, 1,2-, TCLP	95-50-1	E615B/WT	A		<0.025	----	----	----	----	----	----
Dichlorobenzene, 1,4-, TCLP	106-46-7	E615B/WT	A	mg/L	<0.025	----	----	----	----	----	----
Dichloroethane, 1,2-, TCLP	107-06-2	E615B/WT	A		<0.025	----	----	----	----	----	----
Dichloroethylene, 1,1-, TCLP	75-35-4	E615B/WT	A	mg/L	<0.025	----	----	----	----	----	----
Dichloromethane, TCLP	75-09-2	E615B/WT	A		<0.10	----	----	----	----	----	----
Methyl ethyl ketone [MEK], TCLP	78-93-3	E615B/WT	A	mg/L	<0.10	----	----	----	----	----	----
Tetrachloroethylene, TCLP	127-18-4	E615B/WT	A		<0.025	----	----	----	----	----	----
Trichloroethylene, TCLP	79-01-6	E615B/WT	A	mg/L	<0.025	----	----	----	----	----	----
Vinyl chloride, TCLP	75-01-4	E615B/WT			<0.050	----	----	----	----	----	----
TCLP VOCs Surrogates											
Bromofluorobenzene, 4-, TCLP	460-00-4	E615B/WT		%	98.2	----	----	----	----	----	----
Difluorobenzene, 1,4-, TCLP	540-36-3	E615B/WT			97.5	----	----	----	----	----	----

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

Summary of Guideline Limits

Analyte	CAS Number	Unit	ONWCR Sch. 4						
TCLP Metals									
Antimony, TCLP	7440-36-0	mg/L	--						
Arsenic, TCLP	7440-38-2	mg/L	**2.5 mg/L**						
Barium, TCLP	7440-39-3	mg/L	**100 mg/L**						
Beryllium, TCLP	7440-41-7	mg/L	--						
Boron, TCLP	7440-42-8	mg/L	**500 mg/L**						
Cadmium, TCLP	7440-43-9	mg/L	**0.5 mg/L**						
Calcium, TCLP	7440-70-2	mg/L	--						
Chromium, TCLP	7440-47-3	mg/L	**5 mg/L**						
Cobalt, TCLP	7440-48-4	mg/L	--						
Copper, TCLP	7440-50-8	mg/L	--						
Iron, TCLP	7439-89-6	mg/L	--						
Lead, TCLP	7439-92-1	mg/L	**5 mg/L**						
Magnesium, TCLP	7439-95-4	mg/L	--						
Mercury, TCLP	7439-97-6	mg/L	**0.1 mg/L**						
Nickel, TCLP	7440-02-0	mg/L	--						
pH, TCLP 1st preliminary	----	pH units	--						
pH, TCLP 2nd preliminary	----	pH units	--						
pH, TCLP extraction fluid initial	----	pH units	--						
pH, TCLP final	----	pH units	--						
Selenium, TCLP	7782-49-2	mg/L	**1 mg/L**						
Silver, TCLP	7440-22-4	mg/L	**5 mg/L**						
Thallium, TCLP	7440-28-0	mg/L	--						
Uranium, TCLP	7440-61-1	mg/L	**10 mg/L**						
Vanadium, TCLP	7440-62-2	mg/L	--						
Zinc, TCLP	7440-66-6	mg/L	--						
Zirconium, TCLP	7440-67-7	mg/L	--						
TCLP VOCs									
Benzene, TCLP	71-43-2	mg/L	**0.5 mg/L**						
Carbon tetrachloride, TCLP	56-23-5	mg/L	**0.5 mg/L**						
Chlorobenzene, TCLP	108-90-7	mg/L	**8 mg/L**						
Chloroform, TCLP	67-66-3	mg/L	**10 mg/L**						
Dichlorobenzene, 1,2-, TCLP	95-50-1	mg/L	**20 mg/L**						
Dichlorobenzene, 1,4-, TCLP	106-46-7	mg/L	**0.5 mg/L**						
Dichloroethane, 1,2-, TCLP	107-06-2	mg/L	**0.5 mg/L**						
Dichloroethylene, 1,1-, TCLP	75-35-4	mg/L	**1.4 mg/L**						
Dichloromethane, TCLP	75-09-2	mg/L	**5 mg/L**						
Methyl ethyl ketone [MEK], TCLP	78-93-3	mg/L	**200 mg/L**						

Analyte	*CAS Number*	*Unit*	**ONWCR Sch. 4**
TCLP VOCs - Continued			
Tetrachloroethylene, TCLP	127-18-4	mg/L	**3 mg/L**
Trichloroethylene, TCLP	79-01-6	mg/L	**5 mg/L**
Vinyl chloride, TCLP	75-01-4	mg/L	**0.2 mg/L**
Bromofluorobenzene, 4-, TCLP	460-00-4	%	
Difluorobenzene, 1,4-, TCLP	540-36-3	%	

Please refer to the General Comments section for an explanation of any qualifiers detected.

Key:

ONWCR — Ontario MECP, General Waste Control Regulation No. 347/90,558/00

Sch. 4 — Schedule 4 Leachate Quality Criteria

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2326299**	Page	: 1 of 5
Client	: **CMT Engineering Inc.**	Laboratory	: ALS Environmental - Waterloo
Contact	: Jake Feeney	Account Manager	: Mathy Mahadeva
Address	: 1011 Industrial Crescent Unit 1 St. Clements ON Canada N0B 2M0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 699 5775	Telephone	: +1 519 886 6910
Project	: 23-146 Emma St. S. Grand Valley	Date Samples Received	: 22-Aug-2023 15:44
PO	: ----	Issue Date	: 29-Aug-2023 04:25
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: Standing Offer 2023 Pricing		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
TCLP Metals : Mercury by CVAAS (TCLP)										
Glass vial total (hydrochloric acid)										
BH 1 SAM 2	E512	24-Aug-2023	25-Aug-2023	59 days	32 days	✓	25-Aug-2023	59 days	32 days	✓
TCLP Metals : Metals by CRC ICPMS (TCLP)										
HDPE total (nitric acid)										
BH 1 SAM 2	E444	24-Aug-2023	25-Aug-2023	211 days	32 days	✓	25-Aug-2023	211 days	32 days	✓
TCLP Metals : TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)										
Lab Split - Non-Volatile Leach: 28 day HT (e.g. Hg, CrVI, PFAS)										
BH 1 SAM 2	EPP444	22-Aug-2023	24-Aug-2023	----	----		----	28 days	31 days	✓
TCLP VOCs : VOCs by Headspace GC-MS (TCLP)										
Glass vial (sodium bisulfate)										
BH 1 SAM 2	E615B	25-Aug-2023	26-Aug-2023	46 days	33 days	✓	26-Aug-2023	46 days	33 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Mercury by CVAAS (TCLP)	E512	1103495	1	12	8.3	5.0	✓
Metals by CRC ICPMS (TCLP)	E444	1103454	1	13	7.6	5.0	✓
VOCs by Headspace GC-MS (TCLP)	E615B	1105607	1	4	25.0	5.0	✓
Laboratory Control Samples (LCS)							
Mercury by CVAAS (TCLP)	E512	1103495	1	12	8.3	5.0	✓
Metals by CRC ICPMS (TCLP)	E444	1103454	1	13	7.6	5.0	✓
VOCs by Headspace GC-MS (TCLP)	E615B	1105607	1	4	25.0	5.0	✓
Method Blanks (MB)							
Mercury by CVAAS (TCLP)	E512	1103495	1	12	8.3	5.0	✓
Metals by CRC ICPMS (TCLP)	E444	1103454	1	13	7.6	5.0	✓
VOCs by Headspace GC-MS (TCLP)	E615B	1105607	1	4	25.0	5.0	✓
Matrix Spikes (MS)							
Mercury by CVAAS (TCLP)	E512	1103495	1	12	8.3	5.0	✓
Metals by CRC ICPMS (TCLP)	E444	1103454	1	13	7.6	5.0	✓
VOCs by Headspace GC-MS (TCLP)	E615B	1105607	1	4	25.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Metals by CRC ICPMS (TCLP)	E444 ALS Environmental - Waterloo	Soil/Solid	EPA 1311/6020B (mod)	An extract produced by the Toxicity Characteristic Leachate Procedure (TCLP) as per EPA 1311 is analyzed by Collision/Reaction Cell ICPMS.
Mercury by CVAAS (TCLP)	E512 ALS Environmental - Waterloo	Soil/Solid	SW 846 -1311/245.1 CVAA ON TCLP LEACHATE	An extract produced by the Toxicity Characteristic Leachate Procedure (TCLP) as per EPA 1311 is analyzed by CVAAS.
VOCs by Headspace GC-MS (TCLP)	E615B ALS Environmental - Waterloo	Soil/Solid	EPA 8260D (mod)	Volatile Organic Compounds (VOCs) are analyzed by static headspace GC-MS. Samples are prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
VOCs Preparation for Headspace Analysis (TCLP)	EP582 ALS Environmental - Waterloo	Soil/Solid	EPA 5021A (mod)	Liquid obtained after the TCLP process is prepared in headspace vials and are heated and agitated on the headspace autosampler, causing VOCs to partition between the aqueous phase and the headspace in accordance with Henry's law.
TCLP Leachate Preparation (Metals, Inorganics, and SVOCs)	EPP444 ALS Environmental - Waterloo	Soil/Solid	EPA 1311	Preparation of a Toxicity Characteristic Leaching Procedure (TCLP) solid sample involves particle size reduction, homogenization, then determination of appropriate extraction fluid. A measured portion of fresh subsample is placed in an extraction bottle with the appropriate extraction fluid then tumbled in a rotary extractor for 18+/- 2 hours at 23 +/- 2 C. The liquid leachate is filtered to separate from solids then bottled and prepared for analytical tests.
TCLP Leachate Preparation (VOCs)	EPP582 ALS Environmental - Waterloo	Soil/Solid	EPA 1311	An extract produced by the Toxicity Characteristic Leaching Procedure (TCLP) as per EPA 1311.

QUALITY CONTROL REPORT

Work Order	: **WT2326299**	Page	: 1 of 10
Client	: CMT Engineering Inc.	Laboratory	: ALS Environmental - Waterloo
Contact	: Jake Feeney	Account Manager	: Mathy Mahadeva
Address	: 1011 Industrial Crescent Unit 1 St. Clements ON Canada N0B 2M0	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	:	Telephone	: +1 519 886 6910
Project	: 23-146 Emma St. S. Grand Valley	Date Samples Received	: 22-Aug-2023 15:44
PO	: ----	Date Analysis Commenced	: 24-Aug-2023
C-O-C number	: ----	Issue Date	: 28-Aug-2023 17:08
Sampler	: ---- 519 699 5775		
Site	: ----		
Quote number	: Standing Offer 2023 Pricing		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Andrea Armstrong	Department Manager - Air Quality and Volatiles	Waterloo VOC, Waterloo, Ontario
Nik Perkio	Inorganics Analyst	Waterloo Metals, Waterloo, Ontario
Robert Braun	Soils Team Supervisor	Waterloo Inorganics, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
TCLP Metals (QC Lot: 1103454)											
WT2326299-001	BH 1 SAM 2	Antimony, TCLP	7440-36-0	E444	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
		Arsenic, TCLP	7440-38-2	E444	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		Barium, TCLP	7440-39-3	E444	2.5	mg/L	<2.5	<2.5	0	Diff <2x LOR	----
		Beryllium, TCLP	7440-41-7	E444	0.025	mg/L	<0.025	<0.025	0	Diff <2x LOR	----
		Boron, TCLP	7440-42-8	E444	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Cadmium, TCLP	7440-43-9	E444	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		Calcium, TCLP	7440-70-2	E444	10	mg/L	1140	1370	17.9%	50%	----
		Chromium, TCLP	7440-47-3	E444	0.25	mg/L	<0.25	<0.25	0	Diff <2x LOR	----
		Cobalt, TCLP	7440-48-4	E444	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		Copper, TCLP	7440-50-8	E444	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		Iron, TCLP	7439-89-6	E444	5.0	mg/L	<5.0	<5.0	0	Diff <2x LOR	----
		Lead, TCLP	7439-92-1	E444	0.25	mg/L	<0.25	<0.25	0	Diff <2x LOR	----
		Magnesium, TCLP	7439-95-4	E444	2.5	mg/L	105	106	0.208%	50%	----
		Nickel, TCLP	7440-02-0	E444	0.25	mg/L	<0.25	<0.25	0	Diff <2x LOR	----
		Selenium, TCLP	7782-49-2	E444	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
		Silver, TCLP	7440-22-4	E444	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		Thallium, TCLP	7440-28-0	E444	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		Uranium, TCLP	7440-61-1	E444	0.20	mg/L	<0.20	<0.20	0	Diff <2x LOR	----
		Vanadium, TCLP	7440-62-2	E444	0.15	mg/L	<0.15	<0.15	0	Diff <2x LOR	----
		Zinc, TCLP	7440-66-6	E444	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		Zirconium, TCLP	7440-67-7	E444	10	mg/L	<10	<10	0	Diff <2x LOR	----
TCLP Metals (QC Lot: 1103495)											
WT2326299-001	BH 1 SAM 2	Mercury, TCLP	7439-97-6	E512	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
TCLP VOCs (QC Lot: 1105607)											
WT2326711-007	Anonymous	Benzene, TCLP	71-43-2	E615B	5.0	µg/L	<0.0050 mg/L	<5.0	0	Diff <2x LOR	----
		Carbon tetrachloride, TCLP	56-23-5	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Chlorobenzene, TCLP	108-90-7	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Chloroform, TCLP	67-66-3	E615B	100	µg/L	<0.10 mg/L	<100	0	Diff <2x LOR	----
		Dichlorobenzene, 1,2-, TCLP	95-50-1	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Dichlorobenzene, 1,4-, TCLP	106-46-7	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
TCLP VOCs (QC Lot: 1105607) - continued											
WT2326711-007	Anonymous	Dichloroethane, 1,2-, TCLP	107-06-2	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Dichloroethylene, 1,1-, TCLP	75-35-4	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Dichloromethane, TCLP	75-09-2	E615B	100	µg/L	<0.10 mg/L	<100	0	Diff <2x LOR	----
		Methyl ethyl ketone [MEK], TCLP	78-93-3	E615B	100	µg/L	<0.10 mg/L	<100	0	Diff <2x LOR	----
		Tetrachloroethylene, TCLP	127-18-4	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Trichloroethylene, TCLP	79-01-6	E615B	25	µg/L	<0.025 mg/L	<25	0	Diff <2x LOR	----
		Vinyl chloride, TCLP	75-01-4	E615B	50	µg/L	<0.050 mg/L	<50	0	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
TCLP Metals (QCLot: 1103454)						
Antimony, TCLP	7440-36-0	E444	0.1	mg/L	<0.10	----
Arsenic, TCLP	7440-38-2	E444	1	mg/L	<1.0	----
Barium, TCLP	7440-39-3	E444	2.5	mg/L	<2.5	----
Beryllium, TCLP	7440-41-7	E444	0.025	mg/L	<0.025	----
Boron, TCLP	7440-42-8	E444	0.5	mg/L	<0.50	----
Cadmium, TCLP	7440-43-9	E444	0.05	mg/L	<0.050	----
Calcium, TCLP	7440-70-2	E444	10	mg/L	<10	----
Chromium, TCLP	7440-47-3	E444	0.25	mg/L	<0.25	----
Cobalt, TCLP	7440-48-4	E444	0.05	mg/L	<0.050	----
Copper, TCLP	7440-50-8	E444	0.05	mg/L	<0.050	----
Iron, TCLP	7439-89-6	E444	5	mg/L	<5.0	----
Lead, TCLP	7439-92-1	E444	0.25	mg/L	<0.25	----
Magnesium, TCLP	7439-95-4	E444	2.5	mg/L	<2.5	----
Nickel, TCLP	7440-02-0	E444	0.25	mg/L	<0.25	----
Selenium, TCLP	7782-49-2	E444	0.1	mg/L	<0.10	----
Silver, TCLP	7440-22-4	E444	0.05	mg/L	<0.050	----
Thallium, TCLP	7440-28-0	E444	1	mg/L	<1.0	----
Uranium, TCLP	7440-61-1	E444	0.2	mg/L	<0.20	----
Vanadium, TCLP	7440-62-2	E444	0.15	mg/L	<0.15	----
Zinc, TCLP	7440-66-6	E444	0.5	mg/L	<0.50	----
Zirconium, TCLP	7440-67-7	E444	10	mg/L	<10	----
TCLP Metals (QCLot: 1103495)						
Mercury, TCLP	7439-97-6	E512	0.001	mg/L	<0.0010	----
TCLP VOCs (QCLot: 1105607)						
Benzene, TCLP	71-43-2	E615B	5	µg/L	<5.0	----
Carbon tetrachloride, TCLP	56-23-5	E615B	25	µg/L	<25	----
Chlorobenzene, TCLP	108-90-7	E615B	25	µg/L	<25	----
Chloroform, TCLP	67-66-3	E615B	100	µg/L	<100	----
Dichlorobenzene, 1,2-, TCLP	95-50-1	E615B	25	µg/L	<25	----
Dichlorobenzene, 1,4-, TCLP	106-46-7	E615B	25	µg/L	<25	----
Dichloroethane, 1,2-, TCLP	107-06-2	E615B	25	µg/L	<25	----
Dichloroethylene, 1,1-, TCLP	75-35-4	E615B	25	µg/L	<25	----

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
TCLP VOCs (QCLot: 1105607) - continued						
Dichloromethane, TCLP	75-09-2	E615B	100	µg/L	<100	----
Methyl ethyl ketone [MEK], TCLP	78-93-3	E615B	100	µg/L	<100	----
Tetrachloroethylene, TCLP	127-18-4	E615B	25	µg/L	<25	----
Trichloroethylene, TCLP	79-01-6	E615B	25	µg/L	<25	----
Vinyl chloride, TCLP	75-01-4	E615B	50	µg/L	<50	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
TCLP Metals (QCLot: 1103454)									
Antimony, TCLP	7440-36-0	E444	0.1	mg/L	0.05 mg/L	108	70.0	130	----
Arsenic, TCLP	7440-38-2	E444	1	mg/L	0.05 mg/L	96.1	70.0	130	----
Barium, TCLP	7440-39-3	E444	2.5	mg/L	0.0125 mg/L	93.0	70.0	130	----
Beryllium, TCLP	7440-41-7	E444	0.025	mg/L	0.005 mg/L	93.6	70.0	130	----
Boron, TCLP	7440-42-8	E444	0.5	mg/L	0.05 mg/L	96.5	70.0	130	----
Cadmium, TCLP	7440-43-9	E444	0.05	mg/L	0.005 mg/L	91.2	70.0	130	----
Calcium, TCLP	7440-70-2	E444	10	mg/L	2.5 mg/L	101	70.0	130	----
Chromium, TCLP	7440-47-3	E444	0.25	mg/L	0.0125 mg/L	92.4	70.0	130	----
Cobalt, TCLP	7440-48-4	E444	0.05	mg/L	0.0125 mg/L	90.6	70.0	130	----
Copper, TCLP	7440-50-8	E444	0.05	mg/L	0.0125 mg/L	90.2	70.0	130	----
Iron, TCLP	7439-89-6	E444	5	mg/L	0.05 mg/L	105	70.0	130	----
Lead, TCLP	7439-92-1	E444	0.25	mg/L	0.025 mg/L	105	70.0	130	----
Magnesium, TCLP	7439-95-4	E444	2.5	mg/L	2.5 mg/L	90.8	70.0	130	----
Nickel, TCLP	7440-02-0	E444	0.25	mg/L	0.025 mg/L	91.1	70.0	130	----
Selenium, TCLP	7782-49-2	E444	0.1	mg/L	0.05 mg/L	92.0	70.0	130	----
Silver, TCLP	7440-22-4	E444	0.05	mg/L	0.005 mg/L	97.4	70.0	130	----
Thallium, TCLP	7440-28-0	E444	1	mg/L	0.05 mg/L	105	70.0	130	----
Uranium, TCLP	7440-61-1	E444	0.2	mg/L	0.00025 mg/L	101	70.0	130	----
Vanadium, TCLP	7440-62-2	E444	0.15	mg/L	0.025 mg/L	92.2	70.0	130	----
Zinc, TCLP	7440-66-6	E444	0.5	mg/L	0.025 mg/L	91.3	70.0	130	----
Zirconium, TCLP	7440-67-7	E444	10	mg/L	0.005 mg/L	101	70.0	130	----
TCLP Metals (QCLot: 1103495)									
Mercury, TCLP	7439-97-6	E512	0.001	mg/L	0.0001 mg/L	106	70.0	130	----
TCLP VOCs (QCLot: 1105607)									
Benzene, TCLP	71-43-2	E615B	5	µg/L	250 µg/L	97.1	70.0	130	----
Carbon tetrachloride, TCLP	56-23-5	E615B	25	µg/L	250 µg/L	100	60.0	140	----
Chlorobenzene, TCLP	108-90-7	E615B	25	µg/L	250 µg/L	96.5	70.0	130	----
Chloroform, TCLP	67-66-3	E615B	100	µg/L	250 µg/L	103	70.0	130	----
Dichlorobenzene, 1,2-, TCLP	95-50-1	E615B	25	µg/L	250 µg/L	96.4	70.0	130	----
Dichlorobenzene, 1,4-, TCLP	106-46-7	E615B	25	µg/L	250 µg/L	95.1	70.0	130	----
Dichloroethane, 1,2-, TCLP	107-06-2	E615B	25	µg/L	250 µg/L	97.1	70.0	130	----
Dichloroethylene, 1,1-, TCLP	75-35-4	E615B	25	µg/L	250 µg/L	104	70.0	130	----

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
TCLP VOCs (QCLot: 1105607) - continued									
Dichloromethane, TCLP	75-09-2	E615B	100	µg/L	250 µg/L	104	70.0	130	----
Methyl ethyl ketone [MEK], TCLP	78-93-3	E615B	100	µg/L	250 µg/L	96.0	50.0	150	----
Tetrachloroethylene, TCLP	127-18-4	E615B	25	µg/L	250 µg/L	92.3	70.0	130	----
Trichloroethylene, TCLP	79-01-6	E615B	25	µg/L	250 µg/L	101	70.0	130	----
Vinyl chloride, TCLP	75-01-4	E615B	50	µg/L	250 µg/L	102	60.0	130	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
TCLP Metals (QCLot: 1103454)										
WT2326299-001	BH 1 SAM 2	Antimony, TCLP	7440-36-0	E444	4.47 mg/L	5 mg/L	89.5	50.0	140	----
		Arsenic, TCLP	7440-38-2	E444	5.7 mg/L	5 mg/L	114	50.0	140	----
		Barium, TCLP	7440-39-3	E444	13.9 mg/L	12.5 mg/L	111	50.0	140	----
		Beryllium, TCLP	7440-41-7	E444	0.208 mg/L	0.25 mg/L	83.1	50.0	140	----
		Boron, TCLP	7440-42-8	E444	8.37 mg/L	10 mg/L	83.7	50.0	140	----
		Cadmium, TCLP	7440-43-9	E444	0.268 mg/L	0.25 mg/L	107	50.0	140	----
		Calcium, TCLP	7440-70-2	E444	ND mg/L	250 mg/L	ND	50.0	140	----
		Chromium, TCLP	7440-47-3	E444	1.37 mg/L	1.25 mg/L	110	50.0	140	----
		Cobalt, TCLP	7440-48-4	E444	0.266 mg/L	0.25 mg/L	106	50.0	140	----
		Copper, TCLP	7440-50-8	E444	2.62 mg/L	2.5 mg/L	105	50.0	140	----
		Iron, TCLP	7439-89-6	E444	265 mg/L	250 mg/L	106	50.0	140	----
		Lead, TCLP	7439-92-1	E444	8.84 mg/L	10 mg/L	88.4	50.0	140	----
		Magnesium, TCLP	7439-95-4	E444	289 mg/L	250 mg/L	116	50.0	140	----
		Nickel, TCLP	7440-02-0	E444	2.66 mg/L	2.5 mg/L	106	50.0	140	----
		Selenium, TCLP	7782-49-2	E444	5.50 mg/L	5 mg/L	110	50.0	140	----
		Silver, TCLP	7440-22-4	E444	0.075 mg/L	0.1 mg/L	75.1	50.0	140	----
		Thallium, TCLP	7440-28-0	E444	4.4 mg/L	5 mg/L	88.7	50.0	140	----
		Uranium, TCLP	7440-61-1	E444	4.44 mg/L	5 mg/L	88.9	50.0	140	----
		Vanadium, TCLP	7440-62-2	E444	0.82 mg/L	0.75 mg/L	110	50.0	140	----
		Zinc, TCLP	7440-66-6	E444	10.5 mg/L	10 mg/L	105	50.0	140	----
		Zirconium, TCLP	7440-67-7	E444	0.8 mg/L	1 mg/L	85.9	50.0	140	----
TCLP Metals (QCLot: 1103495)										
WT2326299-001	BH 1 SAM 2	Mercury, TCLP	7439-97-6	E512	0.0031 mg/L	0.003 mg/L	103	50.0	140	----
TCLP VOCs (QCLot: 1105607)										
WT2326711-007	Anonymous	Benzene, TCLP	71-43-2	E615B	254 µg/L	250 µg/L	102	50.0	140	----
		Carbon tetrachloride, TCLP	56-23-5	E615B	255 µg/L	250 µg/L	102	50.0	140	----
		Chlorobenzene, TCLP	108-90-7	E615B	248 µg/L	250 µg/L	99.4	50.0	140	----
		Chloroform, TCLP	67-66-3	E615B	270 µg/L	250 µg/L	108	50.0	140	----
		Dichlorobenzene, 1,2-, TCLP	95-50-1	E615B	245 µg/L	250 µg/L	97.9	50.0	140	----
		Dichlorobenzene, 1,4-, TCLP	106-46-7	E615B	239 µg/L	250 µg/L	95.5	50.0	140	----
		Dichloroethane, 1,2-, TCLP	107-06-2	E615B	270 µg/L	250 µg/L	108	50.0	140	----

Sub-Matrix: **Soil/Solid**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
TCLP VOCs (QCLot: 1105607) - continued										
WT2326711-007	Anonymous	Dichloroethylene, 1,1-, TCLP	75-35-4	E615B	264 µg/L	250 µg/L	105	50.0	140	----
		Dichloromethane, TCLP	75-09-2	E615B	280 µg/L	250 µg/L	112	50.0	140	----
		Methyl ethyl ketone [MEK], TCLP	78-93-3	E615B	270 µg/L	250 µg/L	108	50.0	140	----
		Tetrachloroethylene, TCLP	127-18-4	E615B	228 µg/L	250 µg/L	91.4	50.0	140	----
		Trichloroethylene, TCLP	79-01-6	E615B	258 µg/L	250 µg/L	103	50.0	140	----
		Vinyl chloride, TCLP	75-01-4	E615B	258 µg/L	250 µg/L	103	50.0	140	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 20

Environmental Division Waterloo

Work Order Reference WT2322748

Canada Toll Free: 1 800 668 9878

Page

www.alsglobal.com

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	CMT ENG. INC.
Contact:	BRANDON R FILL / JAKE FEENEY
Phone:	519-699-5775
	Company address below will appear on the final report
Street:	1011 INDUSTRIAL CRES UNIT 1
City/Province:	ST. CLEMENTS, ON
Postal Code:	N0B 2M0
Invoice To	Same as Report To ☐ YES ☒ NO
	Copy of Invoice with Report ☐ YES ☒ NO
Company:	CMT ENG. INC.
Contact:	JAKE FEENEY

Reports / Recipients

Select Report Format: ☒ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☒ YES ☐ NO ☐ N/A

☒ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax bfigg@cmtinc.net

Email 2 jfeeney@cmtinc.net

Email 3 rchantler@cmtinc.net

Invoice Recipients

Select Invoice Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax eqibbs@cmtinc.net

Email 2 jfeeney@cmtinc.net

Turnaround Time (TAT) Requested

☒ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additior may apply to rush requests on weekends, statutory holidays and non-routi

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please contact your AM to confirm availability.

Project Information

ALS Account # / Quote #:

Job #: 23-146 EMMA ST S. GRANDVALLEY

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (ALS use only): WT2322748 CM

ALS Contact: Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	METALS W/O Hg (F/P)	SAR	EC	PH	BTEX	F1-F4	VOC	PAH	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH 1 SAM 2	24-July-23	9:25		6	X	X	X	X	X	X	X	X			
	BH 1 SAM 6	24-July-23	10:05		6	X	X	X	X	X	X	X	X			
	BH 2 SAM 3	24-July-23	10:55		6	X	X	X	X	X	X	X	X			
	DUPLICATE 1	24-July-23	-		5	X	X	X	X	X	X	X	X			

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

O. REG 406/19

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☒ NONE ☐ ICE ☒ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	12.7

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by: Cm	Date: July 25/23	Time: 16:50

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

VS-248 EC

SOL-632 SOL-634

APPENDIX D

SLOPE STABILITY RATING CHART

TABLE 4.2 - SLOPE STABILITY RATING CHART

Site Location 40-60 Emma Street South, Grand Valley, ON Project No. 23-146

Property Owner Sheldon Creek Developments Inspection Date July 24, 2023

Inspected By MF Weather Sunny 20 C

1. SLOPE INCLINATION		
degrees	**horiz:vert**	
a) 18 or less	3:1 or flatter	**0**
b) 18 - 26	2:1 to more than 3:1	6
c) more than 26	steeper than 2:1	16
2. SOIL STRATIGRAPHY		
a) shale, limestone, granite (bedrock)		0
b) sand, gravel		6
c) glacial till		**9**
d) clay, silt		12
e) fill		16
f) leda clay		24
3. SEEPAGE FROM SLOPE FACE		
a) none or near bottom only		0
b) near mid-slope only		**6**
c) near crest only or from several levels		12
4. SLOPE HEIGHT		
a) 2.0 m or less		0
b) 2.1 m to 5.0 m		2
c) 5.1 m to 10.0 m		**4**
d) more than 10.0 m		8
5. VEGETATION COVER ON SLOPE FACE		
a) well-vegetated, heavy shrubs or forested with mature trees		**0**
b) light vegetation; mostly grass, weeds, occasional trees, shrubs		4
c) no vegetation, bare		8
6. TABLE LAND DRAINAGE		
a) table land flat, no apparent drainage over slope		0
b) minor drainage over slope, no active erosion		2
c) drainage over slope, active erosion, gullies		**4**
7. PROXIMITY OF WATERCOURSE TO SLOPE TOE		
a) 15 metres or more from slope toe		**0**
b) less than 15 metres from slope toe		6
8. PREVIOUS LANDSLIDE ACTIVITY		
a) no		**0**
b) yes		6
SLOPE STABILITY RATING VALUES INVESTIGATION RATING SUMMARY	**TOTAL**	**23**

SUMMARY OF RATING VALUES AND RESULTING INVESTIGATION REQUIREMENTS

1. **Low potential**	**< 24**	- site inspection only, confirmation report letter
2. Slight potential	25-35	- site inspection and surveying, preliminary study, detailed report
3. Moderate potential	>35	- boreholes, piezometers, lab tests, surveying, detailed report

NOTES:
a) Choose only one from each category; compare total rating value with above requirements.
b) If there is a water body (stream, creek, river, pond, bay, lake) at the slope toe, the potential for toe erosion and undercutting should be evaluated in detail and protection provided if required.

Reference: Technical Guide - River and Stream Systems: Erosion Hazard Limit, Ontario Ministry of Natural Resources, 2002.

APPENDIX E

MECP WELL RECORDS