APPENDIX A – GEOTECHNICAL REPORT



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Brady Road Leaf and Yard Waste and Pilot Biosolids Composting

Final Report September 19, 2012

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I.0 Introduction

This report summarizes the results of the geotechnical investigation completed by TREK Geotechnical Inc. (TREK) for the Leaf and Yard Waste Composting Facility and Pilot Biosolids Composting Facility at the Brady Road Resource Management Facility in Winnipeg, Manitoba. The terms of reference for the investigation are included in our subconsultant agreement with CH2MHILL that was effective June 15, 2012. The scope of work includes a sub-surface investigation, laboratory testing, and the provision of recommendations for the design and construction of foundations, liners and pavements.

2.0 Background and Existing Information

The proposed facility will consist of the following components:

Leaf and Yard Waste Pad: This will be a clay lined pad for storage and windrowing of leaf and yard waste. The pad is required to support daily truck traffic and loaders for moving materials on-site. A 0.5 m thick compacted clay liner is proposed below the traffic pad. Various surface treatments options for the top of the pad are under consideration including: wood chips only, lean mix concrete, or a cement stabilized pad.

Pond in Wetlands Area: A relatively shallow pond (about 4 m deep) will be developed in the proposed wetlands area located immediately south east of the site. This area will also be used as a borrow source for imported clay fill for the project.

Aerated Static Pile Bunkers: This area will consist of a concrete slab on-grade. Dry stack retaining walls e.g. Lock-Block[®] will be placed at several locations along the slab. At these locations the slab will be thickened to support the additional static load from the wall load. The slab will be subjected to loading by construction equipment such as loaders.

Biofilter: The biofilter will be a large concrete slab with aeration pipes running through it at regularly spaced intervals. The pad will be subject to heavy equipment loading on an annual basis e.g. loader.

Mixing and Receiving Building: This building will consist of a steel truss frame with a canvas cover. There will be a grade supported concrete floor slab throughout.

Leachate Tank: A 2.4 m diameter by 7.5 m long tank will be installed at about 3 m below grade.

All of the above components will be unheated.

3.0 Field Program

3.1 Subsurface Investigation

A subsurface investigation was undertaken on June 27 to July 5, 2012 under the supervision of TREK personnel to determine the soil stratigraphy and groundwater conditions across the site. Test holes were drilled using a CME-850 track mounted drill rig equipped with 125 mm solid stem augers. Subsurface soils observed during the drilling were visually classified using the Unified Soil Classification System (USCS). Other pertinent information such as drilling, groundwater and backfill conditions were also recorded. Samples retrieved during drilling included disturbed grab samples, relatively undisturbed Shelby tubes, and disturbed split spoon samples; all samples were transported to TREK's testing laboratory in Winnipeg, Manitoba. Laboratory testing consisted



of moisture content determination on all samples. Atterberg limit, grain size analysis (hydrometer and mechanical), and undrained shear strength testing (pocket penetrometer, torvane and unconfined compression) testing was performed on select samples. A summary of the soil units encountered including laboratory testing results are included on the test hole logs in Appendix A.

Thirty-four test holes (TH12-01 to TH12-34) were drilled at the locations shown on Figure 01. Thirty test holes were drilled to relatively shallow depth (between 3 and 5 m) to assess near surface conditions. Two test holes were drilled to 6 to 7 m depth (TH12-31 and TH12-32) to assess conditions below the future pond, and two test holes (TH12-29 and TH12-30) were advanced to power auger refusal to evaluate foundation conditions for the mixing and receiving building.

Test hole logs are attached in Appendix A and include a description, the elevation of soil units encountered and other pertinent information such as groundwater levels and sloughing conditions. Test hole locations and elevations were surveyed by TREK personnel on July 5, 2012. The locations for test holes 12-11 and 12-16 could not be surveyed as the stakes used to identify the test hole locations had been removed by others. The approximate locations of these two test holes are shown on Figure 01.

3.2 Soil Stratigraphy

The sub-surface stratigraphy in descending order from ground surface consists of:

- Fill/Organic Clay (Topsoil)
- Silt
- Clay
- Silt (Till)

A brief description of the soil units are provided as follows:

Fill / Organic Clay (Topsoil)

Either fill or organic clay was encountered in all test hole locations. The fill was encountered in TH12-14, TH12-15, TH12-16, TH12-20, TH12-21, TH12-22, TH12-23, and TH12-24. The fill extended from surface to a maximum depth of 1.8 m. The fill was generally variable and contained trace to some waste materials including refuse, wood, and compost. In some instances the fill was underlain by organic clay (topsoil).

Organic clay (topsoil) was encountered at surface in all remaining test holes and extended to a maximum depth of 0.8 m. The organic clay is silty, contains some rootlets (<5 mm diam.), trace oxidation, trace silt inclusions (<2 mm diam.), is black to brown, dry to moist, stiff, with low to high plasticity.

Silt

A silt layer ranging in thickness from 0.2 to 1.8 m was encountered in most test holes at depths ranging from 0.4 to 2.4 m from ground surface. A comparison of test hole logs indicates the silt layer across the site is highly variable in elevation, thickness and aerial extent. The silt generally contains some clay to clayey, trace sand, trace organics (rootlets < 1 mm diam.), trace oxidation, is medium brown, moist to wet, soft, and of low plasticity. Moisture contents range from 21% to 32%.



Clay

A clay layer underlies the fill and topsoil units to a maximum observed depth of 12.0 m in TH12-29. Near surface the clay is silty and contains trace organics, trace silt inclusions and is brown to grey, stiff, moist, and of high plasticity. With depth the clay transitioned to a grey colour and a soft to firm consistency. Moisture contents tended to increase with depth ranging from 26% to 64%. Bulk unit weights range from 16.2 to 17.4 kN/m^3 .

Silt (Till)

A silt till layer was encountered below the clay at a depths of 11.8 m and 12.0 m in TH12-29 and TH12-30 respectively. The silt till is sandy, contains trace to some gravel, trace clay, and is light grey. The upper 2.6 to 3.1 m of the till, referred to locally as putty till, is compact with moisture contents ranging from 9 % to 25 %, with an average of 13 %. The putty till is underlain by dense to very dense glacial silt till with moisture contents ranging from 6% to 8%. Power auger refusal in the dense till was reached at depths of 15.6 m and 15.7 m. Standard Penetration Tests (SPT) conducted in the dense silt till had blow counts of 60 (over 150 mm) and 100 (over 300 mm) at depths of 15.6 m and 15.7 m depth, respectively.

3.2.1 Groundwater Conditions

Seepage, sloughing, and groundwater conditions observed during drilling are shown on the test hole logs. Seepage was observed on occasion from within near surface fill and silt layers and no seepage was encountered from the silt till unit. Standpipe piezometers were installed within the till layer in THs 12-29 and 12-30 to measure short term groundwater levels. Groundwater levels ranging from El. 227.5 m and 227.8 were measured on July 25 and August 1, 2012. These observations are short term and should not be considered reflective of stabilized (static) groundwater levels. It is also important to note that groundwater conditions may change seasonally, annually, or as a result of construction activities.

4.0 Geotechnical Recommendations

4.1 Clay Liners

Clay liners are planned below all areas of the proposed facility. The clay liners will be constructed using imported clay fill from the proposed wetlands area being constructed immediately south east of the site. To assess the suitability of the imported clay for liner construction two test holes were drilled within the borrow area (TH12-33 and TH12-34). Atterberg limits and hydrometer grain size analyses were performed on two samples of the clay and pertinent results are summarized in Table 1 below.

Sample Depth	Moisture Content	Liquid Limit	Plastic Limit	Clay Content
0.8 – 0.9 m	30%	58%	16%	54%
2.4 – 2.6 m	49%	86%	24%	73%

Table 1 - Summary of Atterberg Limits/	Grain Size Analysis in TH12-34
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Based on the engineering properties shown in Table 1, both samples are considered suitable for use in constructing a clay liner. Although not measured, it is anticipated that hydraulic conductivities of the compacted clay will be well below 1×10^{-7} cm/sec. Clay fill will need to be chosen selectively to avoid surficial organic soils and the silt layer that was observed in both test holes.

The following procedures should be followed for construction of the clay liner:

1. Organic and fill soils should be stripped prior to construction of the clay liner. Excavation should proceed in a way that limits disturbance to the subgrade soils, the subgrade should be protected from inundation, drying, and freezing conditions.

The need to excavate the silt will depend on the elevation of the surface of the silt layer across the site relative to the design subgrade elevation and the final design grades. Silt encountered within 1.5 m of final grade should be excavated and replaced with compacted clay fill. A non-woven geotextile (Geotex 801 or equivalent) should be placed on top of any remaining silt prior to bridging with a layer of compacted clay fill. Depending on the consistency of the silt layer, it may be necessary to use light weight equipment for placing and compacting the initial bridging layer.

Clay subgrade that will be incorporated into the liner should be scarified to a depth of 0.3 m and recompacted to 95% of Standard Proctor Maximum Dry Density (SPMDD). If the liner will be supporting settlement sensitive structures the compaction requirement should be increased to 98% SPMDD. If the subgrade will not be incorporated into the clay liner scarification and compaction will not be required, in this case the subgrade should be protected from disturbance, inundation, drying and freezing. The subgrade should be proof-rolled with a fully loaded tandem truck or other equipment of similar weight to determine the location of any localized soft areas. Soft areas should be repaired and treated as per direction by a geotechnical engineer.

- 2. Clay should be placed in loose lift thicknesses that do not exceed 200 mm and compacted to 95% of SPMDD at a moisture content within 2 % of optimum. If the liner will be supporting settlement sensitive structures the compaction requirement should be increased to 98% SPMDD. Based on the in-situ moisture contents of the clay soil which are expected to be well above optimum for compaction, drying will likely be required. Frozen clay or other deleterious material such as organics, silt, or refuse should not be used as fill.
- 3. Prior to placement of an additional clay lift, the upper 50 mm of the existing surface should be scarified to promote bonding between the clay fill layers.

4.2 Leaf and Yard Waste Pad

The leaf and yard waste pad is to be constructed above a 0.5 m thick compacted clay liner and will be subject to daily truck and construction equipment loading. The pad will be gravel surfaced although there has been some consideration of surface treatment to prevent migration of gravel into the compost material. In considering the above requirements TREK recommends that crushed limestone be used at the site. The recommended minimum cross section present in descending order from the final surface is provided in Table 2.



Material Gradation	Proposed Depth
20 mm down	0-100 mm
50 mm down	100 - 250 mm
100 mm down	250 - 450 mm

* Crushed rock should meet specifications identified in CW3110

Table 2 – Proposed Granular Section in Leaf and Yard Waste Pad

The following recommendations are provided for construction of the granular pad:

- 1. A non-woven geotextile (Geotex 801 or equivalent) should be placed on top of the clay fill subgrade prior to granular fill placement. To provide additional reinforcement to the granular section, a woven geotextile such as a Geotex 315ST (or equivalent) could be used in place of the non-woven geotextile. The geotextile should be placed according to manufacturer specifications.
- 2. All granular fill should be placed in 150 mm (compacted thickness) lifts. The granular fill should be compacted to 98% SPMDD. Fill should be placed in an unfrozen condition.
- 3. If a rougher travelling surface is acceptable for end-use, the 20 mm down may be replaced with 50 mm down crushed limestone.

Surface treatments for the granular pad that have been discussed include lean mix concrete and cement stabilization. If a cement stabilized pad is selected, the layer of 20 mm down crushed limestone should be increased to 150 mm and mixed with a minimum 5% by weight of Normal Portland cement (type GU). The cement should be mixed uniformly with the crushed limestone prior to compaction to 98% SPMDD. The cement content may be reduced through the use of additives such as fly-ash however the exact mix would need to be optimized through a laboratory testing program to confirm that performance is not compromised.

4.3 Foundations

Foundations are required to support the Mixing and Receiving building. It is our understanding that the proposed building is a steel framed structure with canvas walls. The building will be unheated. Provided the building can tolerate some seasonal movement, shallow footings or a thickened edge slab are considered suitable at this site. If seasonal movements are not tolerable, TREK can provide recommendations on either end bearing or friction piles.

4.3.1 Shallow Footings

Shallow footings founded below 2.5 m depth on undisturbed *in situ* clay can be designed using an allowable bearing capacity of 80 kPa. The maximum settlement form this loading is expected to be 25 mm although shallow foundations may also be subject to additional vertical movement associated with seasonal shrinkage and swelling of the clay subgrade.

Additional considerations for the design and construction of shallow footings are provided below:

- 1. Footings should have a minimum based width of 0.6 m.
- 2. Excavate to the design subgrade elevation while further ensuring that all fill soils and otherwise unsuitable material is removed. Excavation should be completed with a backhoe equipped with a smooth bladed



bucket operating from the edge of the excavation. Care should be taken not to over-excavate and to minimize the subgrade disturbance at all times.

- 3. After excavation, the subgrade should be reviewed by qualified geotechnical personnel. The exposed subgrade surface should be protected from freezing, inundation and disturbance. As such, it may be necessary for the contractor to sequence construction so that only a small portion of the subgrade remains open at a given time and that excavations are backfilled as soon as possible.
- 4. Where soft or weak areas are identified by the geotechnical personnel, these areas should be repaired as directed by the geotechnical engineer. If silt is encountered at the foundation elevation the geotechnical engineer should be notified immediately so that a remediation design can be provided.
- 5. Fill required to raise grades or for levelling should consist of 20 mm down crushed limestone placed in maximum 150 mm thick lifts and compacted to 98% SPMDD.
- 6. Grade supported structures such as floor slabs should be isolated from the footings to limit differential stresses.

4.3.2 Thickened Edge Slab

A thickened edge slab could also be considered appropriate to support the Mixing and Receiving building. An allowable bearing capacity of 80 kPa should be used for design. In addition to the movements described in Section 4.3.1 the thickened edge slab would also be subject to movements associated with freeze/thaw (frost heave) and settlement of any fill soils, such as the compacted clay liner, placed below the thickened edge. To minimize the effects of frost heave, near surface silts should be excavated from below the base of the thickened edge, frost heave can be further minimized by insulating the footings. TREK can provide design recommendations for insulation on request. For clay and crushed limestone compacted to 98% SPMDD settlements of up to 2% and 0.5% respectively of the layer thickness can be anticipated.

Additional considerations for the design and construction of the thickened edge are provided below. Specific recommendations for design and construction of grade supported floor slabs can be found in Section 4.4.

- 1. Thickened edges should have a minimum based width of 0.6 m.
- 2. Excavate to the design subgrade elevation while further ensuring that all organics, silts, and un-compacted fill soils and otherwise unsuitable material is removed. Excavation should be completed with a backhoe equipped with a smooth bladed bucket operating from the edge of the excavation. Care should be taken not to over-excavate and to minimize the subgrade disturbance at all times. It is anticipated that the subgrade below the thickened edge will consist of either the compacted clay liner or compacted crushed rock.
- 3. After excavation, the subgrade should be reviewed by qualified geotechnical personnel. The exposed subgrade surface should be protected from freezing, inundation and disturbance. As such, it may be necessary for the contractor to sequence construction so that only a small portion of the subgrade remains open at a given time and that excavations are backfilled as soon as possible.
- 4. Where soft or weak areas are identified by the geotechnical personnel, these areas should be repaired as directed by the geotechnical engineer.
- 5. Fill required to raise grades or for levelling should consist of 20 mm down crushed limestone placed in maximum 150 mm thick lifts and compacted to 98% SPMDD.



If increased bearing capacity is required beneath the thickened edge, a compacted granular pad may be constructed below the base of the slab or thickened edge to distribute the contact load to maintain a bearing pressure of 80 kPa on the clay. In plan, the compacted granular pad should extend beyond the thickened edge by at least the gravel thickness. The allowable bearing pressure on the gravel pad can be calculated using the following formulae:

$q_a = 80 (w+d)/w$

where: $q_a =$ allowable bearing pressure (kPa)

w = width of thickened edge slab (m)

d = depth of gravel below thickened edge slab (m)

As an example, to accommodate an allowable load of 130 kPa on a 0.6 m wide thickened edge the granular pad would need to be 0.4 m thick, the granular pad would also need to extend at least 0.4 m beyond the thickened edge in all directions. The granular pad should be constructed using 50 mm down crushed limestone with the upper 100 mm of the granular pad constructed using 20 mm down crushed limestone as a levelling course. The crushed limestone should be compacted to a minimum of 98% SPMDD. Some settlement of the compacted granular fill should be expected as identified earlier in this section.

4.4 Grade Supported Concrete Slabs

Grade supported concrete slabs will be subjected to loading from heavy construction equipment such as loaders. Some vertical deformation of grade supported slabs should be expected due to moisture and volume changes of the underlying soil, frost effects and settlement from underlying compacted fill soils. It is our understanding that the concrete slabs will be placed above the compacted clay liner discussed in Section 4.1. The following recommendations are provided to reduce or accommodate potential movements of the slab:

- 1. The sub-grade should be unfrozen and free of any deleterious material such as organics, debris, etc. prior to placement of granular fill.
- 2. Precautions should be taken to prevent desiccation of the sub-grade during construction. If drying of the sub-grade occurs it should be dampened, scarified and re-compacted to a minimum of 98% SPMDD.
- 3. The floor slab should be placed on a granular pad constructed of 200 mm of 50 mm down crushed limestone underlying 100 mm of 20 mm down crushed limestone. The crushed limestone should be placed in lift thickness not exceeding 150 mm and compacted to 98% SPMDD. If there is a desire to increase the granular thickness to protect the clay liner this should be done by increasing the 50 mm down layer thickness.
- 4. To minimize changes in soil moisture beneath grade supported floor slabs, the discharge from roof leaders and run-off from exposed slabs should be directed away from the structures.
- 5. To accommodate slab movements, it may be desirable to provide control joints to reduce random cracking and isolation joints to separate the slab from other structure elements. Allowances should be made to accommodate vertical movements of light partitions, etc. bearing on the slab.
- 6. Consideration should be given to providing a sub-floor drainage system consisting of a perimeter weeping tile drain, as well as interior lateral drains for larger areas.



4.5 Recommendations for Leachate Collection Tank

It is understood that a buried leachate collection tank (2.4 m diameter x 7.5 m long) will be installed at a depth of at least 3 m below grade. The tank should be founded on undisturbed *in situ* clay soils. Silts, fills, or organic soils should be removed from below the base of the tank and replaced with 20 mm down crushed limestone compacted to 98% of SPMDD. The tank should be backfilled according to the manufacturer's specifications. The tank base should also be design to resist buoyancy forces assuming that backfill material becomes completely saturated.

4.6 Containment Ponds

It is understood that a containment pond, located on the southeast corner of the site in the vicinity of TH12-33 and TH12-34 to a depth of no more than 4 m. The stratigraphy in the area of the ponds generally consists of topsoil overlying highly plastic lacustrine clay. Silt was encountered in TH 12-33 from 1.5 to 1.8 m, and in TH 12-34 from 1.3 to 2.2 m.

The natural highly plastic clay soils at this site are extensive and may be suitable as a natural *in situ* liner depending on the level of containment required and regulatory compliance. Natural liners will require that the upper silt layer (where encountered) be excavated and replaced with a minimum of 1 m of compacted clay. We estimate that at depth, the hydraulic conductivity of the undisturbed clay to be 1×10^{-7} cm/s or less although higher values may occur near the surface where seasonal environmental effects may result in a more pervious stratum. Scarification of the upper 300 mm and compaction should therefore be carried out to minimize the effects of construction disturbance and any environmental effects such as fissuring. If an engineered liner is required for the pond it could consist of compacted clay or a synthetic material *e.g.* high density polyethylene (HDPE).

Clay soil from on-site excavations should be suitable for a compacted clay liner if broken up and recompacted in thin lifts. In this regard, loose lifts should not exceed 150 mm and the clay should be compacted to achieve a minimum of 95% of SPMDD. Recommendations for synthetic liner installation can be provided if requested.

Ponds constructed with natural or engineered clay liners should have internal side slopes no steeper than 4H:1V for a maximum depth (measured from the dyke crest to the floor) of 4 m and 5H:1V for ponds up to a maximum depth of 5 m. Recommendations for ponds greater than 5 m depth can be provided if requested. Where applicable, external side slopes for dykes should be constructed no steeper than 4H:1V. Erosion is expected to be minimal for ponds less than 300 x 300 m in aerial extent with maximum side slopes of 4H:1V and with grass cover. Ponds great than 300 x 300 m in aerial extent should have flatter side slopes and/or be provided with stone armouring or rip rap. The recommended pond geometry is based on the ponds remaining full; flatter slopes may be required in rapid drawdown conditions. TREK should be contacted if this operating case is expected or if recommendations for acceptable rates of drawdown are needed.

4.7 Excavations

Temporary excavations at the site should meet Workplace Health and Safety regulations. It may be necessary to excavate open excavation side slopes flatter than 1 horizontal to 1 vertical if saturated silts are encountered.

4.8 Foundation Concrete

Based on local experience the degree of exposure for concrete subjected so sulphate attack in Winnipeg is classified as severe according to CSA A23.1-09. Sulphate resistant (CSA Type HS) cement is recommended for



all below grade concrete works or concrete in contact with soil. Accordingly, all concrete in contact with the native soil should be made with high sulphate-resistant cement (HS or HSb). Furthermore, the concrete should have a minimum specified 56 day compressive strength of 32 MPa and have a maximum water to cement ratio of 0.45 in accordance with CSA A23.1-09. Concrete which may be exposed to freezing and thawing should be adequately air entrained to improve freeze-thaw durability in accordance with this same standard.

5.0 Closure

The geotechnical information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation, laboratory testing, geometries). Soil conditions are natural deposits that can be highly variable across a site. If subsurface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work or standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.



Figures





150 200m 50 100 SCALE : 1:4000 (279mmx432mm)

LEGEND :

- SURVEYED TEST HOLE LOCATIONS

C.O.W. Leaf and Yard Waste Composting Facility Brady Road Landfill Winnipeg, Manitoba

Figure 01 Test Hole location Plan



Appendix A

Test Hole Logs

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

GEOT

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.

2. Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.

3. When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Ma	ajor Div	isions	USCS Classi- fication	Symbols	Typical Names		Laboratory Classif	fication C	riteria		ş				
	raction	gravel no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines		$C_{U} = \frac{D_{60}}{D_{10}}$ greater than	^{n 4;} C _c = <u> </u>	$\frac{(D_{30})^2}{(10 \times D_{60})^2}$ between 1 and 3		ieve sizes	#10 to #4	#40 to #10	#200 to #40 / #200	< #200
sieve size)	Gravels than half of coarse fraction alarder than 4.75 mm)	Clean (Little or	GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	grain size curve, er than No. 200 sieve) ng dual symbols*	Not meeting all gradatio	on requiren	nents for GW	ە	ASTM Sieve	#10	#401	#500	¥
ained soils larger than No. 200 sieve	Gra than half o	Gravel with fines (Appreciable amount of fines)	GM		Silty gravels, gravel-sand-silt mixtures	r than No. g dual syn	Atterberg limits below "A line or P.I. less than 4	'A"	Above "A" line with P.I. between 4 and 7 are border-	Particle Size	٩			+	
ained soils larger than	lore	Gravel w (Appre amount	GC		Clayey gravels, gravel-sand-silt mixtures	niri o nalla	Atterberg limits above "A line or P.I. greater than 7	'A"	line cases requiring use of dual symbols	Par		Ľ	, g	25	
Coarse-Grained (More than half the material is larger	e fraction mm)	sands no fines)	SW	*****	Well-graded sands, gravelly sands, little or no fines	Determine percentages of sand and gravel from grain size curve. depending on percentage of fines (fraction smaller than No. 200 s coarse-grained soils are classified as follows: Less than 5 percent GW, GP, SW, SP Less than 12 percent GW, GC, SM, SC 6 to 12 percent Borderline case4s requiring dual symbols*	$C_{U} = \frac{D_{60}}{D_{10}}$ greater than	^{n 6;} C _c =	$\frac{(D_{30})^2}{(10 \times D_{60})^2}$ between 1 and 3		шш	2 00 to 4 75	0.425 to 2.00	0.075 to 0.425	c/0.0 >
n half the r	Sands alf of coarse fi r than 4 75 mi		SP		Poorly-graded sands, gravelly sands, little or no fines	ages of sa entage of 1 s are class cent srcent	Not meeting all gradatio	on requiren	nents for SW				. 0	0	
(More thai	Sands than half of coarse smaller than 4 75 n	Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	lemine percentages of s, pending on percentage of arse-grained solls are cla: arse than 5 percent More than 12 percent 6 to 12 percent Bord	Atterberg limits below "A line or P.I. less than 4	'A"	Above "A" line with P.I. between 4 and 7 are border-	lai	5				Clay
	(More t	Sands w (Appre amount	SC		Clayey sands, sand-clay mixtures	Determir dependir coarse-g Less More 6 to 1	Atterberg limits above "A line or P.I. greater than 7	'A" 7	line cases requiring use of dual symbols	Material	ואומוכ	Sand	Medium	Fine Silt or	SIIT OF CIAY
e size)	, As		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	80 Plasticity	Plasticity chart for solid fraction with particles an 0.425 mm	/ Chart	r LINE		e Sizes		-	i i i	
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Cla	(Liquid limit less than 50)	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	70 - 60 -	an 0.425 mm		,U LI . A LINE	e	S	> 12 in. 3 in to 12 in	2	3/4 in. to 3 in. #4 to 3/4 in	15 2 14
soils er than No	Si		OL	==	Organic silts and organic silty clays of low plasticity	- 00 (%)		CH CH		Particle Size	ASTM:	+	_		_
e-Grained al is small	ski	t 50)	MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts	- 1 40 - L 40 - L 40 - S30 -				Pa	mm	> 300 75 to 300	222	19 to 75 4 75 to 19	P 10
Fine the materi	ts and Cla	(Liquid limit greater than 50)	СН		Inorganic clays of high plasticity, fat clays	20-			MH OR OH		L	75 1	· ·	191 4 75) F
than half	N		OH		Organic clays of medium to high plasticity, organic silts		ML or OL 16 20 30 40 50 LIQUID LI	60 70 _IMIT (%)	80 90 100 110		5	ers	3_		-
(More	Highly	Organic Soils	Pt	<u>6 76 76</u> <u>70 77 7</u>	Peat and other highly organic soils	Von Post Class			lour or odour, fibrous texture	Material	ואומוכ	Boulders	Gravel	Coarse Fine	

Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

Asphalt	Bedrock (undifferentiated)	63	Cobbles
Concrete	Limestone Bedrock		Boulders and Cobbles
Fill	Cemented Shale		Silt Till
	Non-Cemented Shale		Clay Till

EXPLANATION OF FIELD AND LABORATORY TESTING

LEGEND OF ABBREVIATIONS AND SYMBOLS

- LL Liquid Limit (%)
- PL Plastic Limit (%)
- PI Plasticity Index (%)
- MC Moisture Content (%)
- SPT Standard Penetration Test
- RQD- Rock Quality Designation
- Qu Unconfined Compression
- Su Undrained Shear Strength
- VW Vibrating Wire Piezometer
- SI Slope Inclinometer

- ☑ Water Level at Time of Drilling
- ▼ Water Level at End of Drilling
- ☑ Water Level After Drilling as Indicated on Test Hole Logs

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>	
Very loose	< 4	
Loose	4 to 10	
Compact	10 to 30	
Dense	30 to 50	
Very dense	> 50	
The Standard Penetration Test blow count (N) of a col	hesive soil can be related to its consistency as follows:	:

Descriptive TermsSPT (N) (Blows/300 mm)Very soft< 2</td>Soft2 to 4Firm4 to 8Stiff8 to 15Very stiff15 to 30Hard> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	Undrained Shear <u>Strength (kPa)</u>
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200



FREK	7
GEOTECHNICAL	

Client:	CH2MHILL				Proje	ct Num	ber:	0068	002 (00				
roject Name:	Waste Comp	osting Facility Brady F	Road		Loca	tion:		UTM	14 N-	551345	5.763, E	-629974.1	08	
Contractor:	Paddock Drill	ing Ltd.			Grou	nd Elev	ation:	233.3	5 m E	Existing	Ground	_		
Method:	125 mm Solid	d Stem Auger, CME-8	50 Track Mount		Date	Drilled:	1	June	27, 20	012		_		
Sample	е Туре:	Grab (G)	Sh	elby Tube (T)	\square	Split S	poon (S	SS)		Split Ba	rrel (SB)	C	ore (C)
Particle	Size Legend:	Fines	Clay	Silt		· · · · · ·	Sand	•		Gravel	67	Cobbles		Boulder
Elevation (m) Depth (m) Soil Symbol		MAT	ERIAL DESCRIF	-			Sample Type	Sample Number	SPT (N)	16 17	Bulk Unit (kN/m ³) 18 19 Particle Size	20 21 : (%)	• •	drained Shea <u>Strength (kPa)</u> <u>Test Type</u> △ Torvane △ Pocket Pen. △ Qu △) Field Vane (100 150
	- mc - mc - hig SILT - trac - me - me	C CLAY (Topsoil) - silt titled black and grey ist, stiff h plasticity ce clay, trace fine san edium brown ist to wet, soft / plasticity ty, trace oxidation			n diam	ı.)		G01 G02						
	- ligt - mc - hig	it grey ist, stiff h plasticity ions (<5 mm diam.) b	elow 1.8 m					G03						
2.5	-firm below	v 2.3 m						G04 G05						
<u>230.3</u> -3.0	Notes: 1) Test ho 2) Test ho below grou 3) Test ho	TEST HOLE AT 3.1 m le was squeezing in a le was dry approximat und surface. le was backfilled with te was used in the tes	t 0.6 m below gro ely 15 minutes a cuttings to 0.3 m	after drilling and	surfac									
_ogged By: _⊺o			Reviewed By									ent Banni		

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles Image: Split S	re (C) Boulders Undrained Shear Strength (kPa) <u>Test Type</u> △ Torvane △ ● Pocket Pen. ● ⊠ Qu ⊠ ○ Field Vane ○	250
Contractor: Paddock Drilling Ltd. Ground Elevation: 233.48 m Existing Ground Method: 125 mm Solid Stem Auger, CME-850 Track Mount Date Drilled: June 27, 2012 Sample Type: Image: Contract Mount Date Drilled: June 27, 2012 Particle Size Legend: Fines Clay Sample Type: Gravel Gravel <th< th=""><th>rre (C) Boulders Undrained Shear Strength (kPa) <u>Test Type</u> △ Torvane △ ♥ Pocket Pen. ♥ ⊠ Qu ⊠ ○ Field Vane ○</th><th>250</th></th<>	rre (C) Boulders Undrained Shear Strength (kPa) <u>Test Type</u> △ Torvane △ ♥ Pocket Pen. ♥ ⊠ Qu ⊠ ○ Field Vane ○	250
Method: 125 mm Solid Stem Auger, CME-850 Track Mount Date Drilled: June 27, 2012 Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core Particle Size Legend: Fines Clay Silt Sand Grave Cobbles Image: Second State Legend: MATERIAL DESCRIPTION MATERIAL DESCRIPTION Image: Second State Legend: Particle Size (%) Particle	Boulders Undrained Shear Strength (kPa) Test Type △ Torvane △ Pocket Pen. ◆ ☑ Qu ☑ ○ Field Vane ○	250
Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) Core Particle Size Legend: Fines Clay Sold	Boulders Undrained Shear Strength (kPa) Test Type △ Torvane △ Pocket Pen. ◆ ☑ Qu ☑ ○ Field Vane ○	250
Particle Size Legend: Fines Clay Silt Sand Gravel Cobbles 5 <	Boulders Undrained Shear Strength (kPa) Test Type △ Torvane △ Pocket Pen. ◆ ☑ Qu ☑ ○ Field Vane ○	250
Image: Second constraints Image:	Undrained Shear Strength (kPa) <u>Test Type</u> △ Torvane △ ♥ Pocket Pen. ● ⊠ Qu ⊠ ○ Field Vane ○	250
233.0 0.5 CLAY - silty, trace silt inclusions (<2 mm diam.)	<u>Test Type</u> △ Torvane △ ● Pocket Pen. ● ⊠ Qu ⊠ ○ Field Vane ○	250
233.0 - mottled black and grey - dry to moist, stiff, high plasticity 0.5 CLAY - silty, trace silt inclusions (<2 mm diam.) trace oxidation - light grey - moist, stiff - high plasticity 1.0 G07 1.0 G07		
- mottled black and grey - dry to moist, stiff, high plasticity 0.5 - light grey - moist, stiff - high plasticity 1.0 - 1.5		
233.0 0.5 CLAY - silty, trace silt inclusions (<2 mm diam.) trace oxidation		
- light grey - moist, stiff - high plasticity 1.0 -1.5		
- high plasticity		
G08		
-firm below 2.3 m	<u></u>	
230.4 – 3.0 G10 • • •	\$	
END OF TEST HOLE AT 3.1 m IN CLAY Notes:		
 Test hole was squeezing in at 0.6 m below ground surface. Test hole was dry approximately 15 minutes after drilling and open to 0.6 m below ground surface. Test hole was backfilled with cuttings to 0.3 m below ground surface. One bag of bentonite was used in the test hole from 0.3 m to the surface. 		

TREK
GEOTECHNICAL

Client:	CH2MHILI				Proje	ct Numbe	er:	0068	3 002	00					
Proiect Name:	Waste Cor	mposting Facility Brady F	Road		Locat						377.282. 6	-629833.	332		
Contractor:	Paddock D					nd Elevati									
Method:		olid Stem Auger, CME-8	50 Track Mount			Drilled:			27, 2			_			
				elby Tube (T)		Split Spo					Barrel (SB		Core (C	、 、	
	е Туре:	Grab (G)					-	ວວ) [-					
Particle	e Size Lege	nd: Fines	Clay	Silt		Sa	and			Grave					Iders
Elevation (m) Depth (m)	CLAY - - - - - - - - - - - - - - - - - - -		ERIAL DESCRIP y, some rootlets (trace organics (r d, trace organics d, trace precipitate IN CLAY t 1.2 m below gro ely 15 minutes af ground approxim cuttings to 1.2 m	TION 5 mm diam.) ootlets <10 mm (rootlets <10 mm (rootlets <1 mm es ound surface. ter drilling and ately one day is below ground	n diam Im diam	.) n.) o 1.2 m illing.	Sample Type	G11 G12 G13 G15 G15	SPT (N)	16 1 0 2	Bulk Ur (kN/m 7 18 Particle Siz 0 40 6 PL MC	it Wt) 9 20 21		ndrained Strength (<u>Test Ty</u> △ Torvar Pocket F ⊠ Qu	Shear (kPa) pe ∩e ∆ Pen. Φ ⊠

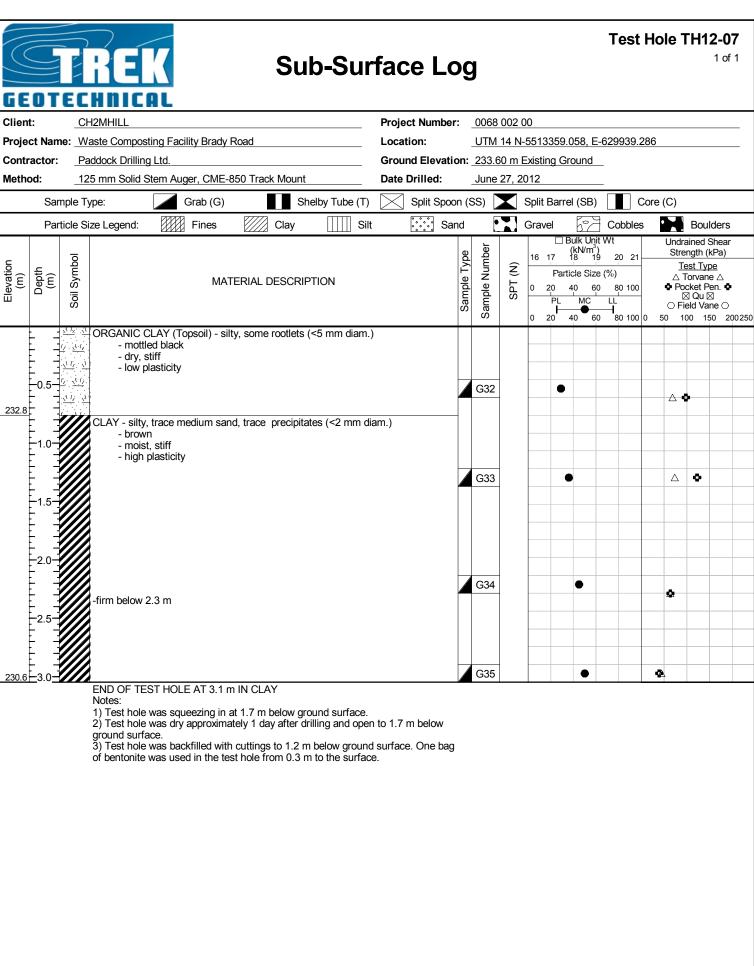


LEVIE	CHNIC	AL													
Client:	CH2MHILL				Proje	ect Num	ber:	0068	002 0	00					
Project Name:	Waste Compos	sting Facility Brady F	Road		Loca	tion:		UTM	14 N-	5513358	8.49, E-6	29746.183			
-	Paddock Drilling	-			Grou	nd Eleva	ation:	233.8	81 m E	Existing (Ground	-			
Method:	125 mm Solid S	Stem Auger, CME-8	50 Track Mount		Date	Drilled:		June	27, 20	012					
Sample	е Туре:	Grab (G)	She	Iby Tube (T)	\boxtimes	Split Sp	000n (\$	SS)		Split Bar	rel (SB)	Co	re (C)		
Particle	Size Legend:	Fines	Clay	Silt			Sand			Gravel	62	Cobbles		Boul	
Elevation (m) (m) (m) (m)			ERIAL DESCRIPT	-			Sample Type	Sample Number	SPT (N)	16 17		20 21 (%) 80 100 LL	Stre 	ained S ength (I est Typ Torvan ocket P ⊠ Qu ⊉ ield Vai 00 15	kPa) <u>⊃e</u> e ∆ en. Φ ⊠
	- mottl	CLAY (Topsoil) - silty led black and grey		5 mm diam.)				040	-						
233.5	- mois	t, stiff, high plasticity , trace organics (roo	/ tlets <1 mm diam) trace oxidat	tion tra	ace silt		G16			•				
233.2 0.5	inclusions (<10 mm diam.) grey, moist, stiff,hig), 11000 0,100				G17	-					•	
	SILT AND C	CLAY LAYERS ers 50-75 mm thick													
232.9	2 silt layer	rs I25 mm thick					_/	G18	-	•					
	- medi	e clay, trace fine san ium brown, dry, soft,	d, trace organics (low plasticity	rootlets <1 m	m dian	n.)		G19	-	•					
	-moist below	v 1.1 m						010	-		_				
232.3 -1.5															
	- light - mois	, trace medium sand grey t, stiff plasticity	l, trace precipitate	es											
-2.0-								G20			•			•	
-2.5	-firm below 2	2.3 m													
230.8 3.0		ST HOLE AT 3.1 m						G21	_						
	Notes: 1) Test hole 2) Test hole below groun 3) Test hole	was squeezing in a was dry approximat	t 0.6 m below grou ely 15 minutes afte cuttings to 1.2 m t	er drilling and below ground	surfac		ag								
Logged By: _To	om Hildahl		Reviewed By:	Kent Banni	ster				Proje	ct Engin	neer: _K	ent Bannis	er		

FREK	
GEOTECHNICAL	

Client:	CH2MHILL				Proje	ct Number	:	0068	002 (00								
Project Name:	Waste Compos	sting Facility Brady F	Road		Locat	ion:	-	UTM	14 N-	5513	281.7	'84, E-	6297	92.11	8			
Contractor:	Paddock Drillin	ig Ltd.			Grou	nd Elevatio	on:	233.6	60 m E	Existin	ng Gro	ound	_					
Method:	125 mm Solid	Stem Auger, CME-8	50 Track Mount		Date	Drilled:	-	June	27, 2	012			_					
Sample	e Type:	Grab (G)	She	elby Tube (T)	\square	Split Spoo	on (S	SS)		Split E	Barrel	(SB)		Co	ore (C	C)		
Particle	e Size Legend:	Fines	Clay	Silt		Sar	nd	۲		Grave		53		bles	•	В	oulder	s
	5						e	ber		16 1	□ Bu (17 1	ulk Unit kN/m³) 8 19	Wt 20	21_		Indraine Strengt		
Elevation (m) Depth (m)							Sample Type	Sample Number	(Z			le Size		21		<u>Test</u> ∆ Torv		
Elevatio (m) Depth (m)		MAT	ERIAL DESCRIP	HON			mple	l aldı	SPT (N)	0 2	1 1	0 60 MC	80 LL	100	4	Pocke	t Pen. •	
)						s	San		0 2		0 60	_	100 0		⊃ Field 100		
]	CLAY (Topsoil) - silt	y, some rootlets (•	<5 mm diam.)														
E di i	- drv	led black and grey stiff, high plasticity						G22			•							
<u>233.2</u> -0.5	SILT - some	e clay, trace oxidatio	n								_							
	- mois	lium brown st to wet, firm						G23			•						_	
F	- low -soft below	plasticity 0.6 m						G24			•							
											-							_
232.2																		
-1.5-		, trace medium sand	d, trace precipitate	es (<2 mm dia	m.)		1								_			_
		st, stiff													_			
	- high	plasticity																
-2.0-																		
								G25			•				Δ	•		
	-firm below	2.3 m																
- 2.3															_			
																		_
230.6 - 3.0 -								G26				•			∆¢			
	END OF TE Notes:	EST HOLE AT 3.1 m	IN CLAY															
	1) Test hole	e was squeezing in a e was dry approximat	t 0.8 m below gro	und surface.	to 0.9	n holow												
	ground surf	ace.		•														
	of bentonite	e was backfilled with was used in the tes	t hole from 0.3 m	to the surface	surrace e.	e. Une bag												
Logged By: _T			Reviewed By:															

	<u>, 11</u>	RE	K	S	Sub-Su	irfac	e Lo	bg					Test H	lole T		- 06 of 1
GEOT	EC	HNIC	AL													
Client:		H2MHILL				Proje	ct Number	:	0068	002 0	0					
Project Nam	e: W	aste Compos	sting Facility Brady	Road		Locat			υтм	14 N-	551332	21.603, E	-629865.74	1		
Contractor:	Pa	addock Drilling	g Ltd.			Grou	nd Elevatio	on: _	233.6	62 m E	Existing	Ground	_			
Method:	12	5 mm Solid S	Stem Auger, CME-	850 Track N	lount	Date	Drilled:	_	June	27, 20	012		_			
Sam	nple Ty	ype:	Grab (G)		Shelby Tube (T) 🔀	Split Spoo	on (S	S)		Split Ba	arrel (SB)	Co	re (C)		
Part	ticle Si	ze Legend:	Fines	CI	ay 🔛 :	Silt	Sar	nd	۲		Gravel	52	Cobbles		Boulde	ers
	_							e	oer			Bulk Unit (kN/m ³) 18 19	t Wt		ned She gth (kPa	
tion	Symbol							Sample Type	Sample Number	2	16 17 F	18 19 Particle Size		Tes	<u>st Type</u> srvane ∠	
Elevation (m) Depth (m)	il Sy		MA	TERIAL DES	SCRIPTION			nple	ple N	SPT	0 20	40 60	. ,	Pocl	ket Pen. Qu 🛛	
ш	Soil							Sar	Sam	0,	P			○ Fiel	d Vane	-
	<u>zi k</u> <u></u>	ORGANIC (CLAY (Topsoil) - s	Ity, some roo	otlets (<5 mm dia	n.), mottle	d black				0 20	40 60	80 100 0	50 100	150	200250
233.5		and grey, dr	y, stiff, high plastic	ity					021							
		- mottl	ed grey and brown	nd, trace pre	cipitates (<2 mm	uam.)										
-0.5-			t, stiff plasticity													
										-				_		
								A	G28	-		•				
-1.0-																
-1.5-																
								н	T 20							
								н	129							
														_		
		-firm below	2.3 m						000	-						
-25-			2.5 11					A	G30			-		₩ <u>₽</u> _		
230.6-3.0-									G31					۵		
		END OF TE Notes:	ST HOLE AT 3.1	m IN CLAY												
		1) Test hole	was dry approxim	ately 1 day a	fter drilling and o	pen to 3.1	m below									
		2) Test hole	was backfilled wit	h cuttings to	1.2 m below grou	ind surface	e. One bag									
		or bentonite	was used in the te	est noie from	0.3 m to the sun	ace.										
		END OF TE Notes: 1) Test hole around surfa	, trace medium sa led grey and brown t, stiff plasticity 2.3 m ST HOLE AT 3.1	mi, trace pre	cipitates (<2 mm	diam.)	m below		G27 G28 T29 G30							



8/3/12

			RE		Su	b-Sur	fac	e Lo	bg						Test	Но	le 1	"H1:	2-0 8 1 of	-
Clien	t: ct Na racto	<u>_C</u> ame: <u>_</u> r: _P	H2MHILL /aste Compos addock Drillin	sting Facility Brady I			Locati Groun	t Number on: d Elevatio Drilled:	<u> </u>	JTM 33.1		-55133 Existing			30011.4	154				_
	S	ample 1	уре:	Grab (G)	St	elby Tube (T)	\square	Split Spoo	n (SS	5)		Split Ba	arrel (S	B)		Core ((C)			
	Р	article S	Size Legend:	Fines	Clay	Silt		Sar	nd	٠		Gravel	5	2	Cobbles	;		Boul	ders	
Elevation (m)	Depth	Soil Symbol		MAT	ERIAL DESCRIF	PTION			Sample Type	Sample Number	SPT (N)	16 17 F 0 20	Bulk (kN/ 18 Particle \$ 40 PL M	m ³) 19 Size (' 60 C	20 21		Stre <u>T</u> e △ T ● Poo ○ Fie	ained S ngth (H est Typ orvane cket P 2 Qu D eld Var 00 15	kPa) <u>>e</u> ≥ ∆ en. ● ⊴ ne ⊖	
233.0			and grey, m CLAY - silty - light - mois - high -trace precip	it, stiff plasticity pitates (< 50 mm dia	icity d am.) below 0.8 m	<u> </u>	, mottlec	i black		536 537 738 539						• •				
			Notes: 1) Test hole 2) Test hole below arour	EST HOLE AT 3.1 m was squeezing in a was dry approxima d surface. was backfilled with was used in the tes	at 1.7 m below gr tely 15 minutes a	fter drilling and														

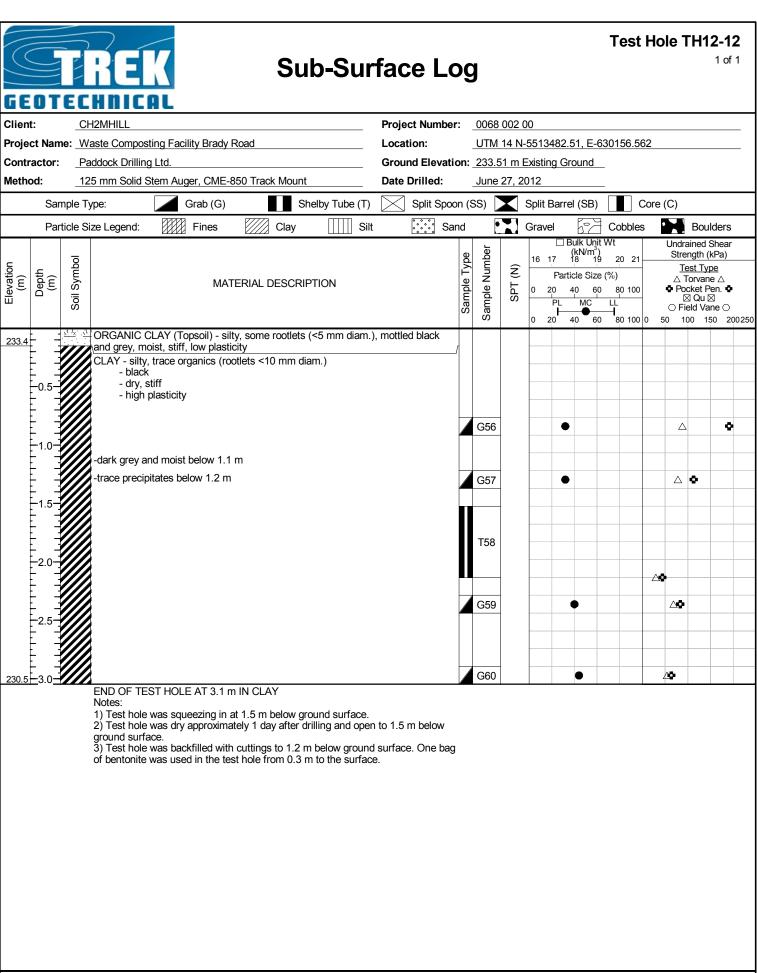
TREK
GEOTECHNICAL

GE		HNIC	AL													
Client:		12MHILL				-	ct Number									
-			ting Facility Brady I	Road		Loca							630081.8	24		
Contra		ddock Drilling	-				nd Elevatio				-	Fround	-			
Method			Stem Auger, CME-8				Drilled:		une 2							
	Sample Ty	-	Grab (G)		elby Tube (T)	\bowtie	Split Spoo	-	5)		Split Barr	el (SB)		ore (C)	1	
	Particle Si	ze Legend:	Fines	Clay	Silt		ःःःः Sar	nd	•		Gravel	Bulk Unit	Cobbles			ulders Shear
Elevation (m)	Depth (m) Soil Symbol		MAT	ERIAL DESCRIP	TION			Sample Type	Sample Number	SPT (N)	16 17 Par 0 20 PL	(kN/m ³) 18 19 ticle Size 40 60 MC	20 21		rength <u>Test Ty</u> Torva Pocket ⊠ Qu Field V	(kPa) /pe ∩e ∆ Pen. Φ ⊠
233.3		- mottle	CLAY (Topsoil) - silf ed black and grey , stiff, high plasticit	-	<5 mm diam.)				541)				
232.5	0.5	CLAY - silty, - dark g - dry to	trace coarse sand		ootlets <10 mr	n diam	.)		642						△ •	
231.9	1.5	- mediu - moist - low pl	lasticity			m dian	1.)	G	42A		•		2	•		
	2.0	- browr - moist		d, trace precipital	ies				643						•	
230.6	2.5								644			•				
Loggeo		Notes: 1) Test hole 2) Test hole below ground 3) Test hole	ST HOLE AT 3.1 m was squeezing in a was dry approxima d surface. was backfilled with was used in the tes	at 1.1 m below gro tely 15 minutes at cuttings to 1.2 m	fter drilling and below ground	surfac										
Logged	d By: _Tom	Hildahl		Reviewed By	: Kent Banni	ster			P	Proje	ct Engine	eer: _K	ent Bannis	ster		

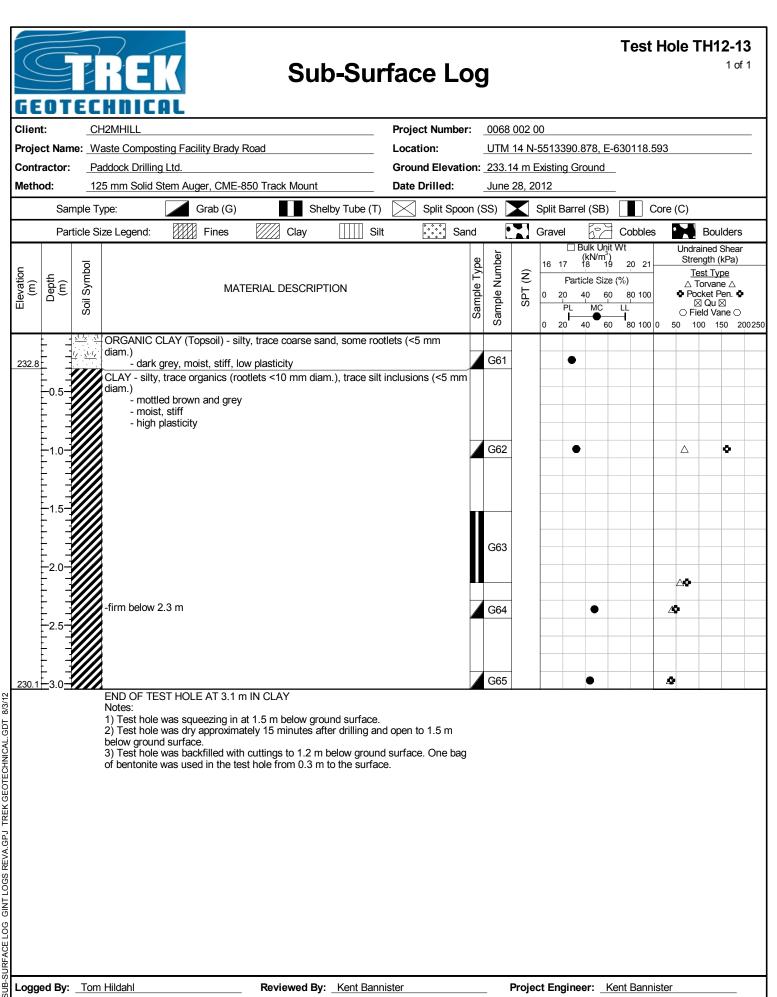
			RE	K			Su	b-Sur	fac	e Lo	bg						Tes	st H	ole 1	ΓH1	2-1 1 of	-
Client	: t Name actor:	<u>CH</u> e: <u>Wa</u> Pa	2MHILL aste Compos ddock Drilling 5 mm Solid S	sting Fac g Ltd.			ck Mount		Locat Grour	ct Number ion: nd Elevatio Drilled:	<u> </u>		14 N 1 m l	-55134 Existin			63004	8.068	3			
Metho		ple Ty			Grab (G)	500 114		elby Tube (T)		Split Spoo				Split E	Barrel ((SB)		Core	e (C)			
			ze Legend:		. ,	<i>\</i> ///	Clay	Silt		Sar	-			Grave		707	Cobb			Bou	Iders	
Elevation (m)	Depth (m)	Soil Symbol				ERIAL	DESCRIP					Sample Number	SPT (N)	16 1 0 2	Bul (kl (kl 7 18 Particle 0 40 PL L		20	00	Stre	ained sength (est Typ Forvan cket P ⊴ Qu eld Va 00 15	kPa) pe e ∆ Ven. Ф ⊠ ne ⊖	•
233.2			- black - mois CLAY - silty - mottl - dry to	t, stiff, hi , trace cc ed brown o moist, v plasticity	gh plastici barse sand h and grey very stiff	ty , trace o		<5 mm diam.) potlets <10 mr	n diam.)		G45 G46 T47 G48 G49										
			 Test hole below groun Test hole 	was squ was dry d surfac was bac	leezing in a approxima e. kfilled with	at 1.4 m Itely 15	below gro minutes af s to 1.2 m	und surface. ter drilling and below ground to the surface	surface													

TREK
GEOTECHNICAL

Client:	CH2MHILL				Droige	t Number		0060	002 0	0							-
		ting Facility Brady F	Road		Locati						341 2	77 E_4	629760.5	574			
Contractor:	Paddock Drilling		(Oau			d Elevatio	_				J 4 1.J	<i>11</i> , ∟ -0	023700.0	<i></i>			
Method:		Stem Auger, CME-8	50 Track Mount		Date D		_		27, 2								
Samr	ble Type:	Grab (G)		by Tube (T)		Split Spoo	_	_			Barrel	(SB)		Core (C)		
	cle Size Legend:	Fines		Silt		San				Grave		62	Cobbles	·		oulder	
T aluc	le Olze Legena.	MMM 1 mes			l	<u>,,,,</u> Oai		<u> </u>			🗆 Βι	ılk Unit			ndraine		
R							ype	Sample Number		16 1	17	kN/m ³) 8 19	20 21	5	Strength Test)
Depth (m) il Symbol		MATER	IAL DESCRIPTION	I			ole T	e Nu	(N)	0 2			``'		∆ Torva Pocket	ane 🛆	
Soil							Sample Type	ample	SPT		20 40 PL	0 60 MC	80 100		Field V	u 🖂	
							0)	ŝ		0 2	20 4	0 60	80 100		100		
	RGANIC CLAY (T lasticity	Γopsoil) - silty, som	e rootlets (<5 mm o	diam.), black,	moist, s	tiff, low	4	G50	-		•						
	LAY - silty, trace c	organics (rootlets <	10 mm diam.), trac	e oxidation, tr	race silt												
0.5- ///	nclusions (<5 mm o - medium brov															_	+
	 moist, stiff high plasticit 	^t y															
<u>-///</u>								G51			•					Þ	
1.0																	
			ity from 1.1 to 1.2 r				4	G52	-		•						
	race medium sanc elow 1.2 m	d, trace precipitates	(<5 mm diam.), ar	nd mottled gre	ey and b	rown		<u> </u>	-								
1.5-							A	G53	-		•)			-	•	
																_	_
																	_
2.0																	
								G54				•		-			
	irm below 2.3 m																
2.5-																_	
								G55				•		ΦΔ			_
		LE AT 3.1 m IN CL	AY					000				-		• -			
	lotes:) Test hole was sq	ueezing in at 0.9 m	h below ground surf	ace.													
2			minutes after drillir		o 0.9 m	below											
3) Test hole was ba		gs to 1.2 m below g m 0.3 m to the surf		e. One b	ag of											
		n based off of GPS		ace.													



8/3/12



			REK		Su	b-Sur	face Lo	DC DC	J				Test H	lole ⁻		2-14 1 of 1	
Clien Proje	t: ct Nar ractor: od:	 me:W :Pa	HINICAL H2MHILL aste Composting Facilit addock Drilling Ltd. 5 mm Solid Stem Auge ype:) Track Mount	nelby Tube (T)	Project Number Location: Ground Elevatio Date Drilled:	on:	234.8 ⁻ June 2		re (C)						
	Pa	rticle S	ize Legend:	Fines	Clay	Silt	Sar	nd	•		Grave	62	Cobbles		Bould	ders	
Elevation (m)	Depth (m)	Soil Symbol			RIAL DESCRIF		Sample Type	Sample Number	SPT (N)	16 17 0 20	Particle Size) 20 21 ∋ (%) ⊃ 80 100 LL	Stre <u>I</u>	ained S ength (k est Typ Torvane cket Pe ⊠ Qu ⊠ ield Van 00 150	Pa) <u>e</u> en. Φ	250	
<u>233.3</u> 233.1	- 1.0		CLAY (Fill) - silty, trace diam.), trace oxidation, - mottled grey an - moist, firm - high plasticity ORGANIC CLAY (Top black and grey, moist, CLAY - silty, trace coa - dark grey - moist, stiff - high plasticity	trace glass d brown	some organica lasticity ace organics (s (rootlets <5 m	m diam.), mottled		G66 G67 G68 G70 G71 G72								
			 Test hole was squee Test hole was dry ap below ground surface. Test hole was backf of bentonite was used 	oproximatel	y 15 minutes a uttings to 1.2 n	after drilling and n below ground	surface. One bag										
Logg	ed By:	Tom	Hildahl		Reviewed B	y: Kent Banni	ster		Р	roie	ct Enc	ineer: ł	Kent Bannist	er			

SUB-SURFACE LOG GINT LOGS REVA.GPJ TREK GEOTECHNICAL.GDT 8/3/12

	7	
	ťΞ	$\langle \langle \rangle$
GEOTECI	HNIC	AL

Client:	CH2	2MHILL				Proje	ct Number	:	0068 002 00 UTM 14 N-5513342.445, E-630049.451										
Project Name	e:_Wa	ste Compos	sting Facility Brady	Road		Loca	tion:												
Contractor:	Pad	dock Drillin	g Ltd.			Grou	nd Elevatio	on:	: 234.70 m Existing Ground										
Method:	125	mm Solid S	Stem Auger, CME-	850 Track Mount		Date	Drilled:		June	e 28, 2	2012			_					
Sam	ple Typ	e:	Grab (G)	Sh	Split Spoon (SS)		Split Barrel (SB)			Core (C)						
Parti	cle Siz	e Legend:	Fines	Clay	Silt		Sar	nd			Gravel		Cobbles		Boulders		ders		
	_							۵	ber				Bulk Unit (kN/m ³) 18 19	Wt			ained S ngth (k		
tion	Symbol							Typ	Im	Î	16		icle Size		1	<u>Test Type</u> △ Torvane △ ◆ Pocket Pen. ◆ ⊠ Qu ⊠		t Type	
Elevation (m) Depth (m)	il Sy		MA	TERIAL DESCRIP	TION			Sample Type	ample Number	SPT	0 2	20	40 60	80 10	0			en. 🕈	
ш	Soil							Sar	Sam			PL	MC			⊖ Fi	eld Var	ne 🔿	
	XXX (CLAY (Fill)	- silty, trace to som	ie sand, trace coar	se gravel, trac	e orgar	lics	-			0 2	20	40 60	80 10		50 1	10 15	0 200	
E R	××	rootlets <5	mm diam.), trace of led grey and brown	oxidation, trace gla	SS	- 0													
234.2		- mois	st, firm, high plastic	ity															
-0.5-	۱	NOOD						1											
F ¥																			
ĒĪ																			
-1.0-																			
E IX									G73	,									
233.3									Gra	`									
-1.5-		CLAY - silty - dark	ootlets <10 m	m diam	.)														
		- mois	st, stiff																
		- nign	plasticity						G74	L I			•			_ _ _			
232.7					(-											
		SIL I - some	e clay, trace fine sa	race fine sand, trace organics (rootlets <1 m															
E E		- medi - mois	ium brown						_						_				
			plasticity						G75	>		•				^			
232.1 - 2.5 -		CLAY - siltv	, trace medium sar	nd trace precipita	tes			-											
		- brow	'n																
		- mois - high	it, stiff plasticity						G76									b	
-3.0-		-						'n	0/0	4									
									T77	·									
-3.5-																			
										1								•	
4.0																			
									G78	3			•						
]									
230.1 4.5																			
		END OF TE Notes:	ST HOLE AT 4.6 r	m IN CLAY															
		I) Test hole	was squeezing in			1 au	- 0 5 -												
		2) Test hole below grour	e was dry approxima nd surface.	ately 15 minutes a	tter drilling and	a open t	o 3.5 m												
	3	Test hole	was backfilled with was used in the te	h cuttings to 1.2 m	below ground	surfac	e. One bag												
	C			at noi c noin 0.3 N		. .													
.ogged By:	Tom H	Hildahl		Reviewed By	: Kent Banni	ister			_	Proje	ect En	gine	er: _K	ent Ban	niste	r			

							Test	Hole	• TH [′]	12-1	6			
	REK Sub-Surf	ace Lo	bg							1 0	f 1			
GEUT Client:	ECHNICAL CH2MHILL I	Project Number	. 0	069.0	22.0	0								
		Location:	nber: 0068 002 00 UTM 14 N-5513341.996, E-630046.535											
Contractor:		Ground Elevation					<u>L-030040.</u>	555						
Method:		Date Drilled:		une 28										
	nple Type: Grab (G) Shelby Tube (T)	Split Spoo			_	Split Barrel (SE		Core (C)					
	ticle Size Legend:	Spint Spoo	-			Gravel				ulders	3			
				e		Bulk U	nit Wt	6	ndrainec Strength		r			
Symbol			Sample Type	Sample Number	2	(kN/m) 16 17 18			Test T					
Depth (m) il Symł	MATERIAL DESCRIPTION	ole	e N	SPT (I	Particle Si 0 20 40	ze (%) 60 80 100	-	∆ Torva Pocket		5				
Soil		am	du	ŝ	PL MC				ield Vane ⊖					
			5	Sa		0 20 40	60 80 100	1	100					
	CLAY (Fill) - silty, trace to some sand, trace coarse gravel, trace to some	e organics												
	(roots <50 mm diam.), trace oxidation, trace glass - mottled grey and brown													
3	- moist, firm													
0.5	- high plasticity													
1 0-				579		•								

	ORGANIC CLAY (Topsoil) - silty, some rootlets (<5 mm diam.), mottled	black and grey,		380		•								
-////	moist, stiff, high plasticity	/												
-///	CLAY - silty, trace organics (rootlets <10 mm diam.), trace oxidation, tra (<1 mm diam.)	ace precipitates												
2.0-	- black - dry to moist, stiff			381		•			Δ	0				
	- high plasticity									-				
2.5-	SILT - trace to some clay, trace fine sand, trace organics (rootlets <1 mil	m diam.), trace												
	oxidation	,,		382		•		ΦΔ						
3	- medium brown - moist, firm, low plasticity													
	CLAY - silty, trace medium sand, trace precipitates													
3.0-	- brown - moist, stiff													
	- high plasticity													
-///														
3.5-											-			
											-			
				383				A						
4.0-									_		-			
-///											-			
4 5 111				384				4			-			
ч.0° ////	END OF TEST HOLE AT 4.6 m IN CLAY			-04		↓ ▼								
	Notes:													
	 Test hole was squeezing in at 2.1 m below ground surface. Test hole was dry approximately 15 minutes after drilling and open to 	2.1 m below												
	ground surface.													
	Test hole was backfilled with cuttings to 1.2 m below ground surface. bentonite was used in the test hole from 0.3 m to the surface.	One bag of												
	4) Test hole location based off of GPS coordinates.													
	Tom Hildohl Devision a Devision	or		D		t Engine	Kont Daw	viotor						
Loggea By:	Tom Hildahl Reviewed By: Kent Bannist	.er		Pr	ojeo	ct Engineer:	rvent Banr	uster						

			RE	K	Sul	b-Sur	face L	0	3				Test F	lole T		2-17 1 of 1		
GE	ΠΤ	EC	HNIC															
Clien			H2MHILL				Project Numb	er:										
				ting Facility Brady I	Road		Location:											
Contr	actor:	Pa	addock Drilling	g Ltd.			Ground Eleva											
Methe	od:	_12	25 mm Solid S	Stem Auger, CME-8	350 Track Mount	Date Drilled: June 28, 2012												
	Sa	mple T	ype:	Grab (G)	Split Sp	oon (SS)	X	Split Ba	arrel (SB)	Со	re (C)						
	Pa	ticle S	ize Legend:	Fines	Clay	Silt		Sand	•		Gravel	50	Cobbles	Boulders				
								0	er			Bulk Unit (kN/m ³) 18 19	Wt		iined S ngth (kl			
(, t	Symbol						Sample Type	Sample Number	Ĵ	16 17 F	18 19 Particle Size		Te	st Type	2		
Elevation (m)	Depth (m)	il Sy		MAT	FERIAL DESCRIP		nple	ole N	SPT	0 20			Poc	orvane ket Pe Qu 🛛	n. 🗣			
ш		Soil						Sar	Sam		P			⊖ Fie	eld Van	eO		
233.5		<u>, , , , , , , , , , , , , , , , , , , </u>		LAY (Topsoil) - sili	tv. some rootlets (<5 mm diam.).	black, drv mois	st.	0,		0 20	40 60	80 100 0	50 10	0 150	200250		
			stiff, high pla	sticity			-							_				
			inclusions (<	trace organics (roo 3 mm diam.), trace	e precipitates (<1 r	mm diam.)												
	-0.5-		- moist		own				G85]		•			•			
			- high ı	plasticity														
	-1.0-																	
	· · ·								G86	-		•						
									000	-					-			
	-1.5-																	
									T87									
									107									
														• _				
			-firm below 2) 3 m														
	-25-			2.5 111														
									G88			•		2				
230.6	3.0																	
			END OF TES Notes:	ST HOLE AT 3.1 n	1 IN CLAY													
			1) Test hole	was squeezing in a was dry approxima	at 1.8 m below gro	und surface.	open to 1.8 m											
			below ground	d surface.	-	-		~~										
			of bentonite	was backfilled with was used in the test	st hole from 0.3 m	to the surface	surface. One b e.	ag										

FR	EK
GEOTECHI	ICAL

Client: _C	H2MHILL	Proje	ct Numbe	er:	_0068 002 00												
Project Name: <u>W</u>	aste Compos	Locat	ion:		UTM 14 N-5513202.276, E-629839.114												
Contractor: P	addock Drilling	g Ltd.			Grou	nd Elevat	ion:	233.52 m Existing Ground									
Method: 12	25 mm Solid Stem Auger, CME-850 Track Mount					Drilled:		June	June 28, 2012								
Sample 1	уре:	Grab (G)	She	lby Tube (T)	\square	Split Spo	on (S	SS)		Split E	Barrel (SB)	C	ore (C))			
Particle S	ize Legend:	Fines	Clay	Silt		Si Si	and	۲		Grave		-		Bou	Iders		
Elevation (m) Depth (m) Soil Symbol	ORGANIC C - mottl - dry tc CLAY - silty, precipitates - black - black - black - high	MAT CLAY (Topsoil) - silt ed black and grey moist, stiff, high pl trace organics (roc (<1 mm diam.)	ERIAL DESCRIPT y, some organics (asticity tlets <10 mm diar	(rootlets <5 m n.), trace oxid	m diam ation, ti	.) ace	Sample Type	Sample Number 069 069 069	SPT (N)	16 1 0 2	Bulk Un (kN/m 7 18 1 Particle Siz 0 40 6 PL MC	t Wt 9 20 21 – ∋ (%)	Un S	drained trength (<u>Test Ty</u> ∆ Torvar Pocket F ⊠ Qu I Field Va 100 1	Shear (kPa) p <u>e</u> ne ∆ Pen. ⊄ ⊠ ane ⊖		
	CLAY - silty, - brow - moist	t, stiff plasticity		es.				G92 G93									
<u>230.5</u> —3.0 <u>—</u>	Notes: 1) Test hole below groun 2) Test hole	ST HOLE AT 3.1 m was dry approximat d surface. was backfilled with was used in the tes	ely 15 minutes aft	below around	surface		g										
_ogged By: _Ton	n Hildahl		Reviewed By:	Kent Banni	ster				Proje	ct Eng	gineer: _ł	Kent Bannis	ster				

			RE	K	;	Sub	-Sur	fac	e Lo	bg					Test	Hol	e Tŀ		• 19 of 1
GE	01	TEC	HNIC	AL															
Clien	t:	C	H2MHILL					Proje	ct Number	: _	0068	002 (00						
Proje	ct Nai	me: _\\	aste Compos	sting Facility Brady	Road			Locat	ion:	_	UTM	14 N-	551313	30.536, E	-629881.3	817			
Contr			addock Drillin	-					nd Elevation				-	Ground	_				
Methe				Stem Auger, CME-	850 Track I	_	by Tube (T)	Date I	Drilled:		June				_				
		ample T		Grab (G)	\bowtie	Split Spoo		. 19		Split Ba	arrel (SB)		Core (C						
	Pa	article S		👬 Sar	nd	•		Gravel	Bulk Unit				oulde						
_		-								e	her		16 17	(kN/m ³)			Jndrain Streng	th (kPa	
Elevation (m)	Depth (m)	Symbol				Sample Type	Sample Number	(Z)	F	Particle Size	€ (%)			<u>Type</u> /ane ∆					
Elev C	De De	Soil S		MATERIAL DESCRIPTION						dmg	nple	SPT	0 20) 80 100 LL)u 🛛	
		S S								w.	Sar		0 20		80 100		Field 100		⊖ 200250
		<u> <u>zi v</u> <u>zi</u></u>	ORGANIC (CLAY (Topsoil) - si led black and grey,	ty, some ro	otlets (<	5 mm diam.)				G94			_					
233.4			CLAY - silty	, trace organics (ro				ation, tr	ace silt		004								
			inclusions (• - mottl	<3 mm diam.) led dark grey and b	rown														
			- mois																
										G95			•			Δ	•		
	-1.5-		traco procir	oitates (<1 mm diar	n) holow 1 E m													_	
			-trace precip			.5 11					G96						•		
											090						_ _		
	2.0-																		
	-2.5-		-firm below :	2.6															
			-IIIII below	2.0 111						A	G97			•		•2		_	
230.6	 																	_	
230.0	_3.0_			ST HOLE AT 3.1 r	n IN CLAY														
			Notes: 1) Test hole	was squeezing in	at 2.1 m be	low grou	nd surface.												
			below aroun	e was dry approxima nd surface.	•		•												
			 Test hole of bentonite 	was backfilled with was used in the te	n cuttings to st hole fron	o 1.2 m b n 0.3 m t	elow ground o the surface	surface	e. One bag										

		R	EK		Su	b-Sur	fac	e Lo	DC	J				Te	st Ho	ole 1	[H1]	2-2 1 of	-
			ICAL																
Clien		<u>CH2MH</u> Waste (ILL Composting Fa	cility Brady	Road		Proje	ct Numbeı ion:		0068 UTM			177.989, E	-62995	0.647				_
-	ractor:		Corilling Ltd.					nd Elevati							0.0.11				
Meth	od:	125 mm	Solid Stem A	uger, CME-	850 Track Mount		Date	Drilled:		June	28, 2	012		_					
	Samp	le Type:		Grab (G)	Sh	elby Tube (T)	\boxtimes	Split Spoo	on (S	SS)		Split B	arrel (SB)		Core	(C)			
	Partic	le Size Le	gend:	Fines	Clay	Silt		Sa	nd	•		Grave	1 67	Cobb	oles		Boul	ders	
Elevation (m)	Depth (m)	Soil Symbol		MA	TERIAL DESCRIF	PTION			Sample Type	Sample Number	SPT (N)	0 20	Particle Size) 9 20 e (%)	00	Stre	ained S ength (H est Typ Forvane cket P ⊠ Qu ⊵ eld Var 00 15	kPa) <u>pe</u> e ∆ en. Ф ⊲ ne ⊖	1
233.5 232.2 231.9 230.3		orga diam CLA preci -brov CLA CLA	 inics (wood mu.) mottled grey moist, firm high plasticit Y - silty, trace of pitates (<1 mn black dry to moist, high plasticit vn below 2.1 m Y - silty, trace fittion medium bro Y - silty, trace fittion motiled brow most, stiff high plasticit 	Ich <75 mn and brown ty organics (rc n diam.) stiff ty fine sand, tr wn, moist, s medium sar vn and grey ty LE AT 4.6 r	ootlets <10 mm dia	am.), trace silt ind am.), trace oxic tlets <1 mm dia res (<5 mm dia	lation, tr am.), tra	ace		G98 G99 G100 G101 G102 G103 G104	-								
		belov 3) Te	v ground surfa est hole was ba	ce. ackfilled with	ately 15 minutes a h cuttings to 1.2 m est hole from 0.3 m	n below ground	surface												
Logg	ed By:	Tom Hilda	hl		Reviewed By	: Kent Bann	ister			_	Proje	ct Eng	gineer: _	Kent Ba	nnister				

FREK
GEOTECHNICAL

lient:	CH2MHILL				Proje	ct Number	:	0068	3 002	00							
roject Name:	Waste Compos	sting Facility Brady I	Road		Locat	ion:		UTM	1 14 N	-5513	217.8	92, E-	630031	794			
ontractor:	Paddock Drilling	g Ltd.			Grour	nd Elevatio	on:	235.	09 m	Existin	ng Gro	ound	_				
lethod:	125 mm Solid S	Stem Auger, CME-8	350 Track Mount		Date I	Drilled:		June	e 28, 2	012			-				
Sample	е Туре:	Grab (G)	She	elby Tube (T)	\square	Split Spoo	n (S	SS)		Split E	Barrel	(SB)		Core	(C)		
Particle	e Size Legend:	Fines	Clay	Silt		Sar	nd			Grave	el	67	Cobble	s		Boul	ders
							Type	ample Number	(N)	16 1	17 1	ulk Unit kN/m ³) 8 19 le Size	20 2		Stre <u>T</u> e	ained S ngth (k est Typ orvane	(Pa)
Depth (m) (m) (m)		MAT	ERIAL DESCRIP	TION			Sample Type	Sample N	SPT		20 4 PL	0 60 MC	80 100 LL 		● Po ◎ ○ Fi	cket Pe Qu ⊠ eld Var 00 15	en. Φ ⊴ ne ⊖
	Coarse grave	- silty, some munici el led grey and brown,				d, trace											
	-wet below (G10			•								
<u>34.0</u> -1.0-		late <1 mm dia	am) tra		1	G106	-			•		2	2				
33.9	oxidation, m	, trace fine sand, tra edium brown, mois , trace medium san	ty	ann.), u c			G107			•							
-1.5-	- light - mois	to dark grey t, firm to stiff plasticity						G108	В		•	•			•		
	- medi - mois	y, trace organics (ro um brown t, soft plasticity	ootlets <1 mm dia	m.) trace oxida	ation			G109	9		•			\$			
2.5								G11(0		•						
32.1 3.0	firm, high pl	, trace medium san asticity y, trace organics (re				moist,								40			
31.5	- medi - mois	um brown)				G11 [,]	1		•			4			
4.0	CLAY - silty, trace medium sand, trace precipitates - mottled brown and grey - moist, firm - high plasticity -25 cm silt seam at 3.7 m																
30.5 4.5						G112	2			•			•				
		ST HOLE AT 4.6 m	1 IN CLAY						1						1		
	 2) Seepage drilling. 3) Test hole 	was squeezing in a was observed at 0. was open to 2.1 m	6 m below ground below ground sur	surface on co face.													
	Test hole	was backfilled with	cuttings to 1.2 m st hole from 0.3 m	below ground	surface	e. One bag											

	EK
GEOTECHN	ICAL

GE	OTEC	HNIC	AL															
Clien	t: <u>C</u> l	H2MHILL				Proje	ct Numbe	er:	0068	002 (00							
Proje	ct Name: W	aste Compos	ting Facility Brady I	Road		Loca	tion:	-	UTM	14 N-	-5513	3270.	403, E-	630092.3	92			
Contr	ractor: Pa	addock Drilling	g Ltd.			Grou	nd Elevati	ion:	235.0)7 m E	Existi	ing Gr	round	-				
Metho	od: <u>12</u>	25 mm Solid S	Stem Auger, CME-8	50 Track Mount		Date	Drilled:	-	June	28, 2	012			_				
	Sample T	ype:	Grab (G)	She	elby Tube (T)	\bowtie	Split Spo		SS)	X	Split	Barre	el (SB)	C	core (C	C)		
	Particle S	ize Legend:	Fines	Clay	Silt		Sa	and			Grav		62	Cobbles			Bould	
Elevation (m)	L Depth (m) Soil Symbol	REFUSE (F	ill) - clayey, trace to	ERIAL DESCRIP	coarse grave	I, trace	to some	Sample Type	Sample Number	SPT (N)	0	17 Part 20 PL	MC	20 21	•	Stren <u>Tes</u> △ To Pocl ○ Fiel	ned Sł gth (kł st Type rvane ket Per Qu ⊠ d Vano 0 150	Pa) ≙ ∆ n. Ф
234.0		organics (wo waste (plast	ood mulch <75 mm ics, scrap metals, c ed grey and brown t, soft	diam.), trace glass	s, trace to sor	ne mun	iciple		G113	-		•						
233.2		organics - mottl - mois - high	plasticity		0				G114	-						•		
		precipitates - black - mois - high			rootlets <1 m	m diam	.), trace		G115									
									G116	-								
									G117	-						.		
230.5	4.5-	-firm to stiff	below 4.4 m						G118				•		۵			
230.5		Notes: 1) Test hole 2) Seepage drilling. 3) Test hole 4) Test hole bag of bento	ST HOLE AT 4.6 m was squeezing in a was observed at 0.0 was open to 2.1 m was backfilled with onite was used in th	t 1.2 m below grou 6 m below ground below ground surf cuttings to 1.2 m e test hole from 0.	surface on co face. below ground 3 m to the su	surface.												
Logg	ed By: Tom	Hildahl		Reviewed By:	Kent Bann	ister			_	Proje	ct Ei	ngine	er: <u>K</u>	ent Banni	ster			

LI C			HNIC 12MHILL	нс					Proie	ct Number	r:	0068	002 (00							
				sting Facility Br	ady Roa	ad			Loca		•				329.1	56, E-	630168	.928			
-	actor:		ddock Drillin						Grou	nd Elevatio	on:	234.2	24 m l	Existi	ng Gro	ound	_				
Metho	od:	_12	5 mm Solid	Stem Auger, C	ME-850	Track N	<i>l</i> ount		Date	Drilled:		June	28, 2	012			_				
	Sa	mple Ty	vpe:	Grab	G)		She	lby Tube (T)	\bowtie	Split Spoo	on (SS)		Split	Barrel	(SB)		Core	(C)		
	Pa	rticle Si	ze Legend:	Fine	s	//// с	lay	Silt		Saı	nd	۲		Grav	el	62	Cobble	es		Boul	lders
											0	er			□ Bι (ulk Unit kN/m³) 8 19	Wt			rained S ength (k	
tion	₽ C	Soil Symbol									Sample Type	ample Number	(N	16		8 19 de Size		1	I	est Typ	<u>be</u>
Elevation (m)	Depth (m)	il Sy			MATEF	RIAL DES	SCRIPT	ION			nple	ple N	SPT	0	20 4	0 60	80 10	D	Pc	Torvane ocket Pe ⊠ Qu ⊠	en. 🕈
Ш		So									Sar	Sam	0)			MC			ΟF	ield Var	ne 🔿
			CLAY (Fill)	- silty, trace to	some s	and. trac	e coars	e gravel (<25	i mm di	am.). trace	-	0,		0	20 4	0 60	80 10	0 0	50 1	100 15	50 20
-			to some org (<25 mm di	anics (wood m	ulch <7	5 mm dia	am.), tra	ace glass, tra	ce silt i	nclusions				-				-			
-			` - mott	led black and b	rown																
	-0.5-			st, stiff mediate plastic	ity																
-												G119			•						
-	-1.0-													-				-			
233.0			CLAY - siltv	/, trace organic	s (rootle	ets <10 n	nm dian	n.). trace oxid	ation. t	race		G120									
-				(<1 mm diam.				,,				G120			•				2	\ •	
			- mois	st, stiff plasticity																	
-				own and grey b	elow 1.4	l m															
	-2 0-																				
-																			<u> </u>		
												G122			•					•	
231.6 231.5				ne silt, trace fin	e sand,	trace ox	idation,	medium brow	vn, moi	st, soft,		G123			•				0		
201.0			low plasticit	y /, trace medium	sand	trace nre	cinitate	<u> </u>			/										
-	3.0-		- mott	led brown and	grey		cipitates	5													
-			- mois - high	st, firm to stiff plasticity																	
-												G124									
-	-3.5-																				
-											P								4		
-														-				-			
-	4.0																				
ł																			1		
												G125						0			
229.7	-4.5-																		<u>م</u>		
			END OF TE Notes:	EST HOLE AT 4	.6 m IN	I CLAY															
			1) Test hole	was squeezing was dry appro	in at 3	.1 m belo	ow grou	nd surface.	onen t	0.3.1 m											
			below grour	nd surface.				-													
			3) lest hole	was backfilled onite was used	with cu	tings to	1.2 m b	pelow ground	surface	e. One											

FREK
GEOTECHNICAL

Sub-Surface Log

Client	··	CH2	MHILL						Proie	ct Numbe	r.	0068	8 002	00							
	-			ting Facility E	Brady R	oad			Loca						66.386, I	=-630	232 24	16			
	_		lock Drillin		Diady it	000				nd Elevati	-						202.27	10			
Metho				Stem Auger, (CME-85	50 Track M	lount			Drilled:			e 28, 2	-	Cround						
				a			_														
	Sample			Grat			_	by Tube (T)	\square	Split Spo		50)		-	arrel (SB			ore (C			
	Particle	e Size	Legend:	Fir	nes	Cl	ay	Silt		Sa	and			Gravel	52 ⊡ Bulk Ur	_	obbles	<u> </u>		Bould	
	_	5									e	lber		16 17	(kN/m]] 3) 19 2	20 21		Indraii Stren		
Elevation (m)	Depth (m) Soil Symbol							~			Sample Type	Sample Number	Î		Particle Siz				<u>Tes</u> ∆ To	<u>t Type</u> rvane	
(T)	Depth (m)				MATE	RIAL DES	SCRIPTI	ON			mple	ple I	SPT	0 20		1	30 100	•	Pock	tet Pe Qu ⊠	n. 🗭
ш	, v	5									Sai	Sam							⊃ Fiel	d Van	e 🔿
		X	AND and (GRAVEL (Fill	l) - clave	21/						0)		0 20	40 6	30 8	30 100 0	50	100	150	2002
	= 💥	\otimes	- black	, dry, loose, s			raded co	parse sand t	o medii	um gravel											
		(<	<50 mm dia	am.)								G126	6	•							
233.8	-0.5-***	Жc	LAY (Fill)	- silty, trace s	sand tra	ice coarse	oravel	trace to som	e orgar	nics (wood	-										
		Жr	ulch <75 r	nm diam.), tr	race glas	ss, trace si	It inclus	ions (<25 m	m diam	i.)											
-	= = = = = = = = = = = = = = = = = = = =	\otimes	- dark - mois																		
-		\otimes		plasticity																	
-	- '' - 💥	\otimes										G127	7		•					•	
-	= 🔣	\otimes										0121	-		•				-	-	
-		\otimes																			
-	-1.5-	\otimes																			
000 5		\otimes																			
232.5	- 1	Żc	LAY - silty									G128	8		•					4	b
232.2	2.0			grey, moist, s	-								1		-						
232.0		C		, trace fine sa um brown, m								G129	9		•						
202.0		C	LAY - silty	, trace mediu	im sand			i													
-	-2.5-		- mottl - mois	ed brown and	d grey																
-	11			plasticity																	
-	//											G130	D		•			Z	<u> </u>	•	
	-30-																				
-	//										Π		_								
ļ	= = 11											~ . ~									
-												G13′	1								
Ī																					
	: <i>1</i> //												1						•		
ł	11																				
	-4.0-																				
-	//																				
ļ	= =//											G132	2		•			4			
229.7	-4.5-																				
			ND OF TE otes:	ST HOLE AT	4.6 m l	N CLAY															
		1) Test hole	was squeezir						•											
) Test hole elow groun	was dry appr d surface.	roximate	ly 15 minu	ites afte	r drilling and	l open t	o 2.4 m											
		3) Test hole	was backfille	ed with c	uttings to	1.2 m b	elow ground	surfac	e. One											
		b	ag of bento	onite was use	ed in the	test hole f	rom 0.3	m to the su	rtace.												
Logge	ed By: _To	om H	ildahl			Review	ed By:	Kent Bann	ister				Proje	ect Engi	ineer:	Kent	Bannis	ter			

FREK	
GEOTECHNICA	

Client:	CH2MHILL			Proie	ct Number	: (0068	002 (00								
Project Name:		ting Facility Brady F	Road		Loca						119.6	687, E-	630131	.593			
Contractor:	Paddock Drilling				Grou	nd Elevatio											
Method:		Stem Auger, CME-8	50 Track Mount			Drilled:			3, 201		0 -		_				
Sampl	е Туре:	Grab (G)	She	lby Tube (T)	\square	Split Spoo				Split I	Barre	I (SB)		Core	(C)		
	e Size Legend:	Fines	Clay	Silt		Sar				Grave		62	Cobble		. ,	Bould	ore
Faitici	le Size Legeriu.					<u>°,•,•</u> , Sai					B	ulk Unit	Wt			ined Sh	
<u>د</u>	<u>o</u>						ype	Sample Number		16 1	17 1	(kN/m ³) 18 19	20 2	1		igth (kF st Type	,
Elevation (m) Depth (m)	myo	МАТ	ERIAL DESCRIPT	ION			le	Nu	L (N			cle Size	. ,			orvane .	Δ
							Sample Type	mple	SPT	0 2	20 4 PL	MC 60	80 10		\boxtimes	ket Per Qu⊠ Id Vane	
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						S	Sa		0 2	20 4	0 60	80 10	0 0	50 10		
	CLAY (Fill) -	- silty, trace sand, tr	ace coarse gravel,	trace to som	e orgar	nics											
E 38	- brow		giass, trace sit in		minu	d111.)											
F	- moisi - hiah	t, soft plasticity															
-0.5-	×								-								
E 🕉	\bigotimes							5133	-			٠		•			
		ck and brown below	0.0 m														
-1.0-			0.9111					2404	-								
233.0	CLAY - siltv	, trace silt inclusions	s (<5 mm diam)					6134				•			4		
	- mottl	ed black and brown	. ,							-							
-1.5-	- mois	t, stiff, high plasticit	y														
								5135							/ 0		
232.1 2.0		trace evidetion me	dium brown, maio	t ooft low al													
232.0		, trace oxidation, me			asticity			6136	-		-						
	- mottl	ed brown and grey		5													
-2.5-	- moisi - high	t, stiff plasticity															
		. ,							-								
								5137	-			•					
<u>231.1</u> 3.0																	
	Notes:	ST HOLE AT 3.1 m	IN CLAY														
	1) Test hole	was squeezing in a was dry approximat	t 1.8 m below grou	ind surface. er drilling and	onen t	o 1 8 m											
	below groun	d surface.															
	bag of bento	was backfilled with onite was used in the	e test hole from 0.2	3 m to the su	surrace.	e. One											
Logged By: _]	Fom Hildahl		Reviewed By:	Kent Bann	ster		_	-	Proie	ct En	aine	ər K	ent Ban	nister			

			RE	K	Sul	o-Sur	face	e Lo)Q	J				Tes	st H	ole⊺	[H1:	2-26 1 of 1	
				HL															
Clien			H2MHILL				Project			0068									
-				sting Facility Brady F	Road		Location		-				90.969, E		7.945)			
Conti			addock Drillin	-									Ground	_					
Meth				Stem Auger, CME-8			Date Dri			July 3									
	Sa	mple T	ype:	Grab (G)	She	elby Tube (T)		olit Spoo	n (S	. 19		Split B	arrel (SB)		Cor	e (C)			
	Pa	rticle Si	ize Legend:	Fines	Clay	Silt	* *	🔅 Sar	nd	۲		Gravel	62	Cobb	les		Boul	ders	
Elevation (m)	Depth (m)	Soil Symbol			ERIAL DESCRIPT				Sample Type	Sample Number	SPT (N)	16 17 I 0 20	Particle Siz) 9 20 2 e (%) 0 80 10 LL	00	Stre ← Po © Fi 50 1	ained S ength (k est Typ Forvane cket Pe ⊠ Qu ⊠ eld Var 00 15	(Pa) <u>e</u> è∆ en. Φ 3	250
233.5			plasticity CLAY - silty - brow - mois			n diam.), grey.	, moist, tin	n, nign		G138 G139 G140 G141									
			Notes: 1) Test hole 2) Test hole below groun 3) Test hole	ST HOLE AT 3.1 m was squeezing in a was dry approximat id surface. was backfilled with onite was used in th	t 1.8 m below grou tely 15 minutes aft cuttings to 1.2 m l	er drilling and below ground	surface. C		· · · · ·										

GEOTECHNICAL

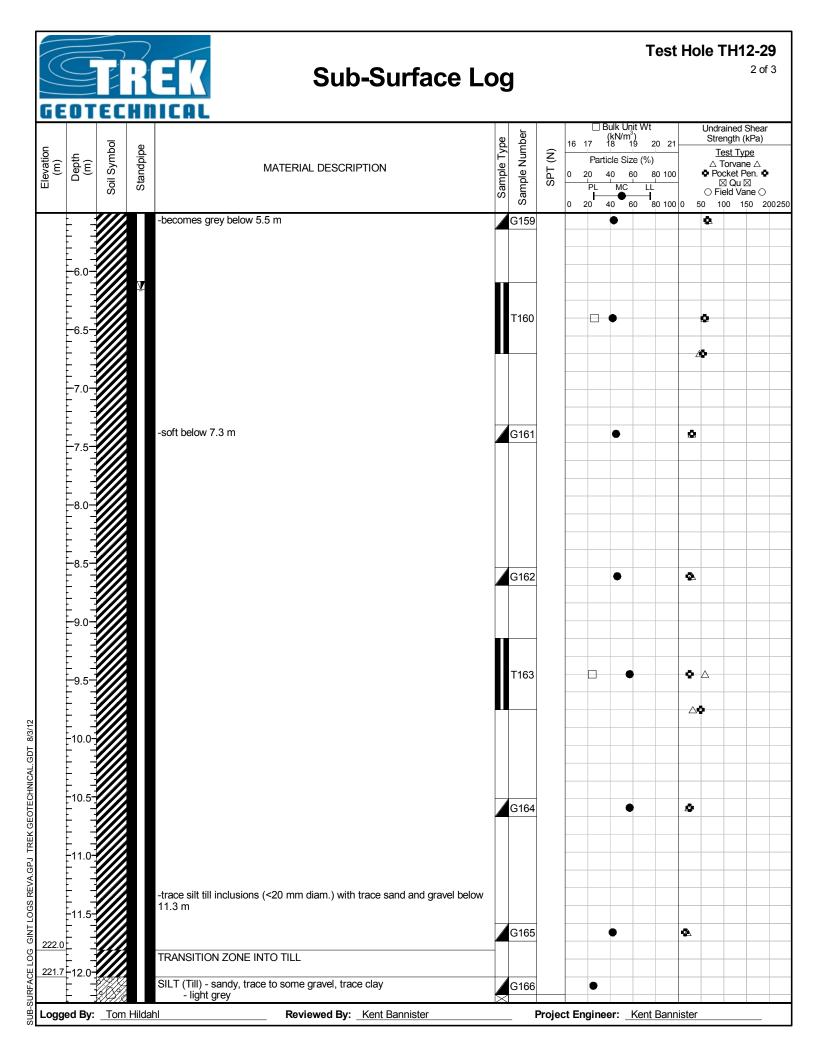
<u>GEOTE</u>	<u>CHNIC</u>	AL												
Client: _(CH2MHILL				Project Nu	mber:	0068	002 0	00					
Project Name: _\	Naste Compos	ting Facility Brady F	Road		Location:		UTM [·]	14 N-	5512946	.115, E-	630005.79	96		
Contractor:	Paddock Drilling	g Ltd.			Ground Ele	vation	233.68	8 m E	Existing C	Ground				
Method:	125 mm Solid S	Stem Auger, CME-8	50 Track Mount		Date Drille	d:	July 3	, 201	2					
Sample	Туре:	Grab (G)	She	lby Tube (T)	Split	Spoon ((SS)		Split Barı	el (SB)	Co	ore (C)		
Particle	Size Legend:	Fines	Clay	Silt	**** ****	Sand	•		Gravel	62	Cobbles		Boulde	ers
Elevation (m) Depth (m) Soil Symbol		MAT	ERIAL DESCRIPT	ION		Sample Type	Sample Number	SPT (N)	16 17	Bulk Unit (kN/m ³) 18 19 ticle Size 40 60 MC 40 60	20 21	Stre	ained Sh ength (kP est Type Forvane ∠ cket Pen ⊠ Qu ⊠ eld Vane 00 150	a) ●
		CLAY (Topsoil) - tra		ı diam.)			C142							
233.5		moist, firm, high pl trace organics (roo	,)			G142							
233.2	- mottle	ed black and brown	, moist, firm, high	plasticity			G143					$\triangle 0$		
		y, trace oxidation um brown												
232.9	- moist CLAY - silty	t, soft, low plasticity	,			/	G144					∆ ∲		
	- mottle - moist	ed brown and grey t, stiff plasticity												
		itates (<5 mm dian					G145 G146 G147							
	Notes: 1) Test hole 2) Test hole below ground 3) Test hole	was squeezing in a was dry approximat	t 1.5 m below grou ely 15 minutes afte cuttings to 1.5 m b	er drilling and below ground	surface. One									
Logged By: _To	m Hildahl		Reviewed By:	Kent Bann	ster		F	Projec	ct Engin	eer: K	ent Bannis	ter		_

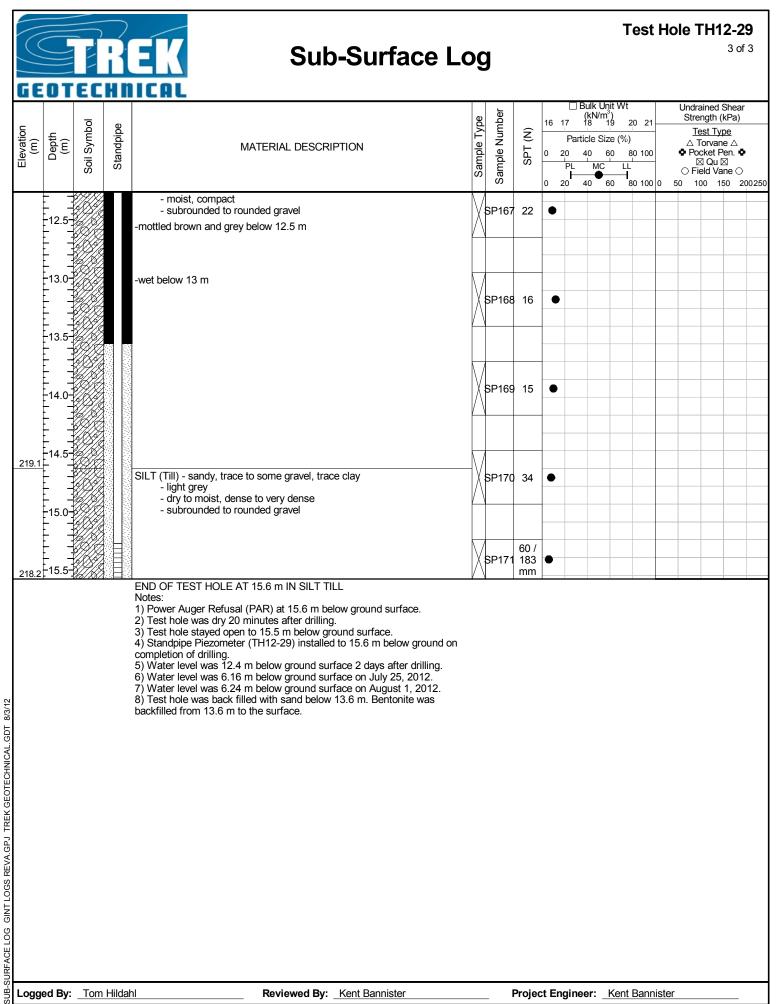
TREK
GEOTECHNICAL

Client:	CH2MHILL				Proje	ct Numbe	r:	0068	002 (00						
Project Name:	Waste Comp	osting Facility Brady F	Road		Loca	tion:		UTM	14 N	-5513	079.099), E-6	30048.45	57		
Contractor:	Paddock Dril	ling Ltd.			Grou	nd Elevati	on:	233.5	52 m l	Existin	g Grour	nd				
Method:	125 mm Soli	d Stem Auger, CME-8	50 Track Mount		Date	Drilled:		July 3	3, 201	12						
Samp	е Туре:	Grab (G)	Sh	elby Tube (T)	\boxtimes	Split Spor	on (S	SS)		Split E	Barrel (S	SB)	Co	ore (C)		
Partic	e Size Legend	: Fines	Clay	Silt		Sa	nd	٠		Grave	a 6	2	Cobbles		Bould	lers
Depth (m)		MAT C CLAY (Topsoil) - tra	ERIAL DESCRIF				Sample Type	Sample Number	SPT (N)		Particle 0 40 PL M	/m ³) 19 Size (60	20 21 %)	Str 	Irained Sl rength (kl Test Type Torvane ocket Pe ⊠ Qu ⊠ Field Van 100 150	Pa) ≙ ∩. √ n. √
233.0 0.5	<u></u>							G148			•					
232.8	- me	edium brown, dry to m	oist, soft, low pla	sticity				G149			•					
	- ma - ma - hig	Ity, trace precipitates ottled brown and grey pist, firm to stiff gh plasticity nick silt seam at 1.2 m						G150							0	
								T151								
230.5 - 3.0 -		iff below 2.9 m						G152				•				
	Notes: 1) Test ho 2) Test ho below gro 3) Test ho	TEST HOLE AT 3.1 m le was squeezing in a le was dry approximat und surface. le was backfilled with ntonite was used in the	: 1.5 m below gro ely 15 minutes a cuttings to 1.2 m	fter drilling and	surface											



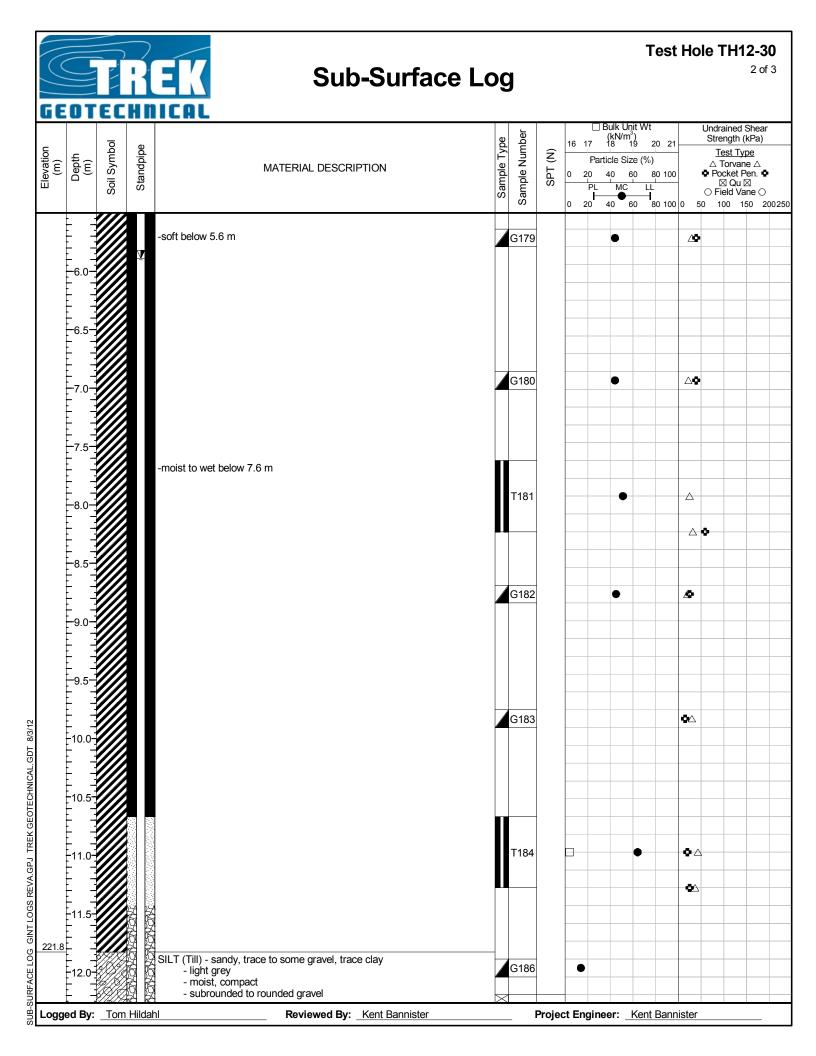
CH2MHIL	L			Project Number:	:	0068	002 (00							
		Road		Location:	_				37.651, E-	629994.32	1				
				Ground Elevatio	_	233.78 m Existing Ground									
		850 Track Mount		Date Drilled:	_				-	-					
le Type:	Grab (G)	She	lby Tube (T)	Split Spoor	n (S	S)		Split B	arrel (SB)	Co	re (C)				
le Size Lege	end: Fines	Clay	Silt	San	nd	•		Gravel	6	Cobbles		Boulders			
ill Legend:	Bentonite S		· E:	Slotted Pipe	BI	ank Ca	asing		* :						
Soil Symbol Standpipe	ORGANIC CLAY (Tops	MATERIAL DESCR		diam.)	Sample Type	Sample Number	SPT (N)	0 20 F	(kN/m ³) 18 19 Particle Size 40 60 PL MC	20 21 (%) 80 100 LL	Stre	ained Shear ength (kPa) est Type Torvane ∆ ocket Pen. ♠ ⊠ Qu ⊠ ield Vane ○ 00 150 20			
. <u></u>	- dry, firm - high plasticity -moist below 0.3 m SILT - clayey, trace oxid	ation				G153			•						
	- medium brown - dry to moist, soft - low plasticity CLAY - silty, lamitated (<2mm thick)				G154			•						
	- moist, stiff - high plasticity -10 mm thick silt seam a -trace precipitates (<5 r	at 1.4 m	3 m			G155									
	-firm below 2.6 m										•				
						G158									
	Waste Co Paddock I 125 mm S le Type: le Size Lege ill Legend:	Waste Composting Facility Brady Paddock Drilling Ltd. 125 mm Solid Stem Auger, CME- Ie Type: Grab (G) le Size Legend: Fines ill Legend: Bentonite S Image: Step Step Step Step Step Step Step Step	Waste Composting Facility Brady Road Paddock Drilling Ltd. 125 mm Solid Stem Auger, CME-850 Track Mount le Type: Grab (G) Ie Size Legend: Fines Il Legend: Bentonite Seal Image: Step Step Step Step Step Step Step Step	Waste Composting Facility Brady Road Paddock Drilling Ltd. 125 mm Solid Stem Auger, CME-850 Track Mount le Type: Grab (G) Site Legend: Fines Bentonite Seal Filter Pack Sand Sand It Legend: Bentonite Seal Site Sand Sand Sand	Waste Composting Facility Brady Road Location: Paddock Drilling Ltd. Ground Elevation 125 mm Solid Stem Auger, CME-850 Track Mount Date Drilled: le Type: Grab (G) Shelby Tube (T) Split Spoo le Size Legend: Files Silt Silt Silt ill Legend: Bentonite Seal Filter Pack Slotted Pipe Slotted Pipe Ill Legend: Bentonite Seal Filter Pack Slotted Pipe Slotted Pipe Ill Legend: Bentonite Seal Filter Pack Slotted Pipe Slotted Pipe Ill Legend: Bentonite Seal Filter Pack Slotted Pipe Slotted Pipe Ill Legend: Bentonite Seal Filter Pack Slotted Pipe Slotted Pipe Ill Legend: Bentonite Seal Filter Pack Slotted Pipe Slotted Pipe Ill Legend: Bentonite Seal Filter Pack Slotted Pipe Slotted Pipe Ill Legend: Bentonite Seal Filter Pack Slotted Pipe Slotted Pipe Ill Legend: Slotted Pipe MATERIAL DESCRIPTION ORGANIC CLAY (Topsoil) - silty, some rootlets (<5 mm diam.)	Waste Composting Facility Brady Road Location: Paddock Drilling Ltd. Ground Elevation: 125 mm Solid Stem Auger, CME-850 Track Mount Date Drilled: Terpe: Grab (G) Shelby Tube (T) Split Spoon (S le Size Legend: Fines Site State Split Spoon (S Selety Tube (T) Split Spoon (S le Size Legend: Fines Site Split Spoon (S Solid Pipe B op MATERIAL DESCRIPTION Solid Pipe B op MATERIAL DESCRIPTION Solid Pipe B op ORGANIC CLAY (Topsoil) - silty, some rootlets (<5 mm diam.)	Waste Composting Facility Brady Road Location: UTM Paddock Drilling Ltd. Ground Elevation: 233.7 125 mm Solid Stem Auger, CME-850 Track Mount Date Drilled: July 3 Ite Type: Image: Grab (G) Shelby Tube (T) Split Spoon (SS) Ite Size Legend: Image: Grab (G) Shelby Tube (T) Split Spoon (SS) Ite Legend: Image: Grab (G) Filter Pack Slotted Pipe Blank Ca Ite Legend: Image: Grab (CLAY (Topsoil) - silty, some rootlets (<5 mm diam.)	Waste Composting Facility Brady Road Location: UTM 14 N Paddock Drilling Ltd. Ground Elevation: 233.78 ml 125 mm Solid Stem Auger, CME-850 Track Mount Date Drilled: July 3, 201 te Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Image: Split Spoon (SS) te Size Legend: Image: Split Spoon (SS) Image: Split Spoon (SS) Image: Split Spoon (SS) Image: Split Spoon (SS) iii Legend: Image: Split Spoon (SS) Image: Split Spoon (SS) Image: Split Spoon (SS) Image: Split Spoon (SS) 00 Image: Split Spoon (SS) Image: Split Spoon (SS) Image: Split Spoon (SS) Image: Split Spoon (SS) 10 Image: Split Spoon (SS) Image: Split Spoon (SS) Image: Split Spoon (SS) Image: Split Spoon (SS) 11 Legend: Image: Split Spoon (SS) Image: Split Split Split Spoon (SS) Image: Split Sp	Waste Composting Facility Brady Road Location: UTM 14 N-55130 Paddock Drilling Ltd. Ground Elevation: 233.78 m Existing 125 mm Solid Stem Auger, CME-850 Track Mount Date Drilled: July 3. 2012 le Type: Grab (G) Shelby Tube (T) Split Spcon (SS) Split B le Size Legend: Image: Split Spcon (SS) Split Spcon (SS) Split B lil Legend: Bentonite Seal Solited Pipe Benk Casing Gravel Image: Split B Benk Casing Gravel ORGANIC CLAY (Topsoil) - silty, some rootlets (<5 mm diam.)	Waste Composing Facility Brady Road Location: UTM 14 N-5513037.651, E Paddock Drilling Ltd. Ground Elevation: 233.78 m Existing Ground 125 mm Solid Stem Auger, CME-850 Track Mount Date Drilled: July 3, 2012 le Type: Grab (G) Shetby Tube (T) Split Spoon (SS) Split Barrel (SB) le Size Legend: Fines Clay Split Spoon (SS) Split Barrel (SB) lil Legend: Bentonite Seal Split Spoon (SS) Split Barrel (SB) of group MATERIAL DESCRIPTION Split Barrel (SB) Split Barrel (SB) of group MATERIAL DESCRIPTION Split Spoon (SS) Split Barrel (SB) of group MATERIAL DESCRIPTION Split Spoon (SS) Split Barrel (SB) of group MATERIAL DESCRIPTION Split Spoon (SS) Split Spoon (SS) Split Spoon (SS) of group MATERIAL DESCRIPTION Split Spoon (SS) Split Spoon (SS) Split Spoon (SS) of group MATERIAL DESCRIPTION Split Spoon (SS) Split Spoon (SS) Split Spoon (SS) of group MATERIAL DESCRIPTION Split Spoon (SS) Split Spoon (SS) Split Spoon (SS) Silt - clayer, trace ox	Waste Compositing Facility Bredy Road Location: UTM 14 N-5513037 651, E-629994.32 Paddock Drilling Ltd. Ground Elevation: 233.78 m Existing Ground 125 mm Sold Stem Auger, CME-850 Track Mount Date Drillet: July 3, 2012 ite Type: Grab (G) Shelby Tube (T) Split Spoon (SS) Split Barrel (SB) C could be	Waste Composting Facility Brady Road Location: UTM 14 N-5613037.651, E-629994.321 Paddock Drilling Ltd. Ground Elevation: 233.78 m Existing Ground 125 mm Solid Stem Auger, CME-850 Track Mount Date Drilled: July 3, 2012 Le Type: Grab (G) Shelty Tube (T) Split Spoon (SS) Split Barrel (SB) Core (C) Is Size Legend: Bentonie Seel Split Park Slotted Pipe Blank Caing Bentonie Seel Split Spoon (SS) Split Barrel (SB) Core (C) 0 Bentonie Seel Split Park Slotted Pipe Blank Caing 0 Bentonie Seel Split Spoon (SS) Split Barrel (SB) Core (C) 0 Bentonie Seel Split Spoon (SS) Split Barrel (SB) Core (C) 0 Bentonie Seel Split Spoon (SS) Split Spoon (SS) Split Barrel (SB) Core (C) 0 MATERIAL DESCRIPTION Split Spoon (SS) Split Spoon (SS) Split Spl			







UCUIC		M C											
-	CH2MHILL				Project Number			10000	-				
		sting Facility Brady Roa	ad		Location:			13039.323		4.993			
	Paddock Drilling		Trook Mount		Ground Elevation								
		Stem Auger, CME-850			Date Drilled:			July 5, 201			(0)		
Sample		Grab (G)		by Tube (T)	Split Spoc			lit Barrel (S	·	Core			
	e Size Legend:	Fines	Clay	Silt	Saı		Gra		Cobb	les	N.	Bould	ders
Backfill	Legend:	Bentonite Seal	Filter Pack Sand		nd at ttom	Slough E	ackfill	Slotted	· ·	В	Blank C	-	
	ξω					'pe nber	16	Bulk (kN/ 17 18	Unit Wt m ³) 19 20 2	21	Stre	ained S ngth (k	Pa)
Elevation (m) Depth (m)	Standpipe	MA	TERIAL DESCRI	PTION		Sample Type Sample Number	SPT (N)	Particle S			ΔT	est Typ orvane	eΔ
	Star					amp mple	-dS	20 40 PL M	60 80 10 C LL	00	Σ	cket Pe I Qu ⊠ eld Var]
						Sa	0	20 40	60 80 1	00 0 9			0 2002
233.4		ANIC CLAY (Topsoil) - - black, moist, firm, hi	 silty, some rootle plasticity 	ets (<5mm dia	ım.)	G172		•					
	CLAY	' - silty, trace precipitat		5 mm diam.)									
-0.5		- grey - moist, stiff											
		- high plasticity											
						G173		•			\triangle	۰	
-1.0-													
	-low p	plasticity from 1.3 to 1.	5 m			G174		•			٠		
-1.5-	-trace	silt inclusions (<10 m	m diam.) below 1	l.5 m									
//			,										
						T175							
-2.0-											•		
	-firm I	below 2.6 m				G176		•			•		
-3.0-													
Logged By:													
-3.5-													
						G177		•)		•		
4.0-													
-4.5-							-						
						T178				_	۵		
											^ 0		
Logged By: _T	om Hildahl		Reviewed By:	Kent Bannist	er	F	Project E	Engineer:	Kent Ba	nnister			

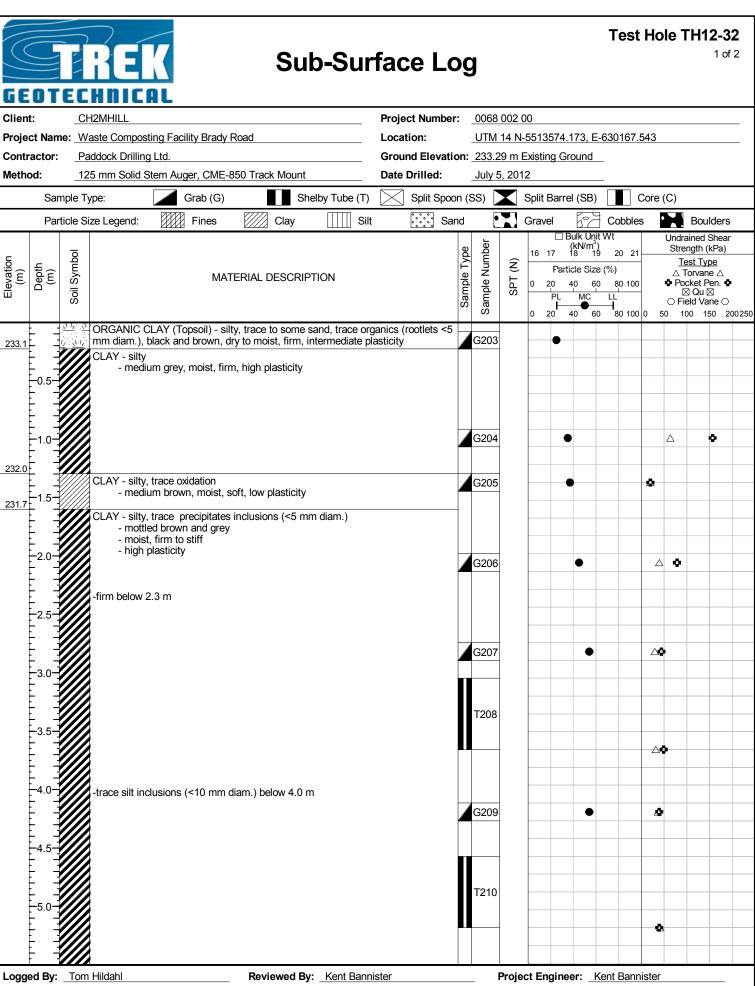




				ICAL	Type	umber	ź	16	□ Bulk (kh 17 18 Particle	√m³) 19	20 2	1	Stre T	ained Sh ength (kP est Type	a)
Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)		20 40 PL I	60 / //C	80 10 LL 80 10	1	∲ Po [○ Fi	Forvane cket Per ⊠ Qu ⊠ eld Vane 00 150	. • 0
	12.5		CINCINCIN CINCINCIN		X	SP1	87 20		• • • • • • • • • • • • • • • • • • •						
	-13.0 -13.0		NGNGNGNGNGN			SP1	88 31	•							
	-14.0		Lananananana Lananananana			SP1	89 33	•							
218.7	-14.5		NONONONONON	SILT (Till) - sandy, trace to some gravel, trace clay - light grey		SP1	90 29	•							
217.9	-15.5			- dry to moist, dense to very dense - subrounded to rounded gravel		SP1	91 100	•							
				 END OF TEST HOLE AT 15.7 m IN SILT TILL Notes: 1) Power Auger Refusal (PAR) at 15.7 m below ground surface. 2) Test hole squeezed in at 11.4 m below ground surface. 3) Test hole was dry 20 minutes after drilling. 4) Standpipe Piezometer (TH12-30) installed to 15.6 m below ground on completion of drilling. 4) Water level was 5.89 m below ground surface on July 25, 2012. 5) Water level was 5.96 m below ground surface on August 1, 2012. 6) Test hole was back filled with sand below 13.6 m. Bentonite was backfilled from 13.6 m to the surface. 											
	od By	: _Tom	Hilda	Reviewed By: Kent Bannister			Proje								

\subseteq		111	REK Sub-Su	rface	Lo	g				T	est H	lole ⁻	ΓH1:	2-31 1 of 2
Client: Project Contrac Method:	Name	<u>CH</u> e: <u>Wa</u> Pao	HINICAL H2MHILL aste Composting Facility Brady Road Iddock Drilling Ltd. 5 mm Solid Stem Auger, CME-850 Track Mount	Project N Location: Ground E Date Drill	levatio	<u>UTM</u> n: <u>233</u> .		-55135 Existin	508.6, E- g Ground		0.85			
	Sam	ple Ty	vpe: Grab (G) Shelby Tube	r) 🔀 Spl	it Spoon				Barrel (SE	3)	Со	re (C)		
	Part	icle Siz	ze Legend: Fines Clay	Silt 🕴	Sano			Grave			bbles		Boul ained S	
Elevation (m) Denth	(m)	Soil Symbol	MATERIAL DESCRIPTION			Sample Type Sample Number	SPT (N)	0 2	(kN/n 7 18 Particle S 0 40 PL MC	n ³) 19 20 ize (%) 60 80 LL	0 21 0 100 0 100 0	Stre	ength (k est Typ Torvane icket Pe ⊠ Qu ⊠ ield Var	(Pa) <u>e</u> e ∆ en. Φ
233.6	0.5	1. 1.11	ORGANIC CLAY (Topsoil) - silty, trace to some sand, trace mm diam.), black and brown, dry to moist, very stiff, low pla CLAY - silty, trace coarse sand, trace precipitates (<25 mn - medium grey, - dry, very stiff - high plasticity	ticity	ets <5 -	G21:	3		•					
	1.0 1.1 1.0		-moist and stiff below 0.9 m		4	G214	1						<u> </u>	•
1 	1.5 1.5 1 1		CLAY - silty, trace oxidation			G21			•				•	
231.7 2	2.0 		 - medium brown, moist, soft, low plasticity CLAY - silty, trace precipitates inclusions (<25 mm diam.) - mottled brown and grey - moist, stiff - high plasticity 			T217	_					φ 		
	11111 3.5 1111111 4.0				-	G218	_							
	4.5 				-	G219)		<u></u>					

		EC	REK Sub-Sur	face Log				Test	Hole T	*H12-31 2 of 2
Elevation (m)		Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	□ Bulk (KNV 16 17 18 Particle 9 0 20 40 PL M 0 20 40	m ³) 19 20 21 Size (%) 60 80 100 C LL	Stre <u> </u>	ained Shear ngth (kPa) orvane △ Sket Pen. Φ 3 Qu ⊠ eld Vane ○ 00 150 200250
227.7	6.0			T2	220				\$	
			END OF TEST HOLE AT 6.1 m IN CLAY Notes: 1) Test hole was dry approximately 15 minutes after drilling 2) Test hole was open to 6.1 m below ground surface. 3) Test hole was backfilled with Bentonite from 6.1 m to the surface surface of the surface of the sur	face.						
Load	jed By:	Tom	Hildahl Reviewed By: Kent Banni	ster	P	roiect	t Engineer:	Kent Bann	ister	



SUB-SURFACE LOG GINT LOGS REVA.GPJ TREK GEOTECHNICAL.GDT 8/3/12



		EC			er				Bulk U (kN/m 18	njit Wt		Und Str	rained S ength (k	near Pa)
(m)	(III) Depth (m) Soil Symbo	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	SPT (N)	16 0 0	Pai 20 PL	ticle Si 40 MC	ze (%) 60 8 LL	0 21 0 100 0 100 0	2 A O P O F	Test Type Torvane ocket Pe ⊠ Qu ⊠ Tield Van 100 150	2 Δ n. Φ e O
					G211				•			٩		
	6.0-													
6.6	6.5				T212									
			 Test hole was dry approximately 15 minutes after drilling Test hole was open to 6.7 m below ground surface. Test hole was backfilled with Bentonite from 6.7 m to the surface. 											

		Test Hole TH12-33
Client:	CHINICAL CH2MHILL Waste Composting Facility Brady Road Paddock Drilling Ltd. 125 mm Solid Stem Auger, CME-850 Track Mount	Project Number: 0068 002 00 Location: UTM 14 N-5513198.622, E-630388.312 Ground Elevation: 233.26 m Existing Ground Date Drilled: July 5, 2012
Sampl	e Type: Grab (G) Shelby Tube (T)	Split Spoon (SS) Split Barrel (SB) Core (C)
Particl	Size Legend: Fines Clay Silt	Sand Gravel Cobbles Boulders
Elevation (m) Depth (m)	MATERIAL DESCRIPTION	Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa) Image: Strength (kPa)
233.0	 ORGANIC CLAY (Topsoil) - silty, trace roots (<5 mm diam.) black, moist, firm, high plasticity CLAY - silty, trace organics (rootlets <5 mm diam.) light grey moist, stiff high plasticity 	G192
	-firm below 1.4 m SILT - some clay - medium brown, moist, soft, low plasticity CLAY - silty, trace precipitate inclusions (<3 mm diam.) - mottled brown and grey - moist, stiff - high plasticity	G193 ● △ ◆ I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I </td
71.50		G195 T196
	 END OF TEST HOLE AT 3.7 m IN CLAY Notes: 1) Test hole was dry approximately 15 minutes after drilling 2) Test hole was open to 3.7 m below ground surface. 3) Test hole was backfilled with cuttings to 1.5 m below ground bag of bentonite was used in the test hole from 0.3 m to the sur 	surface. One rface.

GEDT	REK Sub-Surfac	Test Hole TH12-34 1 of 1
Client:		ct Number: 0068 002 00
Project Name	: Waste Composting Facility Brady Road Locat	
Contractor:		nd Elevation: 233.25 m Existing Ground
Method:	125 mm Solid Stem Auger, CME-850 Track Mount Date	Drilled:July 5, 2012
Sam	ole Type: Grab (G) Shelby Tube (T)	Split Spoon (SS) Split Barrel (SB) Core (C)
Parti	cle Size Legend:	Sand Gravel 7 Cobbles M Boulders
Elevation (m) Depth (m)	To and the second secon	add add
233.0	 △ ORGANIC CLAY (Topsoil) - silty, trace organics (roots <5 mm diam.) → black, moist, firm, high plasticity 	G197 • 24
	CLAY - silty, some fine sand, trace oxidation - mottled brown and grey - moist, stiff - high plasticity -25 mm fine sand seam	G198
<u>232.0</u> 231.9	SAND with the maint loope fine and	G199
201.0	SAND - silty, brown, moist, loose, fine sand SILT - some clay, some sand - medium brown - moist to wet, soft - low plasticity	
	CLAY - silty, trace fine sand, trace precipitate inclusions (<3 mm diam. - mottled brown and grey - moist, firm - high plasticity	G201
		T202
	 END OF TEST HOLE AT 3.7 m IN CLAY Notes: 1) Water level was 3.4 m below ground surface approximately 15 minu drilling 2) Test hole was open to 3.7 m below ground surface. 3) Test hole was backfilled with cuttings to 1.5 m below ground surface bag of bentonite was used in the test hole from 0.3 m to the surface. 	