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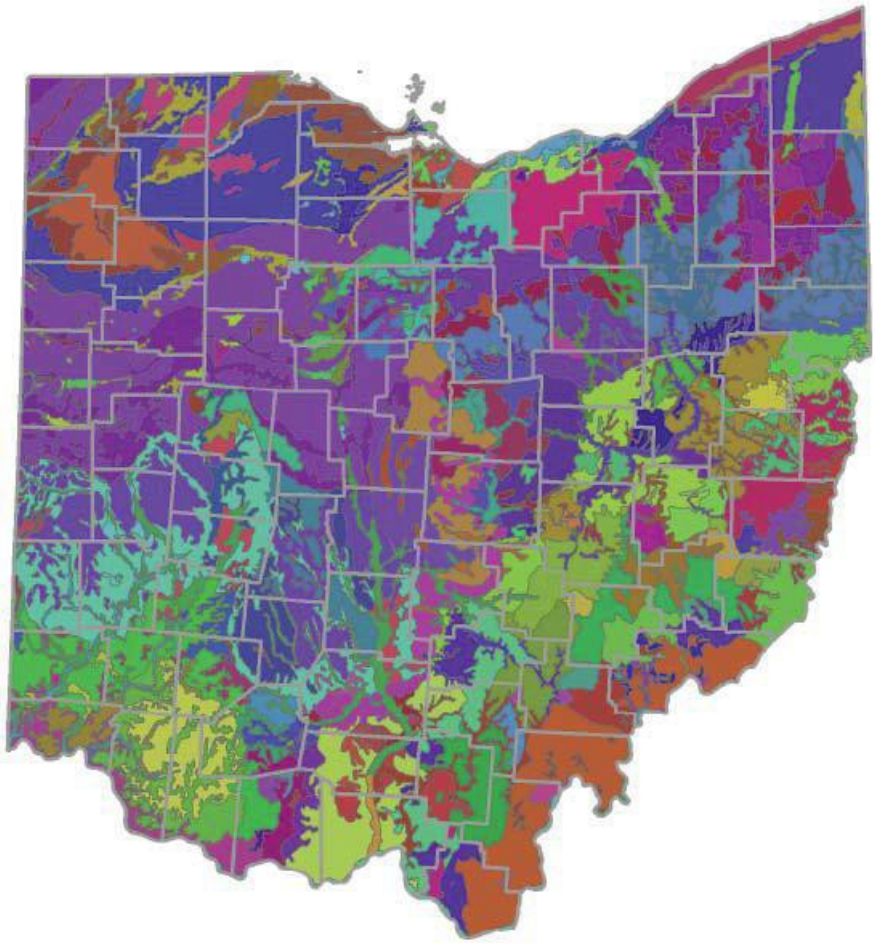
Evaluation of Background Metal Soil Concentrations in Lucas County – Toledo Area

DEVELOPED IN SUPPORT OF
THE OHIO VOLUNTARY ACTION PROGRAM

Summary Report



*Generalized soil map for the State of Ohio, Ohio Department of Natural Resources

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This summary report was developed by a workgroup representing Ohio EPA staff from the Division of Environmental Response and Revitalization (DERR) and environmental consultants, some of whom are Certified Professionals (CPs) for Ohio EPA's Voluntary Action Program (VAP).

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ACRONYMS

amsl	Above mean sea level
bgs	Below ground surface
C_v	Coefficient of variation
DERR	Division of Environmental Response and Revitalization
DET	Detwiler Golf Course
ft	Feet
FP-XRF	Field Portable X-ray Fluorescence
FAR	Farnsworth Metropark
GOF	Goodness-of-fit
GRE	Greenwood Park
KM	Kaplan-Meier
LAT	Lathrop Park
mg/kg	Milligram per kilogram
n_b	Number of background observations
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
OTT	Ottawa Golf Course
PEA	Pearson Metropark
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation Recovery Act
SAP	Sampling and Analysis Plan
S_b	Standard deviation
SEC	Secor Metropark
SID	Side Cut Metropark
SIFU	Site Investigation Field Unit
SWA	Swan Creek Preserve
TAL	Target Analyte List
TBA	Targeted Brownfields Assessment
TOC	Total Organic Carbon
UCL	Upper confidence level
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UPL	Upper prediction limit
UTL	Upper tolerance limit
VAP	Voluntary Action Program
VAP UL	Voluntary Action Program Upper Limit
WIL	Wildwood Preserve
WOO	Woodsdale Park

EXECUTIVE SUMMARY

Ohio EPA Division of Environmental Response and Revitalization (DERR) sampled and analyzed surface soils at 11 Toledo-area properties for background concentrations of Resource Conservation and Recovery Act (RCRA) metals (As, Ba, Cd, Cr, Pb, Hg, and Se) in addition to nickel (Ni) and thallium (Tl). Silver was removed from the RCRA analytical suite due to repeated non-detections found in other Ohio counties. Soil sample locations met the location restriction requirements of OAC 3745-300-07(H)(1)(b).

An initial reconnaissance was performed to install one preliminary soil boring at each property. The reconnaissance evaluated the shallow soil horizon (less than four feet deep) to ensure that the property where samples were to be collected met location restrictions. Select soil samples from the preliminary borings were screened for metals concentrations using Ohio EPA's mobile laboratory field-portable X-ray fluorescence (FP-XRF) analyzer. Screening results were used to further evaluate the suitability of the sampling locations and depth intervals.

Once the suitability of the property was determined, ten soil samples were collected per targeted soil horizon at each property to provide a statistically representative data set as described by OAC 3745-300-07(H)(1)(d)(i). Ohio EPA collected all surficial soil samples between the ground surface and a depth of two feet using a hand auger. Sample locations were within a 15 ft. radius of the preliminary soil boring location. Once collected, all samples were sent to a fixed-base, VAP-certified laboratory for analysis.

Statistical evaluations were performed to determine the representative background concentration for each metal. Background soil concentrations were calculated in accordance with the VAP rules effective April 23, 2012, found in OAC 3745-300-07(H)(1)(d)(ii). All statistical analyses, including outlier tests, were run using ProUCL version 4.1. A summary of the background determination results for Lucas County are provided in tabular format as part of this report. Results were found to be dependent upon predominant soil type and are generally segregated into soil types either greater, less than or equal to 50% sand content. Therefore, site specific soil classification must be completed through geotechnical analysis prior to applying these background results to site specific samples. Final representative concentrations could not be determined for cadmium and selenium due to the high number of non-detections in each dataset. Final and representative background concentrations of metals in Lucas County are as follows:

	≤50% Sand	>50% Sand
Arsenic	9.7 mg/kg	2.42 mg/kg
Barium	90.1 mg/kg	41.0 mg/kg
Chromium	23.2 mg/kg	7.14 mg/kg
Lead	17.0 mg/kg	12.2 mg/kg
Mercury	0.045 mg/kg	0.045 mg/kg
Nickel	28.5 mg/kg	6.30 mg/kg
Thallium	0.44 mg/kg	0.067 mg/kg

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1.0 INTRODUCTION

Evaluation of metals in soils for the assessment and remediation of brownfield sites often requires that "background" concentrations be determined. Background metal concentrations are typically attributed to the natural composition of soil and not from the impact of hazardous substances or petroleum, hazardous or solid wastes, or wastewater. Background concentrations are assumed to be largely dependent on soil texture and composition (i.e., the percentages of sand, silt and clay; the specific mineral components present; and the naturally occurring organic matter present) and also the types of geologic material from which the soil has been derived (e.g., sand and gravel outwash, shale bedrock, till, etc.).

Background metal concentrations in urban soils are particularly challenging to characterize as opposed to background concentrations in suburban or rural areas. Urban soils often have been subjected to decades of various unregulated anthropogenic activities that can elevate background metal concentrations. For example, aerial deposition of particulate matter from fuel combustion or industrial activities in urban areas may increase the concentrations of lead, arsenic, zinc and certain other metals in soils. Construction activities, demolition activities, and surface water runoff from roofs and paved areas may also increase soil metal concentrations.

This investigation evaluates background metal concentrations in urban, suburban and rural surface soils to provide a dataset that may be used as a reference to help satisfy the requirements of, in part, Ohio Voluntary Action Program (VAP) rules (OAC Chapter 3745-300). Specifically, this summary report applies to Lucas County and Toledo-area brownfield properties being assessed and remediated under the Ohio VAP. For the purposes of this investigation, "Lucas County –Toledo area urban soils" means surficial soils within the City of Toledo or adjacent municipalities, including suburban areas and metro parks within suburban or rural areas.

2.0 SCOPE

Under the direction of Ohio EPA – VAP Central Office, the Ohio EPA Site Investigation Field Unit (SIFU) sampled and analyzed surface soils at 11 Toledo-area properties for background concentrations of Resource Conservation and Recovery Act (RCRA) metals (As, Ba, Cd, Cr, Pb, Hg, and Se) in addition to nickel and thallium. Silver was removed from the RCRA metals analytical suite due to repeated non-detections found in soil samples collected from other counties. The property locations are shown on Figure 1, and Tables 1A and 1B provide additional location information and property characteristics including setting (land use), topography and general soil data. The properties were selected based on the following criteria:

- The ability to obtain access from local governments or private property owners.

- Compliance with the VAP location restrictions for background soil sampling investigations [OAC 3745-300-07(H)(1)(b)].

- Design of an investigation that provided representative data for the major soil mapping units within Lucas County as described on the "General Soil Map, Lucas County, Ohio" of the *Soil Survey of Lucas County, Ohio* (USDA Soil Conservation Service) to the extent possible given limitations imposed by the first two criteria.

In addition, at each property one representative sample of the targeted soil horizon was submitted to a contract soil laboratory for USCS and USDA soil texture classification based on sieve, hydrometer and Atterberg limits analyses.

Prior to performing sampling activities, SIFU performed a reconnaissance and collected one preliminary soil boring at each property. The objectives of the reconnaissance were to evaluate the shallow (less than four feet deep) soil horizons present and select a target sampling horizon, ensure that areas of the property where samples were collected met location restrictions, and select a general sampling area. Each preliminary soil boring (one per sampling area) was field logged in accordance with the Unified Soil Classification System (USCS) and the USDA soil classification system to evaluate the soil types present and screen the sampling location for fill or waste materials. In addition, selected soil samples from the preliminary borings were screened for metals concentrations using Ohio EPA's mobile laboratory field-portable X-ray fluorescence (FP-XRF) analyzer. The screening results were used to further evaluate the suitability of the sampling locations and depth intervals for background data.

Data quality objectives (DQOs) for this project included the following:

1. Soil samples from Toledo-area urban properties meeting the location restriction requirements of OAC 3745-300-07(H)(1)(b)

2. USCS field classification of each preliminary soil boring per ASTM D2488, Standard Practice for Description and Identification of Soils (Visual–Manual Procedure)

3. USDA field classification of each preliminary soil boring using "texture-by-feel" analysis (Presley and Thien, 2008)

4. FP-XRF analyzer screening of each preliminary soil boring for selected metals (Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Rb, Sr, Zr, Mo, Ag, Cd, Sn, Sb, Hg and Pb) meeting the requirements of SW-846 Method 6200

5. Analysis of 10 soil samples per targeted soil horizon at each property to provide a statistically representative data set as described by OAC 3745-300-07(H)(1)(d)(i)

6. Fixed-base, VAP-certified laboratory analyses of each soil sample for RCRA metals (As, Ba, Cd, Cr, Pb, Hg, Se and Ag), nickel, and thallium meeting the requirements of Ohio EPA's Voluntary Action Program

7. USCS and USDA classification and textural composition of one selected soil sample per property based on soil laboratory testing in accordance with ASTM D422, Standard Test Method for Particle Size Analysis of Soils (modified to provide USDA soil particle size classes); ASTM D4318, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; and ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

3.0 TOLEDO-AREA SOIL TYPES

Figure 2 ("General Soil Map, Lucas County, Ohio" from the Soil Survey of Lucas County, Ohio) shows the general soil mapping units present in the Toledo-area (USDA Soil Conservation Service, 1980). These include the following:

1. "Latty-Toledo-Fulton association: Level to gently sloping, very poorly drained and somewhat poorly drained soils that formed in clayey glacial lake sediment."

2. "Del Rey-Lenawee association: Level to nearly level, somewhat poorly drained and very poorly drained soils that formed in clayey and loamy glacial lake sediment."

3. "Toledo-Fulton association: Level to gently sloping, very poorly drained and somewhat poorly drained soils that formed in clayey glacial lake sediment."

4. "Hoytville-Nappanee-Mermill association: Level to nearly level, very poorly drained and somewhat poorly drained soils that formed in clayey and loamy, water-worked glacial till."

5. "Bixler-Dixboro association: Nearly level to gently sloping, somewhat poorly drained soils that formed in loamy and sandy glacial lake sediment."

6. "Colwood-Dixboro association: Level to gently sloping, very poorly drained and somewhat poorly drained soils that formed in loamy and sandy glacial lake sediment."

7. "Mermill-Metamora-Haskins association: Level to nearly level, very poorly drained and somewhat poorly drained soils that formed in loamy and clayey glacial lake deposits."

8. "Granby-Ottokee-Tedrow association: Level to gently sloping, very poorly drained, moderately well drained, and somewhat poorly drained soils that formed in sandy material."

9. "Urban land association: Level and nearly level urban areas."

The majority of the soils in Lucas County are formed on silt- and clay-rich glacial till and lacustrine sediment.

In summary, properties were selected to incorporate as many of these general soil mapping units as possible to provide a background metal data set that is representative with respect to the soils present in Lucas County.

4.0 PROPERTY USE AND REGULATORY HISTORY

Properties evaluated for soil sampling included public parks that were not underlain by engineered or structural fill [OAC 3745-300-01(A)(43)] or industrial fill [OAC 3745-300-01(A)(72)], and where industrial or waste disposal activities have not occurred (Tables 1A and 1B and Figure 1). Soil types where disposal has occurred must be excluded from background determinations by rule. The reconnaissance effort conducted prior to the actual sampling event prevented sampling of these prohibited soil types.

Properties underlain by native fill may be sampled [OAC 3745-300-01(A)(83)]. "Native fill" is soil material derived from the property and transferred from one area of the property to another area in such a manner that the original soil structure and physical properties may be altered from the initial pre-excavation conditions, but the chemical and physical properties remain consistent with other undisturbed native soils at the property.

5.0 SUMMARY OF SAMPLING STRATEGY AND FIELD ACTIVITIES

5.1 Property Reconnaissance and Preliminary Soil Boring Evaluation

SIFU performed a property reconnaissance to evaluate potential sampling areas and inspect the property soils. The results of the reconnaissance were used to select the general area where samples were ultimately collected, as well as determine the soil horizon sampled for chemical (metals) and soil texture analysis (classification).

Prior to each property reconnaissance, a review of property soil descriptions provided by the Soil Survey of Lucas County, Ohio was conducted. During site reconnaissance, field staff evaluated sampling location restrictions based on OAC 3745-300-07(H)(1)(b), which include:

(i) Areas underlain by engineered fill, structural fill or industrial fill
(ii) Areas where the management, treatment, handling, storage or disposal of hazardous substances or petroleum, solid or hazardous wastes, waste waters or material handling areas are known or are suspected to have occurred
(iii) Areas within three feet of a roadway
(iv) Parking lots or areas surrounding parking lots or other paved areas
(v) Railroad tracks or railway areas or other areas affected by their runoff

(vi) Areas of concentrated air pollution depositions or areas affected by their runoff
(vii) Storm drains or ditches presently or historically receiving industrial or urban runoff
(viii) Spill areas

The sampling locations were evaluated based on visual inspection of the property, interviews with the property owners or representatives, review of Sanborn Maps and other historical records, and sampling and inspection of property soils.

A hand auger was used to collect a preliminary soil boring at each proposed sampling area to evaluate the upper four (4) feet of surficial soils, which were field-classified in accordance the USCS (ASTM D2488) and the USDA soil classification system (Presley and Thien, 2008). Soil boring logs are included in Appendix A.

Ohio EPA analyzed selected soil samples from each preliminary soil boring for selected metals (Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Rb, Sr, Zr, Mo, Ag, Cd, Sn, Sb, Hg, and Pb) using the FP – XRF analyzer in accordance with SW-846 Method 6200. The results were used to evaluate the influence of anthropogenic activities on the soil metal concentrations. Based on the screening results, the soil metal concentrations did not appear to be elevated by anthropogenic activities at any of the selected properties.

The FP-XRF results also were used to examine the vertical distributions of metal concentrations in the soil profile at each preliminary soil boring location. The results appear to indicate that some metal concentrations may be depth-related (e.g., at some locations, lead concentrations are higher near the ground surface and decrease with depth). The trends were not tested for statistical significance. However, based on these results, a sampling interval of ground surface to two feet deep (or until refusal on shallow bedrock) was selected for all analytical samples to avoid introducing additional variation in the analytical data set due to potential variability associated with an inconsistent sampling depth interval.

The XP-XRF analytical results are considered 'screening' level data quality under the current VAP rules. As such, these results cannot be used as part of a background demonstration where comparison to soil applicable standards is required. However, the results are provided in Appendix B for general reference purposes.

5.2 Soil Sampling and Analysis

Based on the results of the preliminary field investigation, the team selected 11 soil sampling localities (properties) to collect soil samples for RCRA metal laboratory analysis (excluding silver), including nickel and thallium.

At each locality, Ohio EPA collected 10 surficial soil samples between the ground surface and depth of two feet using a hand auger. At the Farnsworth Metropark location

the depth to limestone bedrock varies between 0.7 and 3.0 ft, and Ohio EPA encountered auger refusal between those depths. At a few other locations auger refusal was encountered due to very stiff to hard or heaving clays before reaching the target depth of two feet. As a result the sampling interval was slightly smaller (e.g., ground surface to 1.5 feet) at these locations, but was never less than one foot.

The sample locations were within a 15 ft. radius of the preliminary soil boring location (the sampling area circular with an approximate diameter of 30 ft. with the preliminary soil boring location in the center). Ohio EPA collected the geotechnical and 10 analytical samples within an area approximately 30 feet in diameter to ensure that the soil samples were similar in texture and composition (i.e., from the same population). The Ohio EPA SIFU sampling team used this approach at all sampling localities for a consistent investigative approach across all properties sampled.

The first of the 10 samples at each locality (e.g., DET-1,FAR-1, GRE-1, etc.) was collected adjacent to the preliminary soil boring location, and included analytical sample for metals analyses and a soil sample for geotechnical analysis. The other nine analytical samples were collected at random locations within a radius of 15 ft. of the preliminary soil boring. Upon completion, each sampling location was backfilled with native soil.

Each soil sample (approximately three to four pounds) was homogenized in a stainless steel mixing pan. A two-ounce subsample was collected and preserved on ice at 4^{o} C and submitted to Ohio EPA's contract laboratory for RCRA metals, nickel and thallium analysis. Approximately two (2) pounds of soil were collected for laboratory USCS and USDA classification and soil texture composition based on sieve, hydrometer, and Atterberg limits testing (one per sampling area).

5.3 Field Sampling Equipment Decontamination

Hand augers, sampling spoons, mixing bowls, and other field equipment used to sample soils were decontaminated between properties by washing with a solution of non-phosphate detergent and potable water and rinsing with deionized water.

5.4 Laboratory Analyses

Ohio EPA's contract laboratory (Microbac Laboratories, Inc.) analyzed 110 soil samples (10 per site) for RCRA metals (As, Ba, Cd, Cr, Pb, Hg and Se), nickel (Ni), and thallium (Tl) using Inductively Coupled Plasma (ICP) and/or Graphite Furnace Atomic Absorption Spectrophotometry (GFAAS) via U.S. EPA Method 6020 and Method 7471. Geotechnics, subcontracted by Microbac, Inc. performed the USCS and USDA classification (see Table 2 and Appendix C) and soil texture composition in accordance with ASTM D422, Standard Test Method for Particle Size Analysis of Soils (modified to provide USDA soil particle size classes); ASTM D4318, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; and ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

Data received from Microbac are considered certified under the Ohio EPA VAP certified laboratory program.

6.0 SAMPLING LOCATIONS

6.1 Property Descriptions and Locations

Details for the 11 locations sampled for this investigation are included in Tables 1A and 1B. Information contained in Table 1A provides property information such as site location (latitude/longitude), generalized setting (e.g., urban, suburban or rural), and the topography (e.g., level, gently sloping, etc.). Surveying the location of each sampling point was determined not to be practical; therefore, the longitude and latitude coordinates are presented for the approximate location of the preliminary soil boring. As noted in Section 5.0, samples were collected within a 15-foot radius of the original preliminary sample boring. Table 1B provides information relative to the soil survey for Lucas County. Specific details on the table includes the mapping (soil type) unit at each property and the underlying parent material (e.g., bedrock, lake deposits, etc.) underlying each property.

7.0 METHOD OF BACKGROUND VALUE DETERMINATION

Upon receipt of all laboratory data, statistical evaluations were performed to determine the representative background concentrations. It was originally determined that data collected from all 11 property locations would be incorporated into a single data set. However, preliminary evaluations proved to show that two distinct groupings emerged whereby statistically similar sites would need to be combined resulting in two data sets based on soil type. Upon further evaluation, statistically similar sites could be grouped based on the sand/clay content at each site. Good correlation was found when sites were segregated into those locations where soil either had greater, or less than or equal to 50 per cent sand content.

Statistical methodologies in Sections 7.1 through 7.7 were run for each data set. Outliers were removed for each data set as appropriate. Similarly, there are two values presented in the results sections (Section 8.0) that are based on representative soil type. Therefore, the result of this approach is that two representative background numbers are generated for each metal. The representative background numbers are segregated and presented based on soil type. Background values were determined for the 0-2 ft bgs interval from all 11 property locations.

7.1 Outlier Test

The data set was evaluated for the presence of outliers in accordance with the VAP Rule OAC 3745-300-07(H)(1)(d)(ii)(d). The presence of outliers in the background data sets

could yield higher or lower estimates of the upper limits. Statistical outlier tests give evidence that a value does not fit with the distribution of the remainder of the data and is, therefore, a statistical outlier. The outlier identification was performed by the Rosner outlier test utilizing ProUCL. All outliers were removed prior to completing background calculations.

7.2 Nondetect Test

According to the ProUCL user's guide, when the percentage of nondetects in a data set is high (greater than 50 percent (%)) or when multiple detection limits are present, it is hard to reliably perform goodness-of-fit (GOF) tests to determine data distribution. In those cases, the uncertainty associated with the GOF tests is high, especially with smaller data sets (less than 10 to 20 samples). In those situations, the use of nonparametric methods such as the Kaplan-Meier (KM) method to compute statistics such as upper confidence limits, upper prediction limits (UPLs), and upper tolerance limits (UTLs) is preferred because nonparametric methods do not require any distributional assumptions about the data sets.

7.3 Soil Background Mean

The background mean (X_b) for data sets without nondetects was calculated by ProUCL by dividing the sum of the total background values (X_n) by the total number of background readings (n_b):

$$X_b = \frac{X_1 + X_2 + X_3 \text{ (etc.)}}{n_b}$$

The background mean for data sets with nondetects was calculated by ProUCL using the appropriate method based on the distribution (e.g., the KM method for nonparametric data sets with multiple detection limits).

7.4 Standard Deviation

The standard deviation (S_b) for data sets without nondetects was calculated by ProUCL by taking the square root of the sum of the squares of each value (X_n) minus the mean (X_b), divided by the degrees of freedom (number of background soil samples minus one):

$$S_b = \left[\frac{(X_1 - X_b)^2 + (X_2 - X_b)^2 + (X_3 - X_b)^2 \text{ (etc.)}}{n_b - 1} \right]^{1/2}$$

For data sets with nondetects, the standard deviation was calculated by ProUCL using the appropriate method based on the distribution (e.g., the KM method for nonparametric data sets with multiple detection limits).

7.5 Coefficient of Variation

The C_v is the ratio of the standard deviation (S_b) to the mean (X_b) and describes the magnitude of sample values and the variation within them:

$$C_v = \frac{S_b}{X_b}$$

The C_v is used to evaluate the distribution of the data, where generally a C_v of less than 0.5 indicates a normal distribution. A C_v was calculated only for data sets without nondetects.

7.6 Distribution

The values for each data set were also evaluated using ProUCL to determine if the data followed normal, lognormal, or gamma distributions. The upper limits for the data sets that were normal were then calculated as described below. For data that followed the lognormal distribution the upper tolerance limit (UTL) was calculated using 95% confidence and 95% coverage. In no case was a background value assigned higher than the greatest observed value.

Data sets that followed no standard distribution were evaluated for the upper limits using nonparametric methods (Upper tolerance limit, 95% confidence, 95% coverage). Nonparametric methods do not assume a particular population probability distribution, and are therefore valid for data from any population with any probability distribution, which can remain unknown.

7.7 VAP Upper Limit (UL)

In accordance with the VAP background soil determination requirements in OAC 3745-300-07(H)(1), the background mean plus two standard deviations is the maximum allowable limit or upper limit for normally distributed data. The background upper limit for normally distributed data sets was calculated by multiplying the standard deviation by two and adding the background mean such that:

$$\text{VAP UL} = X_b + (2 \times S_b)$$

If the data follows a lognormal, nonparametric, or gamma distribution, the upper limit was calculated using ProUCL to determine the 95% upper tolerance limit (UTL) based on the best fit distribution. This is noted in Tables 3A and 3B.

8.0 TOLEDO-AREA SOIL BACKGROUND VALUES

Background soil concentrations were calculated in accordance with the VAP rules effective April 23, 2012, found in OAC 3745-300-07(H)(1)(d)(ii). As noted in Section 7.7, for normally distributed data, the background mean plus two standard deviations is the maximum allowable limit, or UL, which was calculated by multiplying the standard deviation by two and then adding the mean concentration. Normally distributed data were observed in the arsenic, barium, nickel, lead, and mercury less than or equal to 50 per cent sand data sets. The chromium and thallium data sets from the clayey soils and all of the greater than 50 per cent sand data sets were all determined to be non-normal distributions. The 95% upper tolerance limit was used as the representative background concentrations for the remaining, non-normal data sets.

A summary of the background determination results for Lucas County are provided in Tables 3A and 3B. Seven of the eight original RCRA metals are presented. As previously discussed, silver was not included in this study due to the characteristically high number of nondetects found for other county-wide soil background studies completed in the State. Therefore, silver has been determined not to be a significant contributor to elevated background concentrations across the Lucas County region. As a replacement both nickel and thallium were added to the suite of metals analyses.

The ProUCL output data sheets are provided in Appendix D. Analytical results for each metal are provided in Tables 5 through 13. Metal concentrations for each sample at each location are provided. Summary statistics including maximum, minimum, average, and standard deviation are also provided. The following sections are a narrative of the summary results.

8.1 **Arsenic**

Concentrations of arsenic ranged from 0.452 to 9.36 mg/kg with no nondetects. There were 110 valid data points, with no outliers removed. The data set mean for the less than or equal to 50 per cent sand soil was calculated to be 6.373 mg/kg, with a standard deviation of 1.645 mg/kg. The data set mean for the greater than 50 per cent sand soil was calculated to be 1.206 mg/kg, with a standard deviation of 0.444 mg/kg. The VAP UL for the less than or equal to 50 per cent sand soil was determined to be 9.7 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of less than or equal to 50 per cent sand.

The VAP UL for the greater than 50 per cent sand soil was determined to be 2.1 mg/kg; however the data set was not normally distributed. Therefore the VAP UL cannot be

used as the representative concentration. The 95% UTL with 95% coverage was determined to be 2.42 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of greater than 50 per cent sand.

8.2 Barium

Concentrations of barium ranged from 7.41 to 85.6 mg/kg with no nondetects. There were 110 valid data points with no outliers removed. The data set mean for the less than or equal to 50 per cent sand soil was calculated to be 68.18 mg/kg, with a standard deviation of 11.02 mg/kg. The VAP UL for the less than or equal to 50 per cent sand soil was determined to be 90.1 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of less than or equal to 50 per cent sand.

The VAP UL cannot be used as the representative concentration for the greater than 50 per cent sand soils because the data have a nonparametric distribution. The 95% UTL was determined to be 41.0 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of greater than 50 per cent sand.

8.3 Cadmium

Detected concentrations of cadmium ranged from 0.217 to 0.388 mg/kg. There were 110 valid data points with no outliers removed. There were 79 nondetects, or 71.81%, of the final data set. Due to the elevated number of nondetections in the overall data set no meaningful statistics could be performed on the cadmium data. Therefore, cadmium has been determined not to be a significant contributor to elevated background concentrations across the Lucas County region. As such, no representative background concentration is presented.

8.4 Chromium

Concentrations of chromium ranged from 2.28 to 24.0 mg/kg with no nondetects. There were 110 valid data points with no outliers removed. The data set mean for the less than or equal to 50 per cent sand soil was calculated to be 15.99 mg/kg, with a standard deviation of 3.115 mg/kg. The VAP UL for the less than or equal to 50 per cent soil was determined to be 22.2 mg/kg. The VAP UL cannot be used as the representative concentration for the less than or equal to 50 per cent sand soils because the data have a lognormal distribution. The 95% UTL with 95% coverage was determined to be 23.2 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of less than or equal to 50 per cent sand.

The VAP UL for the greater than 50 per cent sand soil was determined to be 7.2 mg/kg; however the data set was not normally distributed. The VAP UL cannot be used as the representative concentration for the greater than 50 per cent sand soils because the data have a nonparametric distribution. The 95% UTL with 95% coverage was determined to

be 7.14 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of greater than 50 per cent sand.

8.5 Lead

Detected concentrations of lead ranged from 2.77 to 17.6 mg/kg. There were 110 valid data points, with no outliers removed. There were no nondetects in the data set. The data set mean for the less than or equal to 50 per cent sand soil was calculated to be 13.35 mg/kg, with a standard deviation of 1.827 mg/kg. The VAP UL for the less than or equal to 50 per cent soil was determined to be 17.0 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of less than or equal to 50 per cent sand.

The VAP UL for the greater than 50 per cent sand soil was determined to be 11.0 mg/kg; however the data set was not normally distributed. Therefore the VAP UL cannot be used as the representative concentration because the data are lognormally distributed. The 95% UTL with 95% coverage was determined to be 12.2 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of greater than 50 per cent sand.

8.6 Mercury

Concentrations of mercury ranged from 0.0102 to 0.0478 mg/kg. There were 109 valid data points after removal of one outlier. There were eight nondetects in the data set; all of which came from the Swan Creek Preserve (SWA) and the Wildwood Preserve (WIL) sites. The values for those specimens were approximated using regression-on-statistics (ROS) methods. The data for mercury at all 11 sites were combined to form one normally distributed group. No statistical distinction is made for mercury content in either clay- rich or sandy-rich soils. The data set mean was calculated to be 0.026 mg/kg, with a standard deviation of 0.00953 mg/kg. The VAP UL for the entire data set was determined to be 0.045 mg/kg. The VAP UL was determined to be the representative soil background concentration for the entire mercury data set.

8.7 Nickel

Detected concentrations of nickel ranged from 1.80 to 29.6 mg/kg. There were 109 valid data points, with one outlier removed from the greater than 50 per cent sand data set. There were no nondetects in the data set. The data set mean for the less than or equal to 50 per cent sand soil was calculated to be 22.45 mg/kg, with a standard deviation of 2.982 mg/kg. The VAP UL for the less than or equal to 50 per cent soil was determined to be 28.5 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of less than or equal to 50 per cent sand.

The VAP UL for the greater than 50 per cent sand soil was determined to be 7.40 mg/kg;

however the data set was lognormally distributed. Therefore the VAP UL cannot be used as the representative concentration. The 95% UTL with 95% coverage was determined to be 6.30 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of greater than 50 per cent sand.

8.8 Selenium

Detected concentrations of selenium ranged from 0.103 to 0.501 mg/kg. There were 110 valid data points with no outliers removed. There were 67 nondetects, or 60.9%, of the final data set. Due to the elevated number of nondetections in the overall data set no meaningful statistics could be performed on the selenium data. Therefore, selenium has been determined not to be a significant contributor to elevated background concentrations across the Lucas County region. As such, no representative background concentration is presented.

8.9 Thallium

Concentrations of thallium ranged from 0.0218 to 0.438 mg/kg with six nondetects. There were 110 valid data points with no outliers. The data set mean for the less than or equal to 50 per cent sand soil was calculated to be 0.288 mg/kg, with a standard deviation of 0.073 mg/kg. The VAP UL for the less than or equal to 50 per cent soil was determined to be 0.44 mg/kg. The VAP UL cannot be used as the representative concentration for the less than or equal to 50 per cent sand soils because the data have a lognormal distribution. The 95% UTL with 95% coverage was determined to be 0.44 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of less than or equal to 50 per cent sand.

The VAP UL for the greater than 50 per cent sand soil was determined to be 0.061 mg/kg; however the data set was not normally distributed. The VAP UL cannot be used as the representative concentration for the greater than 50 per cent sand soils because the data have a lognormal distribution. The 95% UTL with 95% coverage was determined to be 0.067 mg/kg. This value is determined to be the representative soil background concentration for soils comprised of greater than 50 per cent sand.

9.0 APPLICATION OF THIS REPORT AND SUMMARY OF BACKGROUND DETERMINATION

Background results generated in this report are specific to Lucas County. Users of this report may elect to utilize the results presented in Section 8.0 and Tables 3A and 3B for direct comparison purposes to other properties in Lucas County in accordance with VAP soil background rule requirements (OAC 3745-300-07(H)(2)). It is generally inappropriate to apply these background values to properties located in non-adjacent or surrounding counties. Exceptions to this provision may be allowable if the user can demonstrate that the subject property has a similar soil provenance and type to one or

more soil types listed for properties within this study. Geotechnical analysis of the subject property soil type is advisable to make the soil type comparison. Additionally, samples collected at the subject property must be representative of the zone (e.g., 0-2 ft. bgs.) assessed in this study.

Results were found to be dependent upon predominant soil type and results are generally segregated into soil types either greater, or less than or equal to 50% sand content. Therefore, site specific knowledge of soil classification must be obtained through geotechnical analyses prior to application of these results when making a comparison to background. Final representative concentrations could not be determined for cadmium and selenium due to the high number of non-detections in each dataset. The following results are the background upper limits for metal soil concentrations in Lucas County – Toledo Area:

	≤50% Sand	>50% Sand
Arsenic	9.7 mg/kg	2.42 mg/kg
Barium	90.1 mg/kg	41.0 mg/kg
Chromium	23.2 mg/kg	7.14 mg/kg
Lead	17.0 mg/kg	12.2 mg/kg
Mercury	0.045 mg/kg	0.045 mg/kg
Nickel	28.5 mg/kg	6.30 mg/kg
Thallium	0.44 mg/kg	0.067 mg/kg

10.0 REFERENCES

ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D2488, Standard Practice for Description and Identification of Soils (Visual – Manual Procedure)

ASTM D422, Standard Test Method for Particle Size Analysis of Soils

ASTM D4318, Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

Presley, D., and S. Thien, September 2008, Estimating Soil Texture By Feel, Kansas State University Department of Agronomy, MF-2852

USDA Soil Conservation Service, December 1980, Soil Survey of Lucas County, Ohio

U.S. EPA SW-846 Method 6200 (Revision 0, February 2007), Field Portable X-ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil or Sediment

U.S. EPA, U.S. EPA Statistical Software ProUCL 4.1 for Environmental Applications for Data Sets With and Without Non-detect Observations

FIGURE 1: SAMPLE LOCATIONS, LUCAS COUNTY, OHIO

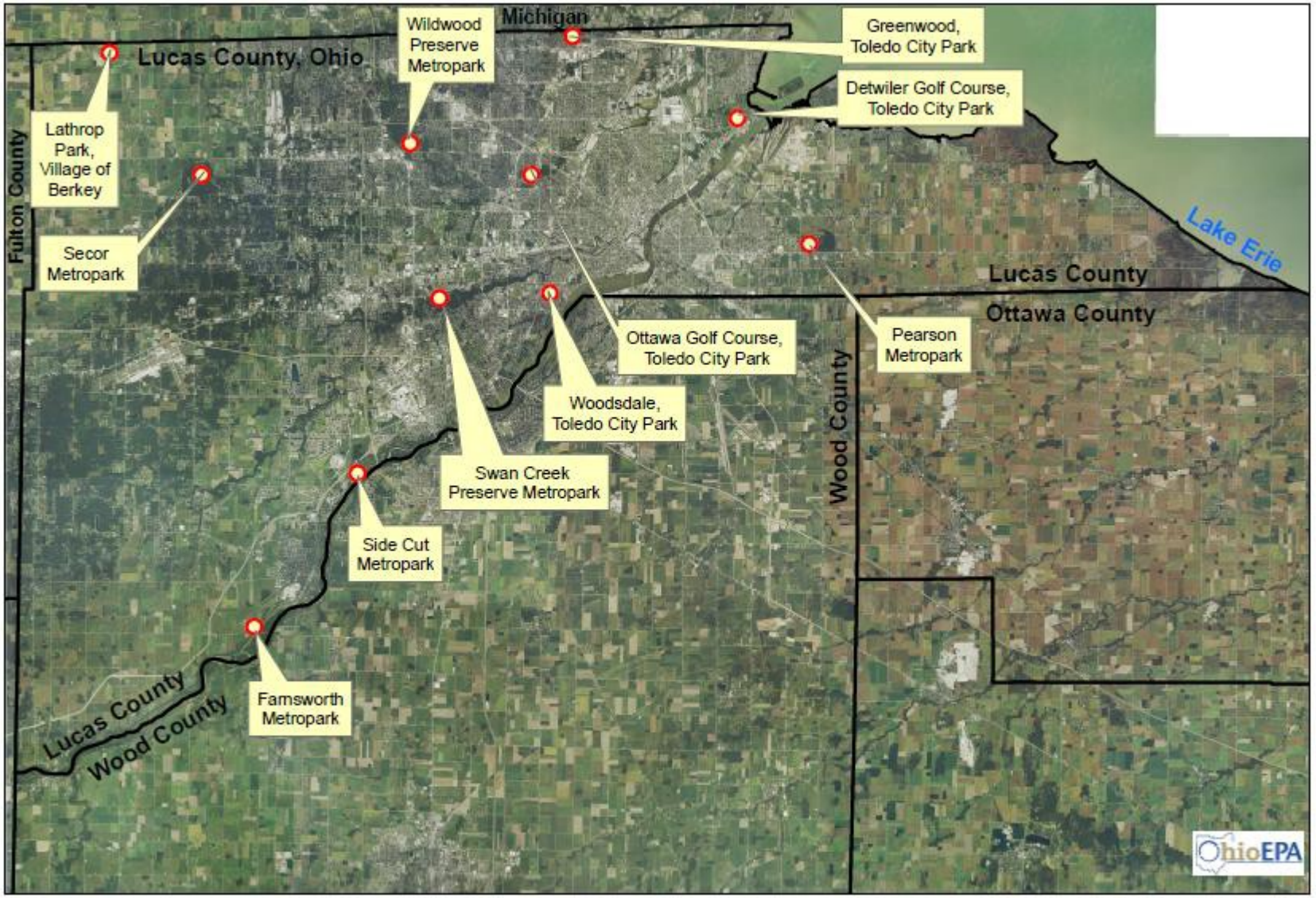


FIGURE 2: GENERAL SOIL MAP, LUCAS COUNTY, OHIO

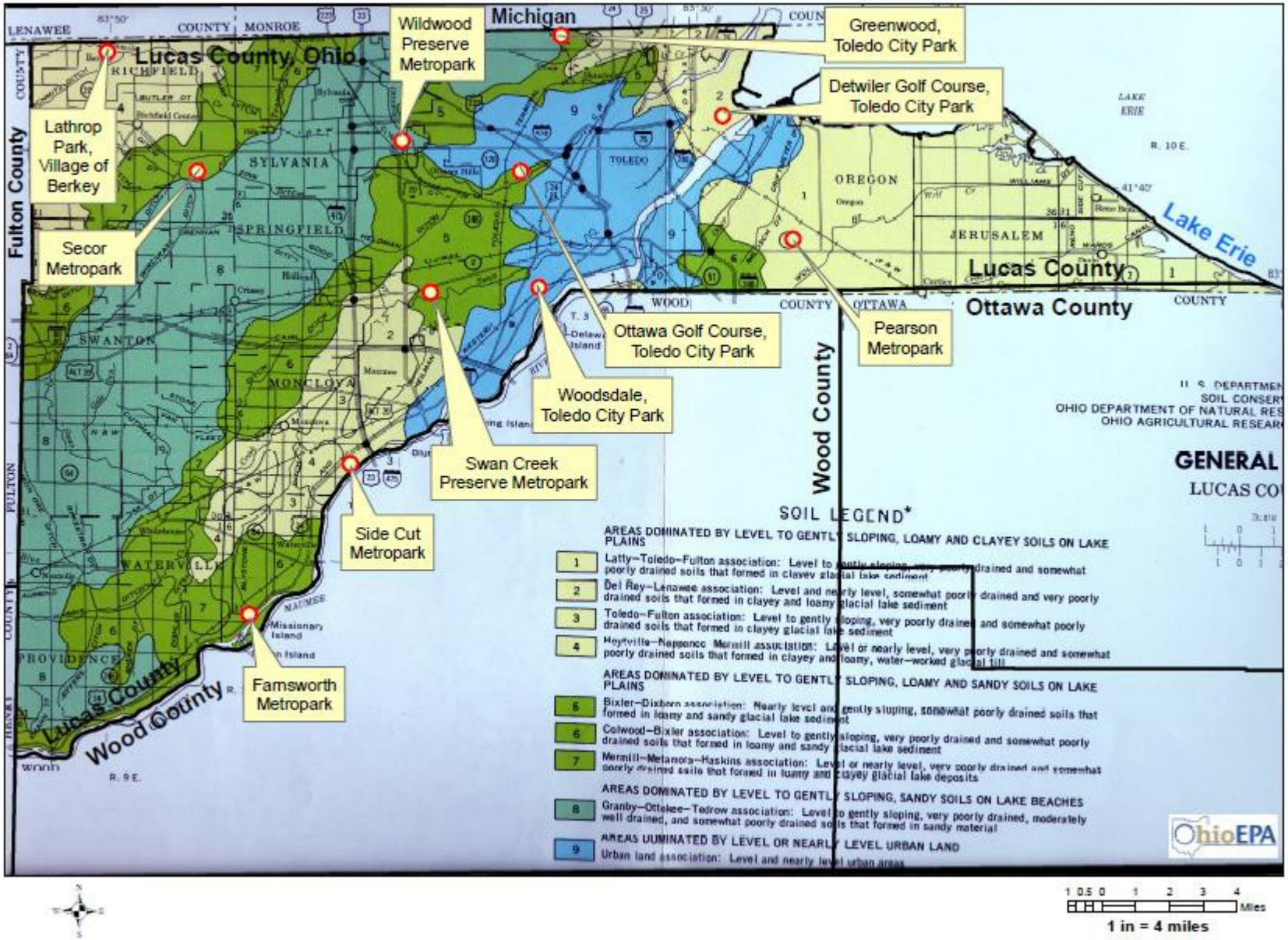


TABLE 1A

Soil Sampling Property Information Summary: Locations, Settings & Topography

Sampled Property (Sample Abbreviation)	Address	Latitude	Longitude	Setting	Topography
Detwiler Golf Course (DET) Toledo City Park	4001 N. Summit St., Toledo, OH 43611	41.701361	-83.484469	Urban Park	Level to nearly level
Farnsworth (FAR) Toledo Metropark	8505 South River Road, (Old U.S. Rt. 24, near Neowash Road) Waterville, OH 43566	41.479164	-83.746915	Rural Park	Level to gently sloping
Greenwood (GRE) Toledo City Park	6150 Jackman Road (at Darrel Rd., via Gage Rd. and W. Alexis Rd.) Toledo, OH 43613	41.726731	-83.576681	Urban to Suburban Park	Level to gently sloping
Lathrop Park (LAT) Village of Berkey	North of residence at 12150 Sylvania-Matamora Road, Berkey, OH 43504	41.716549	-83.837780	Rural Park	Level to nearly level
Ottawa Golf course (OTT) Toledo City Park	2315 Walden Pond Drive (at Sherbrooke Rd. & Kenwood Blvd.) Toledo, OH 3606	41.670116	-83.446414	Urban to Suburban Park	Nearly level to gently sloping
Pearson (PEA) Toledo Metropark	761 Lallendorf Road, Oregon, OH 43616	41.639514	-83.446414	Suburban Park	Level to gently sloping
Secor (SEC) Toledo Metropark	10001 West Central Avenue (S. of Wolfinger Cemetary, W, of Wolfinger Rd.) Berkey, OH 43504	42.665410	-83.785488	Rural Park	Level to nearly level

Sidecut (SID) Toledo Metropark	1025 West River Road (Fallen Timbers Lane) (Adjacent to Fallen Timbers St. Pk. Monument) Maumee, OH 43537	41.542883	-83.696041	Suburban to Rural Park	Level to gently sloping
Swan Creek Preserve (SWA) Toledo Metropark	4659 Airport Highway (near Wenz Road entrance) Toledo, 43615	41.617556	-83.646517	Suburban Park	Nearly level to gently sloping
Wildwood Preserve (WIL) Toledo Metropark	5100 W. Central Avenue, (near Exmoor Road entrance) Toledo, OH 43615	41.681262	-83.670073	Suburban Park	Level to gently sloping
Woodsdale (WOO) Toledo City Park	1226 Woodsdale Ave. (at Anthony Wayne Trail or Ohio Route 25) Toledo, OH 43609	41.617414	-83.590671	Urban Park	Level to nearly level urban areas

TABLE 1B

Soil Sampling Property Information Summary: Soil Mapping Units, Parent Materials and Soil Types

Sampled Property (Sample Abbreviation)	Preliminary Soil Boring[1] (PSB) & Location			Soil Mapping Units, Classification and Parent Materials			
	PSB	Latitude[2]	Longitude	Mapping Unit[3]	USCS Soil Type	USDA Soil Type	Parent Material[4]
Detwiler Golf Course (DET), Toledo City Park	DET-PSB	41.701361	-83.484469	Colwood loam, Co, & Udorthents, loamy, Uo	Fat Clay (CH)	Silty Clay Loam	clayey and loamy glacial lake sediment
Farnsworth (FAR), Toledo Metropark	FAR-PSB	41.479164	-83.746915	Haskins loam, HnA	Lean Clay with Sand (CL)	Clay Loam	weathered limestone bedrock
Greenwood (GRE), Toledo City Park	GRE-PSB	41.726731	-83.576681	Sisson loam, SmC & Bixler-Urban land, loamy fine sand, ByA	Silty Sand (SM)	Loamy Sand	sandy material forming outwash plains, beach ridges and deltas
Lathrop Park (LAT), Village of Berkey	LAT-PSB	41.716549	-83.837780	Haskins loam, HnA & Nappanee loam, NnA	Sandy Lean Clay (CL)	Loam	clayey and loamy, water-worked glacial till
Ottawa Golf Course (OTT), Toledo City Park	OTT-PSB	41.670116	-83.602980	Ottokee-Urban land complex, OuB	Silty Sand (SM)	Loamy Sand	loamy and sandy glacial lake sediment
Pearson (PEA), Toledo Metropark	PEA-PSB	41.639514	-83.446414	Latty silty clay, Lc	Fat Clay (CH)	Silty Clay	clayey glacial lake sediment
Secor (SEC), Toledo Metropark	SEC-PSB	41.665410	-83.785488	Gilford fine sandy loam, Gf & Tedrow fine sand, TdA	Poorly Graded Sand with Silt (SP-SM)	Sand	loamy and clayey glacial lake deposits
Side Cut (SID), Toledo Metropark	SID- PSB	41.542883	-83.696041	Sloan loam, occassionally flooded, So & St. Clair silty clay loam, SuE3	Lean Clay with Sand (CL)	Clay Loam	clayey glacial lake sediment
Swan Creek Preserve (SWA), Toledo Metropark	SWA-PSB	41.617556	-83.646517	Sisson loam, SmD	Poorly Graded Sand with Silt (SP-SM)	Sand	loamy and sandy glacial lake sediment
Wildwood Preserve (WIL), Toledo Metropark	WIL- PSB	41.681262	-83.670073	Oakville fine sand, OaB & Ottokee fine sand, OtB	Poorly Graded Sand (SP)	Sand	sandy material forming beach ridges and dunes
Woodsdale (WOO), Toledo City Park	WOO-PSB	41.617414	-83.590671	Colwood-Urban land complex, Cp	Silty Sand (SM)	Sandy Loam	loamy and sandy material forming deltas

Note:

1 One preliminary soil boring (PSB) was installed at each samplilng location to evaluate soil conditions prior to collecting analytical samples; PSB logs (with field soil descriptions) are included in Appendix A

2 Latitude and longitude values (Google Earth) are for the approximate center of area from which soil samples were collected

3 Mapping Number is based on Lucas County Soil Survey data.

4 Parent Material is based on Lucas County Soil Survey data and Preliminary Soil Boring (PSB) logs.

TABLE 2
Summary of Soil Geotechnical Testing Results

Soil Sample	Soil Parent Material[1]	Unified Soil Classification System (USCS)							USDA Soil Classification System				
		USCS Soil Type	Particle Size Distribution				Atterberg Limits			USDA Soil Type	Particle Size Distribution			
			% Gravel (>4.76 mm)	% Sand (<=4.76 mm, >0.074 mm)	% Silt (<=0.074 mm, >0.002 mm)	% Clay (<=0.002 mm)	LL (%)	PL (%)	PI (%)		% Gravel (>2 mm)	% Sand (<=2 mm, >0.05 mm)	% Silt (<=0.05 mm, >0.002 mm)	% Clay (<=0.002 mm)
DET-1	clayey and loamy glacial lake sediment	Fat Clay (CH)	0	0.88	69.41	29.71	64	30	34	Silty Clay Loam	0	3.49	66.8	29.71
FAR-1	loamy and sandy glacial lake sediment	Lean Clay with Sand (CL)	3.29	26.12	40.73	29.85	40	21	19	Clay Loam	6.38	25.72	38.06	29.85
GRE-1	sandy material forming outwash plains, beach ridges and deltas	Silty Sand (SM)	0.23	86.75	8.09	4.93	NP	NP	NP	Loamy Sand	0.45	86.86	7.77	4.93
LAT-1	clayey and loamy, water-worked glacial till	Sandy Lean Clay (CL)	0.75	41.67	34.92	22.67	37	19	18	Loam	2.5	42.34	32.48	22.67
OTT-1	loamy and sandy glacial lake sediment	Silty Sand (SM)	0.01	84.11	8.68	7.2	NP	NP	NP	Loamy Sand	0.11	85.04	7.65	7.2
PEA-1	clayey glacial lake sediment	Fat Clay (CH)	0	1.76	53.88	44.36	60	23	37	Silty Clay	0.07	3.78	51.79	44.36
SEC-1	loamy and clayey glacial lake deposits	Poorly Graded Sand with Silt (SP-SM)	1.24	89.2	4.78	4.78	NP	NP	NP	Sand	1.64	89.06	4.53	4.78
SID-1	weathered limestone bedrock	Lean Clay with Sand (CL)	0.34	20.6	42.19	36.87	46	18	28	Clay Loam	2.01	22.58	38.54	36.87
SWA-1	loamy and sandy glacial lake sediment	Poorly Graded Sand with Silt (SP-SM)	0	89.7	5.1	5.2	NP	NP	NP	Sand	0.04	90.73	4.03	5.2
WIL-1	sandy material forming beach ridges and dunes	Poorly Graded Sand (SP)	0	> 95.3	< 4.7	< 4.7	NP	NP	NP	Sand	0	> 95.3	< 4.7	< 4.7
WOO-1	loamy and sandy material forming deltas	Silty Sand (SM)	0	67.52	18.12	14.36	NP	NP	NP	Sandy Loam	0.48	69.77	15.39	14.36

[1] Parent Material is based on Lucas County Soil Survey data and Preliminary Soil Boring (PSB) logs.

NP = Non-plastic

Table 3A
Background Statistics for Lucas County
Summary Results for Nine Metals
in
Soils with Less Than or Equal to 50% Sand

Metal	Number of Sites Included[1]	Number of Outliers	% ND	Data points	Maximum	Mean	SD	Distribution	VAP UL	95% UTL with 95% Coverage	95% UPL	Units	Comments
Arsenic	5	0	0.0%	50	9.36	6.373	1.645	Normal	**9.7**	9.759	9.158	mg/kg	
Barium	5	0	0.0%	50	85.6	68.18	11.02	Normal	**90.1**	85.6	86.85	mg/kg	
Cadmium	5	-	71.8%	50	-	-	-	-	-	-	-	mg/kg	No stats completed, excess non-detects
Chromium	5	0	0.0%	50	24.0	15.99	3.115	Lognormal	22.2	**23.2**	21.63	mg/kg	
Lead	5	0	0.0%	50	17.6	13.35	1.827	Normal	**17.0**	17.1	16.44	mg/kg	
Mercury	11[2]	1	0.0%	109	0.0478	0.026	0.009	Normal	**0.045**	0.044	0.084	mg/kg	Highest value deleted as outlier
Nickel	5	0	0.0%	50	29.6	22.45	2.982	Normal	**28.5**	28.6	27.5	mg/kg	
Selenium	5	-	60.9%	50	-	-	-	-	-	-	-	mg/kg	No stats completed, excess non-detects
Thallium	5	0	0.0%	50	0.438	0.288	0.073	Lognormal	0.44	**0.44**	0.432	mg/kg	

(1) Based on geotechnical data samples from the Detwiler Golf Course (DET), Farnsworth Metropark (FAR), Lathrope Park (LAT), Pearson Metropark (PEA), and Side Cut Metropark (SID) sites were identified as those sites where soils with less than or equal to 50% sand are located.

(2) The data for mercury at all 11 sites were combined to form one normally distributed group. No statistical distinction is made for mercury content in either clay-rich or sandy-rich soils.

Note: ND – Nondetect
SD – Standard deviation
VAP UL – Voluntary Action Program upper limit
UTL – Upper tolerance limit
UPL – Upper prediction limit

{ } = mean + 2SD calculated, but dataset is not normal or lognormal and value may not be appropriate for use as the UL.

Bold Number = Representative background value for associated metal

Table 3B
Background Statistics for Lucas County
Summary Results for Nine Metals
in
Soils with Greater than 50% Sand

Metal	Number of Sites Included[1]	Number of Outliers	% ND	Data points	Maximum	Mean	SD	Distribution	VAP UL	95% UTL with 95% Coverage	95% UPL	Units	Comments
Arsenic	6	0	0.0%	60	9.36	6.373	1.645	Lognormal	2.1	**2.42**	3.158	mg/kg	
Barium	6	0	0.0%	60	85.6	68.18	11.02	Nonparametric	39.0	**41.0**	40.72	mg/kg	
Cadmium	6	-	71.8%	60	-	-	-	-	-	-	-	mg/kg	No stats completed, excess non-detects
Chromium	6	0	0.0%	60	24.0	15.99	3.115	Nonparametric	7.20	**7.10**	7.13	mg/kg	
Lead	6	0	0.0%	60	17.6	13.35	1.827	Lognormal	11.0	**12.2**	10.94	mg/kg	
Mercury	11	1	0.0%	109	0.0478	0.026	0.009	Normal	**0.045**	0.044	0.084	mg/kg	Highest value deleted as outlier
Nickel	6	1	0.0%	59	29.6	22.45	2.982	Lognormal	7.40	**6.30**	5.679	mg/kg	One outlier detected
Selenium	6	-	60.9%	60	-	-	-	-	-	-	-	mg/kg	No stats completed, excess non-detects
Thallium	6	0	0.0%	60	0.438	0.288	0.073	Lognormal	0.061	**0.067**	0.055	mg/kg	

(1) Based on geotechnical data samples from the Greenwood Park (GRE), Ottawa Golf Course (OTT), Secor Metropark (SEC), Swan Creek Preserve (SWA), Wildwood Preserve (WIL), and Woodsdale Park (WOO) sites were identified as those sites where soils with greater than 50% sand are located.

(2) The data for mercury at all 11 sites were combined to form one normally distributed group. No statistical distinction is made for mercury content in either clay-rich or sandy-rich soils.

{ } = mean + 2SD calculated, but dataset is not normal or lognormal and value may not be appropriate for use as the UL.

Bold Number = Representative background value for associated metal

Note: ND – Nondetect
SD – Standard deviation
VAP UL – Voluntary Action Program upper limit
UTL – Upper tolerance limit
UPL – Upper prediction limit

Table 4

Property Abbreviation Key

Abbreviation	Property & General Location
DET	Detwiler Golf Course
FAR	Farnsworth Metropark
GRE	Greenwood Park
LAT	Lathrop Park (Village of Berkey)
OTT	Ottawa Golf Course
PEA	Pearson Metropark
SEC	Secor Metropark
SID	Side Cut Metropark
SWA	Swan Creek Preserve
WIL	Wildwood Preserve
WOO	Woodsdale Park

Table 5
Summary of Arsenic Data
Lucas County Background Soils Summary Report

Sample	Location Units	DET	FAR	GRE	LAT	OTT	PEA	SEC	SID	SWA	WIL	WOO
1	mg/kg	6.49	6.54	0.788	8.36	1.34	5.92	1.34	7.52	0.864	1.21	1.84
2	mg/kg	5.83	8.36	1.17	7.76	1.34	3.92	0.876	8.61	1.52	1.03	1.93
3	mg/kg	5.65	8.56	0.705	8.52	1.75	3.30	1.29	6.13	2.30	1.17	2.52
4	mg/kg	5.34	8.21	1.00	7.73	0.935	3.50	0.596	6.54	1.13	0.981	1.54
5	mg/kg	4.52	7.42	1.01	6.41	1.26	4.11	0.945	7.47	1.08	0.966	1.79
6	mg/kg	3.80	7.70	0.958	8.77	1.20	4.43	1.43	7.16	1.19	0.930	2.14
7	mg/kg	5.73	7.53	1.17	6.66	0.860	3.88	0.399	5.22	1.10	1.11	1.66
8	mg/kg	5.05	9.36	0.724	7.47	1.31	4.43	0.486	8.73	1.12	0.712	1.28
9	mg/kg	6.75	7.46	1.83	6.83	1.06	4.28	0.452	6.92	1.20	0.814	2.06
10	mg/kg	4.76	8.68	1.30	6.53	1.26	4.07	0.842	5.72	1.45	0.681	1.43

Notes:
mg/kg = milligrams per kilogram

Table 6
Summary of Barium Data
Lucas County Background Soils Summary Report

Sample	Location Units	DET	FAR	GRE	LAT	OTT	PEA	SEC	SID	SWA	WIL	WOO
1	mg/kg	76.3	55.7	12.1	57.0	22.2	85.4	13.3	66.4	10.5	12.1	37.3
2	mg/kg	67.3	50.3	15.3	73.5	27.3	73.5	13.6	80.3	11.4	16.7	41.0
3	mg/kg	63.3	55.1	13.5	77.1	24.1	80.8	11.9	78.5	16.2	16.1	43.8
4	mg/kg	69.4	56.1	14.3	72.4	24.3	83.1	8.08	67.9	13.0	12.8	40.9
5	mg/kg	57.5	52.7	12.7	69.2	22.0	80.0	14.0	77.9	14.2	12.7	36.0
6	mg/kg	63.5	52.0	15.9	83.7	24.2	85.0	15.6	79.7	16.1	16.7	36.4
7	mg/kg	63.2	56.2	14.3	68.9	23.4	81.7	7.95	63.3	11.3	12.0	37.1
8	mg/kg	54.5	43.5	15.3	73.5	27.5	74.7	7.41	67.1	12.1	10.2	36.4
9	mg/kg	63.7	55.5	30.9	61.0	25.0	85.6	7.90	69.6	12.0	12.0	36.8
10	mg/kg	58.7	55.9	19.4	63.6	21.3	83.8	16.2	74.5	15.2	11.5	33.6

Notes:
mg/kg = milligrams per kilogram

Table 7
Summary of Cadmium Data
Lucas County Background Soils Summary Report

Sample	Location Units	DET	FAR	GRE	LAT	OTT	PEA	SEC	SID	SWA	WIL	WOO
1	mg/kg	0.236	0.265	<0.370	0.247	<0.379	<0.410	<0.420	<0.424	<0.370	<0.350	<0.421
2	mg/kg	0.283	0.251	<0.392	0.309	<0.382	<0.461	<0.410	<0.442	<0.353	<0.354	<0.422
3	mg/kg	0.280	0.225	<0.369	0.271	<0.387	<0.460	<0.415	<0.450	<0.387	<0.355	<0.393
4	mg/kg	0.268	0.258	<0.397	0.237	<0.408	0.244	<0.428	<0.438	<0.384	<0.355	<0.398
5	mg/kg	<0.500	0.298	<0.360	0.388	<0.395	<0.445	<0.393	<0.419	<0.359	<0.346	<0.382
6	mg/kg	0.265	0.217	<0.402	0.283	<0.378	0.245	<0.378	<0.402	<0.456	<0.366	<0.404
7	mg/kg	0.258	0.283	<0.368	0.308	<0.367	<0.487	<0.409	<0.431	<0.459	<0.392	<0.406
8	mg/kg	0.254	0.237	<0.381	0.316	<0.389	<0.471	<0.408	<0.425	<0.419	<0.394	<0.399
9	mg/kg	0.299	0.270	<0.367	0.260	<0.382	<0.457	<0.400	<0.416	<0.365	<0.388	<0.398
10	mg/kg	0.270	0.284	<0.401	0.270	<0.376	<0.471	<0.376	<0.418	<0.353	<0.379	<0.383

Notes:
mg/kg – milligrams per kilogram

Table 8
Summary of Chromium Data
Lucas County Background Soils Summary Report

Sample	Location Units	DET	FAR	GRE	LAT	OTT	PEA	SEC	SID	SWA	WIL	WOO
1	mg/kg	19.9	15.8	2.85	12.7	2.40	15.9	7.14	16.8	3.03	3.62	6.33
2	mg/kg	14.2	14.2	3.36	16.5	2.65	12.2	5.49	21.6	2.82	3.11	7.42
3	mg/kg	13.8	16.6	3.58	16.7	3.22	15.4	6.09	22.1	3.58	3.14	7.14
4	mg/kg	14.4	15.6	3.27	18.0	2.76	13.9	3.26	17.9	3.37	2.85	6.93
5	mg/kg	12.1	14.0	3.09	11.0	2.99	15.6	5.27	24.0	3.50	2.74	6.17
6	mg/kg	10.2	14.7	3.15	21.9	2.68	15.5	6.83	22.7	2.68	3.09	6.88
7	mg/kg	13.8	14.5	3.12	14.1	2.80	16.2	3.41	17.2	2.86	3.38	6.29
8	mg/kg	12.6	12.3	3.01	17.5	2.28	14.7	5.09	20.8	3.15	2.56	6.53
9	mg/kg	14.7	15.8	2.70	14.5	2.36	16.7	3.64	19.4	3.15	3.16	6.66
10	mg/kg	12.7	15.0	3.79	15.5	2.46	15.2	6.18	20.6	3.69	2.63	6.46

Notes:
mg/kg – milligrams per kilogram

Table 9
Summary of Lead Data
Lucas County Background Soils Summary Report

Sample	Location Units	DET	FAR	GRE	LAT	OTT	PEA	SEC	SID	SWA	WIL	WOO
1	mg/kg	14.3	11.7	5.92	9.57	7.88	14.2	3.74	13.5	3.82	6.06	8.72
2	mg/kg	13.9	12.3	5.37	13.4	6.43	14.1	2.77	15.3	5.44	14.7	7.94
3	mg/kg	14.5	12.1	5.86	9.44	12.3	14.0	4.18	13.6	7.74	8.49	7.79
4	mg/kg	12.8	12.3	6.00	10.0	6.45	15.1	5.38	14.6	5.27	4.72	7.48
5	mg/kg	10.8	17.6	4.40	15.1	9.28	16.2	5.51	14.0	5.95	4.53	8.74
6	mg/kg	13.8	11.2	6.15	12.6	6.46	15.0	10.3	13.1	7.81	4.96	9.17
7	mg/kg	13.9	15.5	8.14	13.3	5.97	13.6	3.65	13.5	5.52	5.55	8.01
8	mg/kg	10.7	9.69	4.23	11.4	9.02	13.9	4.12	15.0	5.59	4.40	7.54
9	mg/kg	14.7	12.5	8.47	11.1	8.95	13.7	3.56	13.9	6.37	5.67	7.87
10	mg/kg	12.6	13.1	5.44	17.5	9.13	13.6	3.81	14.2	7.53	3.98	8.47

Notes:
mg/kg – milligrams per kilogram

Table 10
Summary of Mercury Data
Lucas County Background Soils Summary Report

Sample	Location Units	DET	FAR	GRE	LAT	OTT	PEA	SEC	SID	SWA	WIL	WOO
1	mg/kg	0.0418	0.0221	0.0137	0.0413	0.0241	0.0419	0.0260	0.0309	<0.251	0.0120	0.0225
2	mg/kg	0.0478	0.0218	0.0165	0.0399	0.0262	0.0352	0.0300	0.0284	<0.241	0.0106	0.0208
3	mg/kg	0.0410	0.0185	0.0159	0.0335	0.0333	0.0387	0.0228	0.0307	0.0114	0.0150	0.0245
4	mg/kg	0.0394	0.0207	0.0115	0.0336	0.0235	0.0371	0.0214	0.0326	0.0120	0.0111	0.0225
5	mg/kg	0.0309	0.0325	0.0151	0.0366	0.0326	0.0360	0.0290	0.0302	<0.255	0.0102	0.0243
6	mg/kg	0.0322	0.0263	0.0140	0.0338	0.0219	0.0336	0.0306	0.0286	<0.308	<0.246	0.0222
7	mg/kg	0.0345	0.0227	0.0140	0.0409	0.0240	0.0344	0.0121	0.0284	<0.298	0.0164	0.0207
8	mg/kg	0.0407	0.0182	0.0111	0.0414	0.0216	0.0318	0.0153	0.0244	<0.302	0.0127	0.0188
9	mg/kg	0.0357	0.0248	0.0208	0.0363	0.0251	0.0368	0.0214	0.0325	<0.252	0.0170	0.0222
10	mg/kg	0.0400	0.0189	0.0126	0.0371	0.0272	0.0383	0.0211	0.0317	0.0119	0.0130	0.0222

Notes:
mg/kg – milligrams per kilogram

Table 11
Summary of Nickel Data
Lucas County Background Soils Summary Report

Sample	Location Units	DET	FAR	GRE	LAT	OTT	PEA	SEC	SID	SWA	WIL	WOO
1	mg/kg	24.4	21.9	2.60	18.4	3.04	19.8	5.67	26.3	3.61	7.10	4.99
2	mg/kg	23.6	23.8	3.07	20.2	3.46	16.9	4.24	27.0	3.27	2.79	5.50
3	mg/kg	22.7	22.9	2.78	22.4	3.93	19.6	5.40	26.7	3.86	2.82	5.08
4	mg/kg	24.6	23.0	3.03	22.6	3.50	20.2	1.90	23.6	3.68	2.58	5.35
5	mg/kg	21.9	21.0	2.76	18.5	3.60	19.9	4.57	26.6	3.98	2.75	14.5
6	mg/kg	14.5	22.1	2.77	29.6	3.29	22.3	4.61	28.4	3.50	2.83	4.80
7	mg/kg	22.7	22.7	2.75	19.2	3.28	22.1	1.80	23.9	3.12	2.87	4.75
8	mg/kg	22.0	18.0	2.71	25.2	3.48	20.8	1.91	25.2	3.55	2.33	4.46
9	mg/kg	26.3	22.6	3.66	21.3	3.43	21.3	1.91	23.4	3.68	3.01	4.77
10	mg/kg	21.8	23.6	3.67	17.6	3.31	21.8	4.38	25.5	4.13	2.59	4.99

Notes:
mg/kg – milligrams per kilogram

Table 12
Summary of Selenium Data
Lucas County Background Soils Summary Report

Sample	Location Units	DET	FAR	GRE	LAT	OTT	PEA	SEC	SID	SWA	WIL	WOO
1	mg/kg	0.200	<0.448	<0.213	0.229	0.162	<0.241	0.237	<0.454	<0.203	0.109	0.254
2	mg/kg	0.146	<0.225	<0.214	0.443	<0.202	<0.245	0.182	<0.232	<0.202	<0.201	<0.146
3	mg/kg	0.278	<0.227	<0.205	0.115	0.147	<0.252	0.241	<0.224	<0.207	<0.208	0.143
4	mg/kg	0.202	<0.227	<0.208	<0.217	<0.221	<0.242	0.148	<0.234	<0.193	<0.207	0.134
5	mg/kg	<0.263	<0.230	<0.202	0.305	<0.206	<0.255	<0.216	<0.439	<0.210	0.103	<0.217
6	mg/kg	0.277	<0.422	0.113	<0.218	0.124	<0.240	0.146	<0.448	<0.247	<0.199	<0.209
7	mg/kg	0.224	<0.228	0.125	0.339	0.420	0.150	<0.217	<0.233	<0.241	<0.204	0.198
8	mg/kg	<0.251	<0.233	<0.201	0.272	<0.206	<0.247	0.179	<0.441	<0.246	<0.206	0.128
9	mg/kg	0.501	<0.223	0.132	0.213	<0.200	<0.241	<0.220	<0.227	<0.209	0.108	<0.212
10	mg/kg	0.488	<0.462	<0.208	0.264	0.160	0.335	0.188	<0.227	<0.208	0.196	0.121

Notes:
mg/kg – milligrams per kilogram

Table 13
Summary of Thallium Data
Lucas County Background Soils Summary Report

Sample	Location Units	DET	FAR	GRE	LAT	OTT	PEA	SEC	SID	SWA	WIL	WOO
1	mg/kg	0.308	0.321	0.0252	0.212	0.0329	0.252	0.0280	0.384	0.0273	0.0312	0.0453
2	mg/kg	0.257	0.402	0.0359	0.266	0.0435	0.249	0.0405	0.410	0.0330	0.0241	0.0535
3	mg/kg	0.256	0.438	0.0219	0.279	0.0462	0.207	0.0224	0.276	0.0375	0.0286	0.0914
4	mg/kg	0.237	0.307	0.0269	0.271	0.0331	0.220	<0.0444	0.309	0.0227	0.0232	0.0446
5	mg/kg	0.190	0.420	0.0310	0.238	0.0380	0.224	0.0218	0.404	<0.0420	0.0256	0.0545
6	mg/kg	0.133	0.395	0.0315	0.334	0.0357	0.260	0.0319	0.354	<0.0493	0.0277	0.0672
7	mg/kg	0.269	0.384	0.0335	0.233	0.0283	0.205	0.0273	0.269	0.0268	0.0249	0.0519
8	mg/kg	0.253	0.371	0.0277	0.294	0.0424	0.258	0.0428	0.376	0.0257	<0.0412	0.0394
9	mg/kg	0.185	0.355	0.0483	0.259	0.0344	0.221	0.0266	0.343	0.0218	<0.0403	0.0599
10	mg/kg	0.222	0.395	0.0316	0.220	0.0403	0.232	0.0255	0.264	0.0254	<0.0393	0.0443

Notes:
mg/kg – milligrams per kilogram

APPENDIX A

BORING LOGS (PRELIMINARY SOIL BORINGS)

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Detwiler (DET) Golf Course, Toledo
4001 North Summit Street
Toledo, OH 43611
Lucas County, NWDO
Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

DET--PSB
Page 1 of 1

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.701361° / Long -83.484469°, W. side of 14th Hole; in rough grass, among maples; 67' E. of prop. line

GROUND ELEVATION: ~572 ft. a.m.s.l.	**TOC ELEVATION:** NA	**DRILLING SERVICES:** Ohio EPA SIFU
START DATE: 9/24/13	**COMPLETION DATE:** 9/24/13	**DRILLER:** Ed Link, Jeff Martin
DRILLING & SAMPLING METHODS: Hand Auger		**LOGGED BY:** Ed Link, Jeff Martin

DIAMETER (in): ~2	**TOTAL DEPTH** (ft): 4	**REFUSAL** (ft): NE

NOTES: Preliminary Soil Boring (PSB) & Lab sampling performed on cool, early fall day (~65 F); sunny; slight wind

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
09/24/13	00:00		Not Encountered

DEPTH (ft)	CORING Core Type	CORING Core Interval/ Recovery (ft)	SAMPLING Sample Interval (ft)	SAMPLING Sample Purpose/ID	SAMPLING PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
	HA	0.0-0.5 0.5	0.0 - 0.5	XRF screening, DET 0.0-0.5 ft.	NA	1	0.5'	CL	**USCS Lean Clay (USDA Silt Loam):** dark brown to dark gray; low plasticity; roots; no gravel; little sand
	HA	0.5-1.0 0.5	0.5 - 1.0	XRF screening, DET 0.5-1.0 ft.	NA		1'	CL	same as above
1	HA	1.0-1.5 0.5	1.0 - 1.5	XRF screening, DET 1.0-1.5 ft.	NA		1.5'	CL	same as above, but medium plasticity
	HA	1.5-2.0 0.5	1.5 - 2.0	XRF screening, DET 1.5-2.0 ft.	NA		2'	CL	same as above
2	HA	2.0-2.5 0.5	2.0 - 2.5	XRF screening, DET 2.0-2.5 ft.	NA		2.5'	OL	**USCS Organic Soil or Peat (USDA Peat):** dark brown to dark gray; low plasticity
	HA	2.5-3.0 0.5	2.5 - 3.0	XRF screening, DET 2.5-3.0 ft.	NA		3'	OL	same as above, but black to dark brown; roots
3	HA	3.0-3.5 0.5	3.0 - 3.5	XRF screening, DET 3.0-3.5 ft.	NA		3.5'	OL	same as above
	HA	3.5-4.0 0.5	3.5 - 4.0	XRF screening, DET 3.5-4.0 ft.	NA		4'	OL	same as above
4									

Soil analytical and geotechnical testing samples DET-1 through DET-10 were collected on 09-24-2013 @ 13:35. DET-1 was collected adjacent to the DET-PSB location, and DET-2 through DET-10 were collected at random locations within a 15 ft radius of DET-PSB. Each sample was collected from ground surface to a depth of 2 ft using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample DET-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:
1. Homogenized soil from 0.0-2.0 ft deep (sampling location DET-1) consists of USCS Fat Clay (CH) / USDA Silty Clay Loam, based on lab analysis.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 3/7/14 12:49 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC--GINT_SOIL_BORING_LOGS\LC--DETWEILER_CITY_PARK.GPJ

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Farnsworth (FAR) Metropark
8505 South River Road (Old U.S. 24)
Waterville, OH 43566
Lucas County, NWDO
Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

FAR--PSB

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.479164° / Long -83.746915°, Northeastern Parking Lot for Boat Launch & Tow Path Area

GROUND ELEVATION: ~620 ft. a.m.s.l.	**TOC ELEVATION:** NA	**DRILLING SERVICES:** Ohio EPA SIFU
START DATE: 7/15/13	**COMPLETION DATE:** 7/15/13	**DRILLER:** Kelvin Jones, Ed Link
DRILLING & SAMPLING METHODS: Hand Auger		**LOGGED BY:** Ed Link, Jeff Martin

DIAMETER (in): ~2	**TOTAL DEPTH** (ft): 3	**REFUSAL** (ft): 3

NOTES: Preliminary Soil Boring (PSB) sampling performed on hot summer day (~80 F).

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
07/15/13	00:00		Not Encountered

DEPTH (ft)	CORING Core Type	CORING Core Interval/ Recovery (ft)	SAMPLING Sample Interval (ft)	SAMPLING Sample Purpose/ID	SAMPLING PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
0	HA	0.0-0.5 0.5	0.0 - 0.5	XRF screening, FAR 0.0-0.5 ft.	NA	1	0.5'	CL	**USCS Lean Clay with Sand (USDA Clay Loam):** dark brown to dark grayish brown; some organic matter; low to medium plasticity
	HA	0.5-1.0 0.5	0.5 - 1.0	XRF screening, FAR 0.5-1.0 ft.	NA		1'	CL	same as above, but medium brown to dark gray; medium plasticity; trace gravel
1	HA	1.0-1.5 0.5	1.0 - 1.5	XRF screening, FAR 1.0-1.5 ft.	NA		1.5'	CL	**USCS Sandy Lean Clay with Sand (USDA Clay Loam):** dark brown; increasing clay content; increase in sand size; trace gravel
	HA	1.5-2.0 0.5	1.5 - 2.0	XRF screening, FAR 1.5-2.0 ft.	NA		2'	CL	same as above, but grayish brown to brown
2	HA	2.0-2.5 0.5	2.0 - 2.5		NA		2.5'	CL	same as above, but with limestone fragments
	HA	2.5-3.0 0.5	2.5 - 3.0		NA		3'	CL	same as above, but dark brown with carbonate mineralization; alluvial deposits on weathered limestone
3									Refusal @ 3' on weathered limestone

Soil analytical and geotechnical testing samples FAR-1 through FAR-10 were collected on 09-24-2013 @ 18:10. FAR-1 was collected adjacent to the FAR-PSB location, and FAR-2 through FAR-10 were collected at random locations within a 15 ft radius of FAR-PSB. Each sample was collected from ground surface to a depth of 2 ft using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample FAR-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:
1. Homogenized soil from 0.0-2.0 ft deep (sampling location FAR-1) consists of USCS Lean Clay with Sand (CL) / USDA Clay Loam, based on lab analysis.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 2/20/14 09:50 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC--GINT_SOIL_BORING_LOGS\LC--FARNSWORTH_METROPARK.GPJ

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Greenwood (GRE) Park, City of Toledo
6150 Jackman Rd. (at Darrel Rd. entr.)
Toledo, OH 43613
Lucas County, NWDO
Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

GRE--PSB
Page 1 of 1

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.726731° / Long -83.576681°, ~650' NE of Greenwood's Darrel Rd. parking area; N. trail into woods

GROUND ELEVATION: ~592 ft. a.m.s.l. | **TOC ELEVATION:** NA | **DRILLING SERVICES:** Ohio EPA SIFU

START DATE: 7/23/13 | **COMPLETION DATE:** 7/23/13 | **DRILLER:** Kelvin Jones, Ed Link

DRILLING & SAMPLING METHODS: Hand Auger | **LOGGED BY:** Ed Link, Jeff Martin

DIAMETER (in): ~2 | **TOTAL DEPTH** (ft): 4 | **REFUSAL** (ft): NE

NOTES: Preliminary Soil Boring (PSB) sampling performed on hot summer day (~80 F).

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
07/23/13	00:00		Not Encountered

DEPTH (ft)	CORING: Core Type	CORING: Core Interval/ Recovery (ft)	SAMPLING: Sample Interval (ft)	SAMPLING: Sample Purpose/ID	SAMPLING: PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
0	HA	0.0-0.5 / 0.5	0.0 - 0.5	XRF screening, GRE 0.0-2.0 ft., COMPOSITE	NA	1	0.5'	SM	**USCS Sand (USDA Loamy Sand):** dark brown to dark gray; roots; trace rounded fine gravel
	HA	0.5-1.0 / 0.5	0.5 - 1.0		NA		1'	SM	same as above, but color change yellowish brown to brown; no gravel
1	HA	1.0-1.5 / 0.5	0.0 - 2.0		NA		1.5'	SM	same as above
			1.0 - 1.5		NA				
	HA	1.5-2.0 / 0.5	1.5 - 2.0		NA		2'	SM	same as above
2	HA	2.0-2.5 / 0.5	2.0 - 2.5		NA		2.5'	ML/SM	**USCS Sandy Silt to Sandy Clay (USDA Loamy Sand to Sandy Clay layers):** layers of interbedded, loose sand (~75%) & clay or clay clasts (~25%); low to medium plasticity; roots
	HA	2.5-3.0 / 0.5	2.5 - 3.0		NA		3'	CL	**USCS Clay (USDA Loamy Sand with Sandy Clay layers):** layers of interbedded, loose sand (~50%) & clay or clay clasts (~50%)
3	HA	3.0-3.5 / 0.5	3.0 - 3.5		NA		3.5'	SM/SC	**USCS Clayey Sand to Sandy Clay (USDA Sandy Clay to Sandy Clay Loam layers):** layers of interbedded, loose clay or clay clasts (~75%) & sand (~25%)
	HA	3.5-4.0 / 0.5	3.5 - 4.0		NA		4'	CL/ML	**USCS Sandy Clay (USDA Sandy Clay Loam):** medium plasticity; little to some fine sand; massive structure; delta deposits
4									

Soil analytical and geotechnical testing samples GRE-1 through GRE-10 were collected on 2013-09-18 @ 14:15. GRE-1 was collected adjacent to the GRE-PSB location, and GRE-2 through GRE-10 were collected at random locations within a 15 ft radius of GRE-PSB. Each sample was collected from ground surface to a depth of 2 ft using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample GRE-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:
1. Homogenized soil from 0.0-2.0 ft deep (sampling location GRE-1) consists of USCS Silty Sand (SM) / USDA Loamy Sand, based on lab analysis.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 2/24/14 07:38 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC--GINT_SOIL_BORING_LOGS\LC--GREENWOOD_CITY_PARK.GPJ

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Lathrop (LAT) Park, Village of Berkey
North of 12150 Sylvania-Metamora Rd.
Berkey, OH 43504
Lucas County, NWDO
Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

LAT--PSB
Page 1 of 1

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.716549° / Long -83.837780°, between 2 large oak trees; W. of 2 ballfields; on terrace above floodplain

GROUND ELEVATION: ~702 ft. a.m.s.l. | **TOC ELEVATION:** NA | **DRILLING SERVICES:** Ohio EPA SIFU

START DATE: 9/18/13 | **COMPLETION DATE:** 9/18/13 | **DRILLER:** Kelvin Jones, Ed Link, Jeff Martin

DRILLING & SAMPLING METHODS: Hand Auger | **LOGGED BY:** Ed Link, Jeff Martin

DIAMETER (in): ~2 | **TOTAL DEPTH** (ft): 4 | **REFUSAL** (ft): NE

NOTES: Preliminary Soil Boring (PSB) & Lab sampling performed on cool, late summer day (~60 F).

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
09/18/13	00:00		Not Encountered

DEPTH (ft)	Core Type	Core Interval/ Recovery (ft)	Sample Interval (ft)	Sample Purpose/ID	PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
	HA	0.0-0.5 0.5	0.0 - 0.5	XRF screening, LAT 0.0-0.5 ft.	NA	1	0.5'	CL/ML	**USCS Lean Clay with Sand (USDA Loam):** dark brown; roots; sand is fine-grained; trace fine subangular gravel; medium plasticity
	HA	0.5-1.0 0.5	0.5 - 1.0	XRF screening, LAT 0.5-1.0 ft.	NA		1'	CL/ML	same as above, but USDA Loam to Clay Loam
1	HA	1.0-1.5 0.5	1.0 - 1.5	XRF screening, LAT 1.0-1.5 ft.	NA		1.5'	CL/ML	same as above, but USCS Lean Clay with Sand
	HA	1.5-2.0 0.5	1.5 - 2.0	XRF screening, LAT 1.5-2.0 ft.	NA		2'	CL/ML	**USCS Lean Clay with Sand to Sandy Lean Clay (USDA Clay Loam):** dark brown; roots; increase in clay & sand content; sand is fine-grained; low to medium plasticity
2	HA	2.0-2.5 0.5	2.0 - 2.5	XRF screening, LAT 2.0-2.5 ft.	NA		2.5'	CL/ML	same as above, but reddish brown to dark brown; slightly more fine-grained sand; trace fine subangular gravel; medium plasticity
	HA	2.5-3.0 0.5	2.5 - 3.0	XRF screening, LAT 2.5-3.0 ft.	NA		3'	CL/ML	same as above, but dark brown to brown
3	HA	3.0-3.5 0.5	3.0 - 3.5	XRF screening, LAT 3.0-3.5 ft.	NA		3.5'	CL/ML	same as above, but light brown; increase in clay content
	HA	3.5-4.0 0.5	3.5 - 4.0	XRF screening, LAT 3.5-4.0 ft.	NA		4'	CL/ML	same as above, till
4									

Soil analytical and geotechnical testing samples LAT-1 through LAT -10 were collected on 2013-09-18 @ 10:30. LAT -1 was collected adjacent to the LAT -PSB location, and LAT -2 through LAT -10 were collected at random locations within a 15 ft. radius of LAT-PSB. Each sample was collected from ground surface to a depth of 2 ft. using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample LAT-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:
1. Homogenized soil from 0.0-2.0 ft deep (sampling location LAT-1) consists of USCS Sandy Lean Clay (CL) / USDA Loam, based on lab analysis.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 2/20/14 09:54 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC--GNT_SOIL_BORING_LOGS\LC--LATHROP_VILLAGE_PARK.GPJ

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Ottawa (OTT) Golf Course, Toledo City
2315 Walden Pond (Shebrooke tr. entr.)
Toledo, OH 43606
Lucas County, NWDO
Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

OTT--PSB
Page 1 of 1

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.670116° / Long -83.602980°, ~90' SW of Shebrooke & Kenwood intersection @ N woods trail entrance

GROUND ELEVATION: ~592 ft. a.m.s.l.	**TOC ELEVATION:** NA	**DRILLING SERVICES:** Ohio EPA SIFU
START DATE: 7/23/13	**COMPLETION DATE:** 7/23/13	**DRILLER:** Kelvin Jones, Ed Link
DRILLING & SAMPLING METHODS: Hand Auger		**LOGGED BY:** Ed Link, Jeff Martin

DIAMETER (in): ~2 | **TOTAL DEPTH** (ft): 4 | **REFUSAL** (ft): NE

NOTES: Preliminary Soil Boring (PSB) sampling performed on hot summer day (~80 F).

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
07/23/13	00:00		Not Encountered

DEPTH (ft)	CORING: Core Type	CORING: Core Interval/ Recovery (ft)	SAMPLING: Sample Interval (ft)	SAMPLING: Sample Purpose/ID	SAMPLING: PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
0	HA	0.0-0.5 0.5	0.0 - 0.5		NA	1	0.5'	SM	**USCS Silty Sand or Sand with Silt (USDA Loamy Sand):** brown; organic matter & roots; mostly fine sand; high dilatency
	HA	0.5-1.0 0.5	0.5 - 1.0	XRF screening, OTT 0.0-2.0 ft., COMPOSITE	NA		1'	SM	same as above, but USCS Silty Sand with color transition from brown to yellowish brown
1			0.0 - 2.0		NA				
	HA	1.0-1.5 0.5	1.0 - 1.5		NA		1.5'	SM	**USCS Silty Sand (USDA Sand):** yellowish brown
	HA	1.5-2.0 0.5	1.5 - 2.0		NA		2'	SM	same as above
2	HA	2.0-2.5 0.5	2.0 - 2.5		NA		2.5'	SM	same as above
	HA	2.5-3.0 0.5	2.5 - 3.0		NA		3'	SM	same as above
3	HA	3.0-3.5 0.5	3.0 - 3.5		NA		3.5'	SM	same as above
	HA	3.5-4.0 0.5	3.5 - 4.0		NA		4'	SM	same as above, but more intense yellow color with depth; delta or beach depsoits
4									

Soil analytical and geotechnical testing samples OTT-1 through OTT-10 were collected on 2013-09-18 @ 15:10. OTT-1 was collected adjacent to the OTT-PSB location, and OTT-2 through OTT-10 were collected at random locations within a 15 ft. radius of OTT-PSB. Each sample was collected from ground surface to a depth of 2 ft. using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample OTT-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:
1. Homogenized soil from 0.0-2.0 ft deep (sampling location OTT-1) consists of USCS Silty Sand (SM) / USDA Loam Sand, based on lab analysis.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 2/24/14 07:43 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC--GINT_SOIL_BORING_LOGS\LC--OTTAWA_CITY_PARK.GPJ

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Pearson (PEA) Metropark
4600 Starr Ave. (near 761 Lallendorf)
Oregon, OH 43616
Lucas County, NWDO
Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

PEA--PSB
Page 1 of 1

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.639514° / Long -83.446414°, ~700' NE of W. park entr. & Lallendorf Rd.; at NW edge of new prairie

GROUND ELEVATION: ~600 ft. a.m.s.l. | **TOC ELEVATION:** NA | **DRILLING SERVICES:** Ohio EPA SIFU

START DATE: 7/15/13 | **COMPLETION DATE:** 7/15/13 | **DRILLER:** Kelvin Jones, Ed Link

DRILLING & SAMPLING METHODS: Hand Auger | **LOGGED BY:** Jeff Martin, Ed Link

DIAMETER (in): ~2 | **TOTAL DEPTH** (ft): 3.5 | **REFUSAL** (ft): 3.5

NOTES: Preliminary Soil Boring (PSB) sampling performed on hot summer day (~80 F).

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
07/15/13	00:00		Not Encountered

DEPTH (ft)	CORING: Core Type	CORING: Core Interval/ Recovery (ft)	SAMPLING: Sample Interval (ft)	SAMPLING: Sample Purpose/ID	SAMPLING: PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
	HA	0.0-0.5 0.5	0.0 - 0.5		NA	1	0.5'	CL	**USCS Lean Clay (USDA Silty Clay Loam):** dark brown to dark gray; organic; roots; high to medium plasticity
	HA	0.5-1.0 0.5	0.5 - 1.0	XRF screening, PEA 0.0-2.0 ft., COMPOSITE	NA		0.8'	CL	same as above, but to 7.5'
1			0.0 - 2.0		NA		1'	CH	**USCS Fat Clay (USDA Clay):** brown to gray; high to medium plasticity & toughness; mottling
	HA	1.0-1.5 0.5	1.0 - 1.5		NA		1.5'	CH	same as above, but lighter brown
	HA	1.5-2.0 0.5	1.5 - 2.0		NA		2'	CH	same as above
2	HA	2.0-2.5 0.5	2.0 - 2.5		NA		2.5'	CH	same as above
	HA	2.5-3.0 0.5	2.5 - 3.0		NA		3'	CH	same as above
3	HA	3.0-3.5 0.5	3.0 - 3.5		NA	2	3.5'	CH	same as above, but lacustrine deposits
									REFUSAL @ 3.5'

Soil analytical and geotechnical testing samples PEA-1 through PEA -10 were collected on 2013-09-24 @ 10:10. PEA -1 was collected adjacent to the PEA -PSB location, and PEA -2 through PEA -10 were collected at random locations within a 15 ft. radius of PEA-PSB. Each sample was collected from ground surface to a depth of 2 ft. using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample PEA -1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:
1. Homogenized soil from 0.0-2.0 ft deep (sampling location PEA-1) consists of USCS Fat Clay (CH) / USDA Silty Clay, based on lab analysis.
2. Refusal @ ~3.5' due to collapse of auger hole from swelling clays, hard to retrieve the auger.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 3/7/14 12:55 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC--GINT_SOIL_BORING_LOGS\LC--PEARSON_METROPARK.GPJ

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Secor (SEC) Metropark
10001 W. Central Ave.(off Wolfinger Rd)
Berkey, OH 43504
Lucas County, NWDO
Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

SEC--PSB
Page 1 of 1

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.665410° / Long -83.785488°, in woods S. of Wolfinger Cemetary property line & S. of Secor's hiking tr.

GROUND ELEVATION: ~655 ft. a.m.s.l.	**TOC ELEVATION:** NA	**DRILLING SERVICES:** Ohio EPA SIFU
START DATE: 7/15/13	**COMPLETION DATE:** 7/15/13	**DRILLER:** Kelvin Jones, Ed Link
DRILLING & SAMPLING METHODS: Hand Auger		**LOGGED BY:** Jeff Martin, Ed Link

DIAMETER (in): ~2	**TOTAL DEPTH** (ft): 4	**REFUSAL** (ft): NE

NOTES: Preliminary Soil Boring (PSB) sampling performed on hot summer day (~80 F). Soil samples were moist to saturated.

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
07/15/13	11:00	3.00 ▽	saturated sand in borehole

DEPTH (ft)	CORING: Core Type	CORING: Core Interval/ Recovery (ft)	SAMPLING: Sample Interval (ft)	SAMPLING: Sample Purpose/ID	SAMPLING: PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
1	HA	0.0-0.5 0.5	0.0 - 0.5	XRF screening, SEC 0.0-0.5 ft.	NA	1	0.5'	SM	**USCS Silty Sand (USDA Loamy Sand):** brown, roots & organic matter; mostly very fine to fine grained sand
	HA	0.5-1.0 0.5	0.5 - 1.0	XRF screening, SEC 0.5-1.0 ft.	NA		1'	SM	same as above, but dark yellowish-brown; no roots; mostly medium-grained sand
	HA	1.0-1.5 0.5	1.0 - 1.5	XRF screening, SEC 1.0-1.5 ft.	NA		1.5'	SP-SM	**USCS Sand with Silt (USDA Loamy Sand):** yellowish-brown; trace gravel; mostly fine-grained sand with some medium-grained
	HA	1.5-2.0 0.5	1.5 - 2.0	XRF screening, SEC 1.5-2.0 ft.	NA		2'	SP	**USCS Sand (USDA Loamy Sand):** yellowish-brown
	HA	2.0-2.5 0.5	2.0 - 2.5	XRF screening, SEC 2.0-2.5 ft.	NA		2.5'	SP-SM	same as above, but coarser sand texture (more medium-grained sand); almost saturated
	HA	2.5-3.0 0.5	2.5 - 3.0	XRF screening, SEC 2.5-3.0 ft.	NA		3'	SP	same as above, but saturated @ ~3'
	HA	3.0-3.5 0.5	3.0 - 3.5	XRF screening, SEC 3.0-3.5 ft.	NA		3.5'	SP	same as above
	HA	3.5-4.0 0.5	3.5 - 4.0	XRF screening, SEC 3.5-4.0 ft.	NA		4'	SP	same as above, but delta or beach deposits

Soil analytical and geotechnical testing samples SEC-1 through SEC-10 were collected on 2013-09-18 @ 11:30. SEC-1 was collected adjacent to the SEC-PSB location, and SEC-2 through SEC-10 were collected at random locations within a 15 ft. radius of SEC-PSB. Each sample was collected from ground surface to a depth of 2 ft. using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample SEC-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:

1. Homogenized soil from 0.0-2.0 ft deep (sampling location SEC-1) consists of USCS Poorly Graded Sand with Silt (SP-SM) / USDA Sand, based on lab analysis.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 3/7/14 12:57 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC-GINT_SOIL_BORING_LOGS\LC--SECOR_METROPARK.GPJ

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Sidecut (SID) Metropark
Fallen Timbers Lane (near Anthony Dr.)
Maumee, OH 43537
Lucas County, NWDO

Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

SID--PSB
Page 1 of 1

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.542883° / Long -83.696041°, S. of Fallen Timbers Monument's fence & E. of Sidecut's paved, hiking tr.

GROUND ELEVATION: ~592 ft. a.m.s.l.	**TOC ELEVATION:** NA	**DRILLING SERVICES:** Ohio EPA SIFU
START DATE: 7/23/13	**COMPLETION DATE:** 7/23/13	**DRILLER:** Kelvin Jones, Ed Link
DRILLING & SAMPLING METHODS: Hand Auger		**LOGGED BY:** Jeff Martin, Ed Link

DIAMETER (in): ~2	**TOTAL DEPTH** (ft): 3.5	**REFUSAL** (ft): 3.5

NOTES: Preliminary Soil Boring (PSB) sampling performed on hot summer day (~80 F).

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
07/23/13	00:00		Not Encountered

DEPTH (ft)	CORING Core Type	CORING Core Interval/ Recovery (ft)	SAMPLING Sample Interval (ft)	SAMPLING Sample Purpose/ID	SAMPLING PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
	HA	0.0-0.5 0.5	0.0 - 0.5	XRF screening, SID 0.0-0.5 ft.	NA	1	0.5'	CL	**USCS Sandy Lean Clay (USDA Clay Loam):** dark brown to dark gray; roots and organic matter; little to some fine to medium sand; low to medium plasticity
	HA	0.5-1.0 0.5	0.5 - 1.0	XRF screening, SID 0.5-1.0 ft.	NA		1'	CL	same as above, but medium plasticity
1	HA	1.0-1.5 0.5	1.0 - 1.5	XRF screening, SID 1.0-1.5 ft.	NA		1.5'	CL	**USCS Sandy Lean Clay (USDA Clay Loam):** brown; transitions from sand lean clay to clay; mottling; less sand with depth; medium plasticity
	HA	1.5-2.0 0.5	1.5 - 2.0	XRF screening, SID 1.5-2.0 ft.	NA		2'	CL	**USCS Clay (USDA Clay Loam):** brown; few to little fine sand; trace fine gravel; clay increasing with depth; medium plasticity
2	HA	2.0-2.5 0.5	2.0 - 2.5	XRF screening, SID 2.0-2.5 ft.	NA		2.5'	CL	**USCS Lean Clay with Sand (USDA Clay):** yellowish-brown to brown; trace fine gravel; few to little fine sand; high plasticity and toughnes
	HA	2.5-3.0 0.5	2.5 - 3.0	XRF screening, SID 2.5-3.0 ft.	NA		3'	CL	same as above, but very hard clay to auger through
3	HA	3.0-3.5 0.5	3.0 - 3.5	XRF screening, SID 3.0-3.5 ft.	NA		3.5'	CL	same as above, but lacustrine deposits

REFUSAL @ 3.5' – VERY STIFF CLAY

Soil analytical and geotechnical testing samples SID-1 through SID-10 were collected on 2013-09-24 @ 16:45. SID-1 was collected adjacent to the SID-PSB location, and SID-2 through SID-10 were collected at random locations within a 15 ft. radius of SID-PSB. Each sample was collected from ground surface to a depth of 2 ft. using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample SID-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:
1. Homogenized soil from 0.0-2.0 ft deep (sampling location SID-1) consists of USCS Lean Clay with Sand (CL) / USDA Clay Loam, based on lab analysis.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 2/20/14 09:42 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC--GINT_SOIL_BORING_LOGS\LC--SIDECUT_METROPARK.GPJ

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Swan (SWA) Cr. Preserve Metropark
4659 Airport Hiway (near Wenz Rd.entr.)
Toledo, OH 43615
Lucas County, NWDO
Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

SWA--PSB
Page 1 of 1

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.617556° / Long -83.646517°, ~600' W. of Swan Cr.'s Yager Center bldg. & W of paved trail; in woods

GROUND ELEVATION: ~616 ft. a.m.s.l.	**TOC ELEVATION:** NA	**DRILLING SERVICES:** Ohio EPA SIFU
START DATE: 7/15/13	**COMPLETION DATE:** 7/15/13	**DRILLER:** Kelvin Jones, Ed Link
DRILLING & SAMPLING METHODS: Hand Auger		**LOGGED BY:** Jeff Martin, Ed Link

DIAMETER (in): ~2	**TOTAL DEPTH** (ft): 4	**REFUSAL** (ft): NE

NOTES: Preliminary Soil Boring (PSB) sampling performed on hot summer day (~80 F).

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
07/15/13	00:00		Not Encountered

DEPTH (ft)	CORING: Core Type	CORING: Core Interval/ Recovery (ft)	SAMPLING: Sample Interval (ft)	SAMPLING: Sample Purpose/ID	SAMPLING: PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
0	HA	0.0-0.5 0.5	0.0 - 0.5	XRF screening, SWA 0.0-0.5 ft.	NA	1	0.5'	SM	**USCS Silty Sand (USDA Loamy Sand):** dark brown to dark gray; roots
	HA	0.5-1.0 0.5	0.5 - 1.0	XRF screening, SWA 0.5-1.0 ft.	NA		1'	SM	same as above, but dark brown; roots
1	HA	1.0-1.5 0.5	1.0 - 1.5	XRF screening, SWA 1.0-1.5 ft.	NA		1.5'	SP	same as above
	HA	1.5-2.0 0.5	1.5 - 2.0	XRF screening, SWA 1.5-2.0 ft.	NA		2'	SM	same as above
2	HA	2.0-2.5 0.5	2.0 - 2.5	XRF screening, SWA 2.0-2.5 ft.	NA		2.5'	SM	same as above
	HA	2.5-3.0 0.5	2.5 - 3.0	XRF screening, SWA 2.5-3.0 ft.	NA		3'	SM	same as above
3	HA	3.0-3.5 0.5	3.0 - 3.5	XRF screening, SWA 3.0-3.5 ft.	NA		3.5'	SM/SC	**USCS Silty Sand to Clayey Sand (USDA Loamy Sand):** dark brown; layers of sandy silt and layers/clasts of sandy clay; low plasticity
	HA	3.5-4.0 0.5	3.5 - 4.0	XRF screening, SWA 3.5-4.0 ft.	NA		4'	SM/SC	**USCS Silty Sand to Clayey Sand (USDA Sandy Loam to Sandy Clay Load to Sandy Clay):** dark brown; stratified layers; low plasticity
4									

Soil analytical and geotechnical testing samples SWA-1 through SWA-10 were collected on 2013-09-18 @ 16:00. SWA-1 was collected adjacent to the SWA-PSB location, and SWA-2 through SWA-10 were collected at random locations within a 15 ft. radius of SWA-PSB. Each sample was collected from ground surface to a depth of 2 ft. using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample SWA-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:

1. Homogenized soil from 0.0-2.0 ft deep (sampling location SWA-1) consists of USCS Poorly Graded Sand with Silt (SP-SM) / USDA Sand, based on lab analysis.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 2/20/14 09:41 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC--GINT_SOIL_BORING_LOGS\LC--SWANCREEK_METROPARK.GPJ

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Wildwood (WIL) Preserve Metropark
5100 West Central Avenue
Toledo, OH 43615
Lucas County, NWDO
Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

WIL--PSB
Page 1 of 1

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.681262° / Long -83.670073°, ~480' WNW of Metz Visitor Ctr. & 65' N of Upland Woods Tr.; in woods

GROUND ELEVATION: ~639 ft. a.m.s.l.	**TOC ELEVATION:** NA	**DRILLING SERVICES:** Ohio EPA SIFU
START DATE: 7/15/13	**COMPLETION DATE:** 7/15/13	**DRILLER:** Kelvin Jones, Ed Link
DRILLING & SAMPLING METHODS: Hand Auger		**LOGGED BY:** Ed Link, Jeff Martin

DIAMETER (in): ~2	**TOTAL DEPTH** (ft): 4	**REFUSAL** (ft): NE

NOTES: Preliminary Soil Boring (PSB) sampling performed on hot summer day (~80 F).

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
07/15/13	00:00		Not Encountered

DEPTH (ft)	CORING: Core Type	CORING: Core Interval/ Recovery (ft)	SAMPLING: Sample Interval (ft)	SAMPLING: Sample Purpose/ID	SAMPLING: PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
0	HA	0.0-0.5 0.5	0.0 - 0.5	XRF screening, WIL 0.0-0.5 ft.	NA	1	0.5'	SM	**USCS Silty Sand (USDA Loamy Sand):** dark brown to dark gray; roots and a lot of organic matter; mostly fine-grained sand
	HA	0.5-1.0 0.5	0.5 - 1.0	XRF screening, WIL 0.5-1.0 ft.	NA		1'	SM	**USCS Silty Sand (USDA Loamy Sand to Sand):** dark brown to orange brown; less organic matter; roots; mostly fine-grained sand
1	HA	1.0-1.5 0.5	1.0 - 1.5	XRF screening, WIL 1.0-1.5 ft.	NA		1.5'	SP	**USCS Sand (USDA Sand):** orange brown to brown; roots; mostly fine-grained sand
	HA	1.5-2.0 0.5	1.5 - 2.0	XRF screening, WIL 1.5-2.0 ft.	NA		2'	SP	same as above, but orange brown to brown
2	HA	2.0-2.5 0.5	2.0 - 2.5	XRF screening, WIL 2.0-2.5 ft.	NA		2.5'	SP	same as above, but transition zone from orange brown to brown or yellowish brown
	HA	2.5-3.0 0.5	2.5 - 3.0	XRF screening, WIL 2.5-3.0 ft.	NA		3'	SP	same as above, but lighter, yellowish-brown
3	HA	3.0-3.5 0.5	3.0 - 3.5	XRF screening, WIL 3.0-3.5 ft.	NA		3.5'	SP	same as above, but light brown
	HA	3.5-4.0 0.5	3.5 - 4.0	XRF screening, WIL 3.5-4.0 ft.	NA		4'	SP	same as above
4									

Soil analytical and geotechnical testing samples WIL-1 through WIL-10 were collected on 2013-09-18 @ 12:30. WIL-1 was collected adjacent to the WIL-PSB location, and WIL-2 through WIL-10 were collected at random locations within a 15 ft. radius of WIL-PSB. Each sample was collected from ground surface to a depth of 2 ft. using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample WIL-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:
1. Homogenized soil from 0.0-2.0 ft deep (sampling location WIL-1) consists of USCS Poorly Graded Sand (SP) / USDA Sand, based on lab analysis.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 2/20/14 09:39 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC--GINT_SOIL_BORING_LOGS\LC--WILDWOODS_METROPARK.GPJ

Ohio Environmental Protection Agency
4675 Homer-Ohio Lane
Groveport, OH 43125
Telephone: (614) 836-8760, Fax: (614) 836-8795
Edward.Link@epa.ohio.gov

Woodsdale (WOO) Park, City of Toledo
1226 Woodsdale Ave. (@ U.S. 25)
Toledo, OH 43614
Lucas County, NWDO
Project No./Type: NA/County Soil Background

DERR-SIFU
Soil Boring Log

WOO--PSB
Page 1 of 1

LAT/LONG and/or **LOCATION DESCRIPTION:** Lat 41.617414° / Long -83.590671°, ~435' N of ballfield parking; ~55' N of bike path; In woods; near RR

GROUND ELEVATION: ~615 ft. a.m.s.l. | **TOC ELEVATION:** NA | **DRILLING SERVICES:** Ohio EPA SIFU

START DATE: 7/15/13 | **COMPLETION DATE:** 7/15/13 | **DRILLER:** Kelvin Jones, Ed Link

DRILLING & SAMPLING METHODS: Hand Auger | **LOGGED BY:** Jeff Martin, Ed Link

DIAMETER (in): ~2 | **TOTAL DEPTH** (ft): 4 | **REFUSAL** (ft): NE

NOTES: Preliminary Soil Boring (PSB) sampling performed on hot summer day (~80 F)

GROUND WATER LEVELS

Date	Time	Depth (ft)	Notes
07/15/13	00:00		Not Encountered

DEPTH (ft)	CORING: Core Type	CORING: Core Interval/ Recovery (ft)	SAMPLING: Sample Interval (ft)	SAMPLING: Sample Purpose/ID	SAMPLING: PID (ppmv)	REMARKS	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION
1	HA	0.0-0.5 0.5	0.0 - 0.5	XRF screening, WOO 0.0-0.5 ft.	NA	1	0.5'	MH	**USCS Elastic Silt with Sand (USDA Silt Loam to Silt):** dark gray; low plasticity; little sand; roots and a lot of organic matter; slight dilantency
	HA	0.5-1.0 0.5	0.5 - 1.0	XRF screening, WOO 0.5-1.0 ft.	NA		1'	MH	same as above
	HA	1.0-1.5 0.5	1.0 - 1.5	XRF screening, WOO 1.0-1.5 ft.	NA		1.5'	SM/SC	**USCS Silty Sand (USDA Sandy Loam):** transitions from dark gray to yellowish brown with depth; slight to moderate dilantency
2	HA	1.5-2.0 0.5	1.5 - 2.0	XRF screening, WOO 1.5-2.0 ft.	NA		2'	SM/SC	same as above, but yellowish brown to bottom of core
	HA	2.0-2.5 0.5	2.0 - 2.5	XRF screening, WOO 2.0-2.5 ft.	NA		2.5'	SM/SC	same as above
	HA	2.5-3.0 0.5	2.5 - 3.0	XRF screening, WOO 2.5-3.0 ft.	NA		3'	SM/SC	same as above
3	HA	3.0-3.5 0.5	3.0 - 3.5	XRF screening, WOO 3.0-3.5 ft.	NA		3.5'	SM/SC	same as above, moist
	HA	3.5-4.0 0.5	3.5 - 4.0	XRF screening, WOO 3.5-4.0 ft.	NA		4'	SM/SC	same as above
4									

Soil analytical and geotechnical testing samples WOO-1 through WOO-10 were collected on 2013-09-24 @ 15:30. WOO-1 was collected adjacent to the WOO-PSB location, and WOO-2 through WOO-10 were collected at random locations within a 15 ft radius of WOO-PSB. Each sample was collected from ground surface to a depth of 2 ft using a 1.5 to 2-inch inside diameter hand auger. Each sample was homogenized in the field and submitted to Microbac Laboratories of Marietta, OH for RCRA metals analysis (As, Ba, Cd, Cr, Pb, Hg, Se) with Ni substituted for Ag and Tl added. In addition, sample WOO-1 was submitted to Geotechnics of Pittsburgh, PA for sieve and hydrometer analyses, Atterberg limits, and USDA and USCS laboratory soil classification.

REMARKS:
1. Homogenized soil from 0.0-2.0 ft deep (sampling location WOO-1) consists of USCS Silty Sand (SM) / USDA Sandy Loam, based on lab analysis.

SURVEY BENCHMARK & DATUM: Google Earth

OHIO EPA GEOPROBE LOG - OHIO EPA GEOPROBE LOG.GDT - 3/7/14 12:59 - G:\LUCAS_COUNTY--BACKGROUND_SOILS_STUDY\LC--GINT_SOIL_BORING_LOGS\LC--WOODSDALE_CITY_PARK.GPJ

APPENDIX B

FP-XRF SOIL ANALYTICAL SCREENING RESULTS

SAMPLE ID	Pass Fail Standard	Date of Analyses	Reading	Ti	Cr	Mn	Fe	Co	Ni	Cu	Zn	As
Metal or Chemical Element = = >				Titanium	Chromium	Manganese	Iron	Cobalt	Nickel	Copper	Zinc	Arsenic
BLANK SiO2		19-Aug-13	2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BLANK SiO2		19-Aug-13	58	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
Standardizati	PASS	16-Oct-13	1									
BLANK		16-Oct-13	2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
DET-1 0.0-0.5		16-Oct-13	3	3853.81	<LOD	263.64	24854.23	201.2	<LOD	30.39	94.77	10.59
DET-1 0.5-1.0		16-Oct-13	4	3870.51	<LOD	250.3	25983.33	<LOD	<LOD	28.54	90.86	10.2
DET-1 1.0-1.5		16-Oct-13	5	3315.3	153.32	195.88	25639.52	<LOD	53.27	38.26	75.66	10.67
DET-1 1.5-2.0		16-Oct-13	6	3449.87	<LOD	180.77	24544.41	<LOD	52.1	30.32	73.18	<LOD
DET-1 2.0-2.5		16-Oct-13	7	3164.01	<LOD	149.69	24957.24	<LOD	53.21	26.67	71.97	10.58
DET-1 2.5-3.0		16-Oct-13	8	3222.42	<LOD	182.71	25567.35	<LOD	53.05	<LOD	67.19	9.96
DET-1 3.0-3.5		16-Oct-13	9	3014.84	<LOD	161.5	23652.01	<LOD	<LOD	32.73	59.33	10.68
DET-1 3.0-3.5 -- DU		16-Oct-13	10	3558.51	<LOD	176.66	24303.28	<LOD	<LOD	29.62	72.68	6.67
DET-1 3.5-4.0		16-Oct-13	11	2201.67	<LOD	204.42	23527.93	199.91	<LOD	<LOD	69.26	7.69
BLANK		16-Oct-13	12	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
FAR 0.0-0.5		8/19/2013	6	3038.74	<LOD	498.37	26379.05	<LOD	73.18	<LOD	67.28	9.49
FAR 0.5-1.0		8/19/2013	5	3778.7	197.88	321.46	27713.79	<LOD	<LOD	34.31	64.13	12.22
FAR 1.0-1.5		8/19/2013	4	3797.03	<LOD	423.17	28656.01	<LOD	<LOD	<LOD	70.04	9.89
FAR 1.5-2.0		8/19/2013	3	3284.96	<LOD	437.39	25454.74	<LOD	<LOD	38.79	69.51	11.63
GRE 0.0-2.0 COMP		19-Aug-13	18	1920.52	<LOD	157.49	8397.48	<LOD	<LOD	<LOD	22.49	<LOD
Standardizati	PASS	20-Sep-13	1									
BLANK		20-Sep-13	2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
LAT 0.0-0.5		20-Sep-13	3	3350.54	<LOD	464.87	23611.17	<LOD	<LOD	<LOD	95.93	7.98
LAT 0.5-1.0		20-Sep-13	4	3446.62	197.89	405.31	25450.93	<LOD	<LOD	26.29	73.74	<LOD
LAT 1.0-1.5		20-Sep-13	5	3461.38	<LOD	392.93	27069.55	<LOD	52.37	28.87	75.3	11.77
LAT 1.5-2.0		20-Sep-13	6	3581.22	<LOD	339.55	27422.55	<LOD	58.88	<LOD	69.83	9.39
LAT 1.5-2.0 -- DUP		20-Sep-13	7	3396.01	150.85	468.91	28491.31	<LOD	53.64	<LOD	73.75	11.61
LAT 2.0-2.5		20-Sep-13	8	2981.5	<LOD	232.58	25536.18	171.9	<LOD	28.83	69.27	10.92
LAT 2.5-3.0		20-Sep-13	9	4226.73	<LOD	552.37	35423.62	<LOD	63.24	43.8	82.67	12.8
LAT 3.0-3.5		20-Sep-13	10	3641.37	181.07	471.9	33084.13	<LOD	<LOD	<LOD	91.33	11.84
LAT 3.5-4.0		20-Sep-13	11	3752.86	<LOD	372.14	28720.3	<LOD	<LOD	27.6	74.04	11.52
LAT 3.5-4.0 -- DUP		20-Sep-13	12	3135.81	205.36	534.74	29324.67	251.71	<LOD	40.74	74.59	14.6
BLANK		20-Sep-13	13	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BLANK		20-Sep-13	14	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
OTT 0.0-2.0 COMP		19-Aug-13	20	1105.79	<LOD	206.72	7541.52	<LOD	<LOD	<LOD	27.69	<LOD
PEA 0.0-2.0 COMP		19-Aug-13	17	4021.43	<LOD	291.41	29298.09	<LOD	<LOD	34.22	91.9	<LOD

SAMPLE ID	Pass Fail Standard	Date of Analyses	Reading	Se	Rb	Sr	Zr	Mo	Ag	Cd	Sn	Hg	Pb
Metal or Chemical Element = = >				Selenium	Rubidium	Strontium	Zirconium	Molybdenum	Silver	Cadmium	Tin	Mercury	Lead
BLANK SiO2		19-Aug-13	2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
BLANK SiO2		19-Aug-13	58	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	8.7
Standardization	PASS	16-Oct-13	1										
BLANK		16-Oct-13	2	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
DET-1 0.0-0.5		16-Oct-13	3	<LOD	91.07	132.78	178.85	<LOD	<LOD	<LOD	<LOD	<LOD	29.07
DET-1 0.5-1.0		16-Oct-13	4	<LOD	101.83	135.79	192.61	<LOD	<LOD	<LOD	<LOD	<LOD	23.08
DET-1 1.0-1.5		16-Oct-13	5	<LOD	86.45	140.03	188.91	<LOD	<LOD	<LOD	<LOD	<LOD	18
DET-1 1.5-2.0		16-Oct-13	6	<LOD	87.11	135.98	206.64	<LOD	<LOD	<LOD	<LOD	<LOD	27.33
DET-1 2.0-2.5		16-Oct-13	7	<LOD	84.98	138.12	196.25	<LOD	<LOD	<LOD	<LOD	<LOD	19.1
DET-1 2.5-3.0		16-Oct-13	8	<LOD	79.55	130	162.08	<LOD	<LOD	<LOD	<LOD	<LOD	16.4
DET-1 3.0-3.5		16-Oct-13	9	<LOD	78.77	115.64	133.36	<LOD	<LOD	<LOD	<LOD	<LOD	12.29
DET-1 3.0-3.5 -- DUP		16-Oct-13	10	<LOD	79.4	120.1	136.5	<LOD	<LOD	<LOD	<LOD	<LOD	15.38
DET-1 3.5-4.0		16-Oct-13	11	<LOD	70.88	118.58	132.39	<LOD	<LOD	<LOD	<LOD	<LOD	20.39
BLANK		16-Oct-13	12	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
FAR 0.0-0.5		8/19/2013	6	<LOD	85.4	172.24	155.7	<LOD	<LOD	<LOD	<LOD	<LOD	19.03
FAR 0.5-1.0		8/19/2013	5	<LOD	88.56	180.58	179.41	<LOD	<LOD	<LOD	<LOD	<LOD	16.5
FAR 1.0-1.5		8/19/2013	4	<LOD	90.23	190.54	154.3	<LOD	<LOD	<LOD	<LOD	<LOD	16.64
FAR 1.5-2.0		8/19/2013	3	<LOD	89.26	180.43	217.47	<LOD	<LOD	<LOD	<LOD	<LOD	14.31
GRE 0.0-2.0 COMP		19-Aug-13	18	<LOD	34.35	153.37	134.21	<LOD	41.45	<LOD	<LOD	<LOD	16.28
Standardization	PASS	20-Sep-13	1										
BLANK		20-Sep-13	2	N.R.	<LOD	<LOD	<LOD	<LOD	<LOD	N.R.	N.R.	<LOD	<LOD
LAT 0.0-0.5		20-Sep-13	3	N.R.	79.9	170.78	239.59	<LOD	<LOD	N.R.	N.R.	<LOD	24.03
LAT 0.5-1.0		20-Sep-13	4	N.R.	82.99	160.49	227.64	<LOD	<LOD	N.R.	N.R.	<LOD	25.68
LAT 1.0-1.5		20-Sep-13	5	N.R.	84.75	160.18	238.72	<LOD	<LOD	N.R.	N.R.	<LOD	16.98
LAT 1.5-2.0		20-Sep-13	6	N.R.	87.38	170.91	205.12	<LOD	<LOD	N.R.	N.R.	<LOD	14.15
LAT 1.5-2.0 -- DUP		20-Sep-13	7	N.R.	84.32	146.5	216.78	<LOD	<LOD	N.R.	N.R.	<LOD	13.58
LAT 2.0-2.5		20-Sep-13	8	N.R.	85.99	194.39	205.02	<LOD	<LOD	N.R.	N.R.	<LOD	10.83
LAT 2.5-3.0		20-Sep-13	9	N.R.	110.15	151.71	201.51	<LOD	49.52	N.R.	N.R.	<LOD	18.26
LAT 3.0-3.5		20-Sep-13	10	N.R.	105.75	166.56	197.85	<LOD	<LOD	N.R.	N.R.	<LOD	17.88
LAT 3.5-4.0		20-Sep-13	11	N.R.	93.33	169.27	148.59	<LOD	<LOD	N.R.	N.R.	<LOD	14.66
LAT 3.5-4.0 -- DUP		20-Sep-13	12	N.R.	95.29	179.17	170.53	<LOD	<LOD	N.R.	N.R.	<LOD	13.27
BLANK		20-Sep-13	13	N.R.	<LOD	<LOD	<LOD	<LOD	<LOD	N.R.	N.R.	<LOD	<LOD
BLANK		20-Sep-13	14	N.R.	<LOD	<LOD	<LOD	<LOD	<LOD	N.R.	N.R.	<LOD	<LOD
OTT 0.0-2.0 COMP		19-Aug-13	20	<LOD	39.07	150.41	102.84	<LOD	50.96	<LOD	<LOD	<LOD	19.99
PEA 0.0-2.0 COMP		19-Aug-13	17	<LOD	107.6	124.32	214	<LOD	<LOD	<LOD	<LOD	<LOD	23.35

SAMPLE ID	Pass Fail Standard	Date of Analyses	Reading	Ti	Cr	Mn	Fe	Co	Ni	Cu	Zn	As
Metal or Chemical Element = = >				Titanium	Chromium	Manganese	Iron	Cobalt	Nickel	Copper	Zinc	Arsenic
SEC 0.0-0.5		19-Aug-13	12	1438.04	<LOD	87.45	7755.38	<LOD	<LOD	<LOD	38.44	<LOD
SEC 0.5-1.0		19-Aug-13	13	1086.83	<LOD	<LOD	8400.58	<LOD	<LOD	<LOD	38.63	<LOD
SEC 1.0-1.5		19-Aug-13	14	872.96	<LOD	89.21	6455.42	<LOD	54.57	<LOD	32.64	<LOD
SEC 1.5-2.0		19-Aug-13	15	1346.15	<LOD	115.44	7427.94	<LOD	<LOD	<LOD	23.24	<LOD
SEC 1.5-2.0 -- DUP		19-Aug-13	16	1230.03	<LOD	89.48	6356.86	<LOD	<LOD	<LOD	21.46	<LOD
SEC 2.0-2.5		19-Aug-13	7	1607.14	<LOD	<LOD	7525.01	<LOD	47.72	<LOD	28.71	<LOD
SEC 2.5-3.0		19-Aug-13	8	668.24	<LOD	<LOD	4303.54	<LOD	<LOD	<LOD	11.85	<LOD
SEC 2.5-3.0 -- DUP		19-Aug-13	9	<LOD	<LOD	<LOD	4612.39	<LOD	<LOD	<LOD	19.55	<LOD
SEC 3.0-3.5		19-Aug-13	10	1579.15	<LOD	<LOD	6109.33	<LOD	<LOD	<LOD	18.34	<LOD
SEC 3.5-4.0		19-Aug-13	11	1037.18	<LOD	<LOD	5645.16	<LOD	<LOD	<LOD	12.79	6.03
SID 0.0-0.5		19-Aug-13	35	3911.02	<LOD	502.79	25574.57	<LOD	<LOD	<LOD	110.8	10.89
SID 0.5-1.0		19-Aug-13	36	4034.05	<LOD	471.85	27295.76	177.04	<LOD	<LOD	91.86	<LOD
SID 0.5-1.0 -- DUP		19-Aug-13	37	3641	161.84	479.69	29898	<LOD	<LOD	<LOD	91.99	<LOD
SID 1.0-1.5		19-Aug-13	38	3739.81	<LOD	516.48	31250.5	<LOD	64.32	29.9	75.77	8.91
SID 1.5-2.0		19-Aug-13	39	4156.36	<LOD	516.82	37003.46	<LOD	<LOD	29.12	80.47	16.4
SWA 0.0-0.5		19-Aug-13	26	1354.17	<LOD	181.18	6328.51	<LOD	<LOD	27.72	27.58	<LOD
SWA 0.5-1.0		19-Aug-13	27	1580.44	<LOD	168.26	7069.78	<LOD	<LOD	<LOD	20.86	<LOD
SWA 1.0-1.5		19-Aug-13	28	993.48	<LOD	107.46	6992.64	<LOD	<LOD	<LOD	23.18	<LOD
SWA 1.5-2.0		19-Aug-13	29	819.76	<LOD	149.15	10195.96	<LOD	<LOD	<LOD	25.71	<LOD
SWA 1.5-2.0 -- DUP		19-Aug-13	30	1164.19	<LOD	193.24	10129.18	<LOD	<LOD	<LOD	25.87	6.43
SWA 2.0-2.5		19-Aug-13	31	1027.38	<LOD	124.81	9774.98	<LOD	<LOD	<LOD	31.4	<LOD
SWA 2.5-3.0		19-Aug-13	32	1345.17	<LOD	115.67	11474.58	<LOD	<LOD	<LOD	21.74	<LOD
SWA 3.0-3.5		19-Aug-13	33	1615.88	<LOD	164.62	13275.86	<LOD	<LOD	<LOD	29.33	<LOD
SWA 3.5-4.0		19-Aug-13	34	1894.9	<LOD	296.61	19078.14	<LOD	<LOD	<LOD	40.3	7.35
WIL 0.0-0.5		19-Aug-13	21	967.04	<LOD	74.44	7354.25	<LOD	<LOD	<LOD	32.57	<LOD
WIL 0.5-1.0		19-Aug-13	22	773.39	<LOD	122.5	7190.26	<LOD	<LOD	<LOD	30.1	<LOD
WIL 0.5-1.0 -- DUP		19-Aug-13	23	1399.13	<LOD	101.25	7927.48	<LOD	<LOD	<LOD	26.61	<LOD
WIL 1.0-1.5		19-Aug-13	24	<LOD	<LOD	113.6	6219.91	<LOD	<LOD	<LOD	22.86	<LOD
WIL 1.5-2.0		19-Aug-13	25	1532.9	<LOD	125.98	8675.39	<LOD	<LOD	<LOD	22.55	<LOD
WOO 0.0-0.5		19-Aug-13	40	2168.48	<LOD	128.97	12856.75	<LOD	43.84	<LOD	44.59	7.65
WOO 0.5-1.0		19-Aug-13	41	2114.61	<LOD	89.05	12875.84	<LOD	<LOD	<LOD	36.22	7.08
WOO 1.0-2.0 COMP		19-Aug-13	42	1941.12	<LOD	125.15	12812.31	<LOD	<LOD	<LOD	34.71	<LOD
WOO 2.0-3.0 COMP		19-Aug-13	43	1984.73	<LOD	153.41	16480.87	<LOD	44.23	<LOD	44.83	<LOD
WOO 2.0-3.0 COMP		19-Aug-13	44	1740.65	<LOD	156.04	15955.64	<LOD	42.99	<LOD	32.12	<LOD
WOO 3.0-4.0 COMP		19-Aug-13	45	2165.74	<LOD	296.12	17559.81	<LOD	<LOD	<LOD	34.98	<LOD
Standardizati	PASS	19-Aug-13	1									

SAMPLE ID	Pass Fail Standard	Date of Analyses	Reading	Se	Rb	Sr	Zr	Mo	Ag	Cd	Sn	Hg	Pb
Metal or Chemical Element = = >				Selenium	Rubidium	Strontium	Zirconium	Molybdenum	Silver	Cadmium	Tin	Mercury	Lead
SEC 0.0-0.5		19-Aug-13	12	<LOD	33.78	129.7	101.76	<LOD	<LOD	<LOD	<LOD	<LOD	16.5
SEC 0.5-1.0		19-Aug-13	13	<LOD	31.84	142.49	104.01	<LOD	44.07	<LOD	<LOD	<LOD	15.05
SEC 1.0-1.5		19-Aug-13	14	<LOD	34.37	151.17	83.99	<LOD	67.45	<LOD	<LOD	<LOD	12.08
SEC 1.5-2.0		19-Aug-13	15	<LOD	34.94	156.54	142.55	<LOD	<LOD	<LOD	<LOD	<LOD	8.13
SEC 1.5-2.0 -- DUP		19-Aug-13	16	<LOD	36.58	154.88	93.23	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
SEC 2.0-2.5		19-Aug-13	7	<LOD	36.45	164.83	107.13	<LOD	50.36	<LOD	<LOD	<LOD	<LOD
SEC 2.5-3.0		19-Aug-13	8	<LOD	31.37	153	67.89	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
SEC 2.5-3.0 -- DUP		19-Aug-13	9	<LOD	32.57	150.5	89.36	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
SEC 3.0-3.5		19-Aug-13	10	<LOD	34.93	157.5	82.11	<LOD	47.1	<LOD	<LOD	<LOD	8.55
SEC 3.5-4.0		19-Aug-13	11	<LOD	33.04	155.42	75.15	<LOD	63.94	<LOD	<LOD	<LOD	<LOD
SID 0.0-0.5		19-Aug-13	35	<LOD	94.67	144.2	238.3	<LOD	<LOD	<LOD	<LOD	<LOD	26.65
SID 0.5-1.0		19-Aug-13	36	<LOD	97.08	131.31	205.25	<LOD	<LOD	<LOD	<LOD	<LOD	24.32
SID 0.5-1.0 -- DUP		19-Aug-13	37	<LOD	98.26	137.49	217.56	<LOD	<LOD	<LOD	<LOD	<LOD	29.25
SID 1.0-1.5		19-Aug-13	38	<LOD	107.32	129.87	182.73	<LOD	<LOD	<LOD	<LOD	<LOD	20.22
SID 1.5-2.0		19-Aug-13	39	<LOD	112.94	138.27	192.95	<LOD	<LOD	<LOD	<LOD	<LOD	15.05
SWA 0.0-0.5		19-Aug-13	26	<LOD	34.82	141.5	117.14	<LOD	45.63	<LOD	<LOD	<LOD	9.58
SWA 0.5-1.0		19-Aug-13	27	<LOD	33.9	145.74	122.47	<LOD	<LOD	<LOD	<LOD	<LOD	14.15
SWA 1.0-1.5		19-Aug-13	28	<LOD	39.28	148.15	89.37	<LOD	<LOD	<LOD	<LOD	<LOD	9.35
SWA 1.5-2.0		19-Aug-13	29	<LOD	41.54	144.5	75.78	<LOD	<LOD	<LOD	<LOD	<LOD	9.31
SWA 1.5-2.0 -- DUP		19-Aug-13	30	<LOD	43.57	137.47	64.25	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
SWA 2.0-2.5		19-Aug-13	31	<LOD	43.06	135.67	53.85	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
SWA 2.5-3.0		19-Aug-13	32	<LOD	40.21	122.8	55.21	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
SWA 3.0-3.5		19-Aug-13	33	<LOD	50.23	150.82	118.32	<LOD	45.07	<LOD	<LOD	<LOD	12.37
SWA 3.5-4.0		19-Aug-13	34	<LOD	66.28	161.06	192.02	<LOD	<LOD	<LOD	<LOD	<LOD	11.98
WIL 0.0-0.5		19-Aug-13	21	<LOD	28.24	118.8	57.01	<LOD	<LOD	<LOD	<LOD	<LOD	26.24
WIL 0.5-1.0		19-Aug-13	22	<LOD	29.14	136.45	95.09	<LOD	<LOD	<LOD	78.26	<LOD	9.3
WIL 0.5-1.0 -- DUP		19-Aug-13	23	<LOD	29.26	135.82	79.52	<LOD	<LOD	<LOD	<LOD	<LOD	14.11
WIL 1.0-1.5		19-Aug-13	24	<LOD	37.66	130.68	54.22	<LOD	<LOD	<LOD	<LOD	<LOD	10.73
WIL 1.5-2.0		19-Aug-13	25	<LOD	30.61	135.35	61.32	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
WOO 0.0-0.5		19-Aug-13	40	<LOD	50.13	192.82	192.83	<LOD	<LOD	<LOD	<LOD	<LOD	26.09
WOO 0.5-1.0		19-Aug-13	41	<LOD	47.06	187.01	149.01	<LOD	<LOD	<LOD	<LOD	<LOD	18.94
WOO 1.0-2.0 COMF		19-Aug-13	42	<LOD	48.6	188.5	200.12	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD
WOO 2.0-3.0 COMF		19-Aug-13	43	<LOD	53.8	184.86	201.92	<LOD	<LOD	<LOD	<LOD	<LOD	12.56
WOO 2.0-3.0 COMF		19-Aug-13	44	<LOD	51.58	190.49	204.04	<LOD	<LOD	<LOD	<LOD	<LOD	11.77
WOO 3.0-4.0 COMF		19-Aug-13	45	<LOD	54.64	183.93	161.53	<LOD	<LOD	<LOD	<LOD	<LOD	10.86
Standardizati	PASS	19-Aug-13	1										

ABBREVIATIONS:

COMP = composite of 0.5-foot increments within this depth range

DET = Detweiler Golf Course -- City of Toledo

DUP = duplicate sample within this depth range

FAR = Farnsworth -- Metropark

GRE = Greenwood -- City of Toledo

LAT = Lathrop Park -- Village of Berkey

<LOD = less than the XRF's Limit of Detection

OTT = Ottawa Golf Course -- City of Toledo

ppm = part per million

PEA = Pearson -- Metropark

N.R. = Not Reported

SEC = Secor -- Metropark

SID = Sidecut -- Metropark

SWA = Swan Creek Preserve -- Metropark

WIL = Wildwood Preserve -- Metropark

WOO = Woodsdale -- City of Toledo

XRF = X-Ray Fluorescence

APPENDIX C

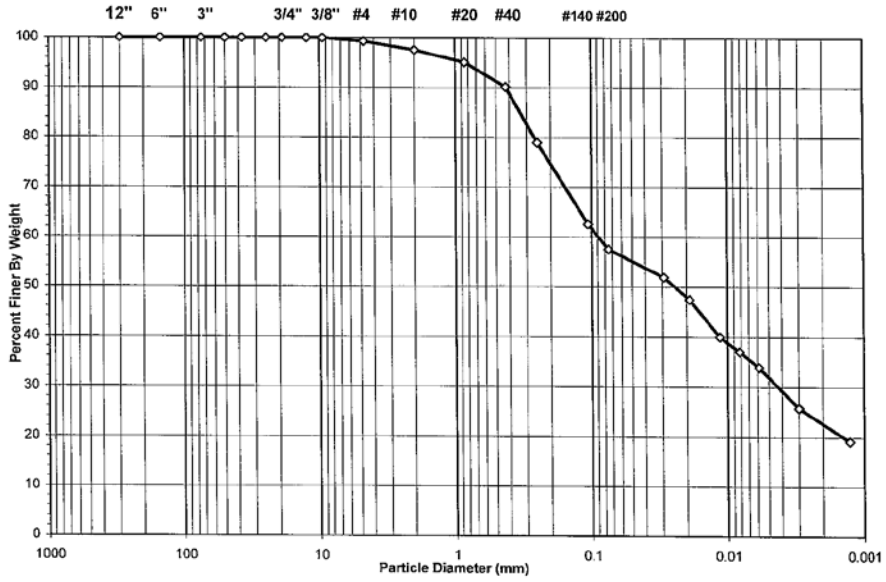
USCS AND USDA SOIL CLASSIFICATION AND TEXTURAL COMPOSITION ANALYSES

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

geotechnics
INTEGRITY IN TESTING

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	LAT-1
Lab ID:	2014-039-001-001	Soil Color:	BROWN

	SIEVE ANALYSIS			*HYDROMETER*	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



Sieve Sizes (mm)	USCS Summary	Percentage
Greater Than #4	*Gravel*	0.75
#4 To #200	*Sand*	41.67
Finer Than #200	*Silt & Clay*	57.59

USCS Symbol ***CL, TESTED***

USCS Classification ***SANDY LEAN CLAY***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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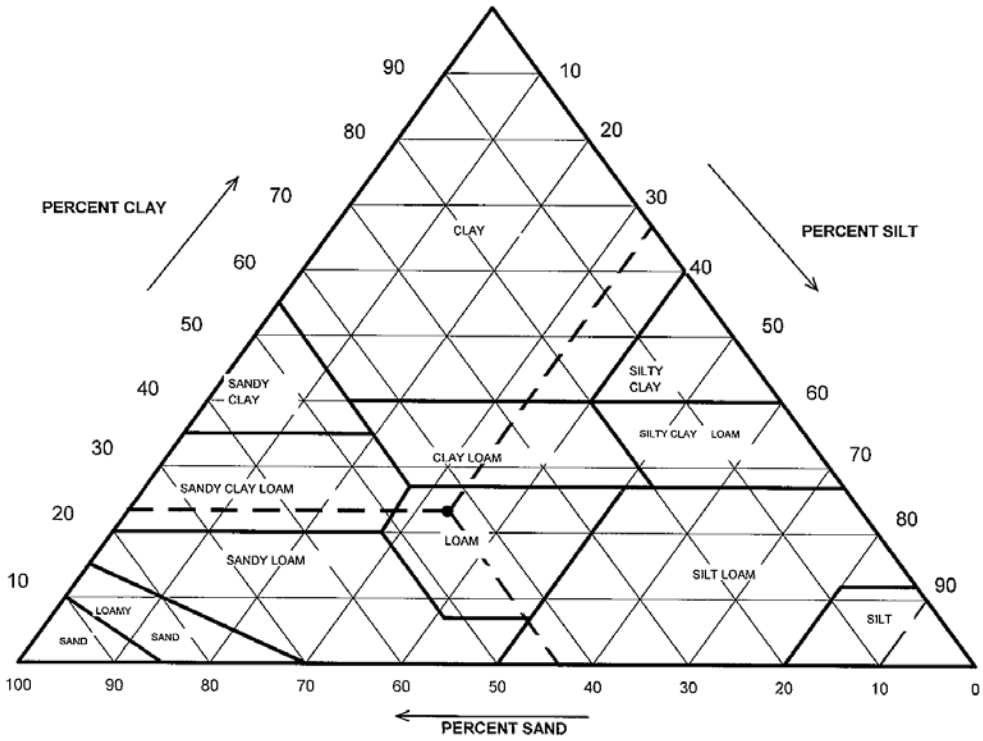
USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	LAT-1
Lab ID:	2014-039-001-001	Soil Color:	BROWN



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	2.50	**0.00**
2	97.50	*Sand*	42.34	**43.43**
0.05	55.16	*Silt*	32.48	**33.32**
0.002	22.67	*Clay*	22.67	**23.26**

USDA Classification: ***LOAM***

DCN: GT-S3A DATE: 3/18/13 REVISION: 11

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	LAT-1
Lab ID:	2014-039-001-001	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1452	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	611.50	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	562.52	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	145.13	Weight of Tare (g)	NA
Weight of Water (g)	48.98	Weight of Water (g)	NA
Weight of Dry Specimen (g)	417.39	Weight of Dry Specimen (g)	NA
Moisture Content (%)	**11.7**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	417.39
Dry Weight of -3/4" Sample (g)	177.03	Weight of - #200 material (g)	240.36
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	177.03
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.08	0.02	0.02		99.98	**99.98**
3/8"	9.50	0.05	0.01	0.03		99.97	**99.97**
#4	4.75	2.98	0.71	0.75		99.25	**99.25**
#10	2.00	7.34	1.76	2.50		97.50	**97.50**
#20	0.85	10.13	2.43	4.93		95.07	**95.07**
#40	0.425	20.61	4.94	9.87		90.13	**90.13**
#60	0.250	46.50	11.14	21.01		78.99	**78.99**
#140	0.106	68.31	16.37	37.38		62.62	**62.62**
#200	0.075	21.03	5.04	42.41		57.59	**57.59**
Pan	-	240.36	57.59	100.00		-	-

Tested By TB Date 9/27/13 Checked By KC Date 1/31/14

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	LAT-1
Lab ID:	2014-039-001-001	Soil Color:	BROWN

Elapsed Time		R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)			(°C)			(%)		(mm)	(%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		40.0	21.1	5.12	34.9	90.2	0.01327	0.0293	**52.0**
5		37.0	21.1	5.12	31.9	82.5	0.01327	0.0190	**47.5**
15		32.0	21.1	5.12	26.9	69.5	0.01327	0.0114	**40.0**
30		30.0	21.1	5.12	24.9	64.4	0.01327	0.0082	**37.1**
60		28.0	20.8	5.21	22.8	58.9	0.01332	0.0059	**33.9**
250		22.5	20.9	5.18	17.3	44.8	0.01330	0.0030	**25.8**
1440		18.0	21.1	5.12	12.9	33.3	0.01327	0.0013	**19.2**

Soil Specimen Data		Other Corrections		
Tare No.	922			
Weight of Tare & Dry Material (g)	143.09	a - Factor	0.99	
Weight of Tare (g)	99.81			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	57.59	
Weight of Dry Material (g)	38.28			
		Specific Gravity	2.7	Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 1/28/14 Checked By KC Date 1/31/14

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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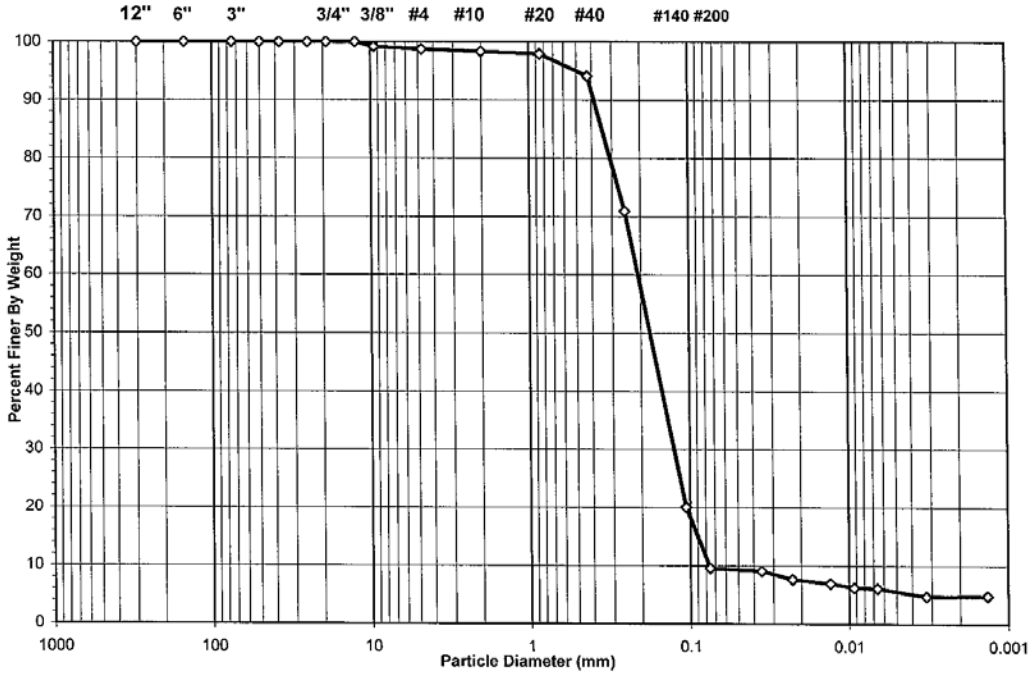
SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

geotechnics
INTEGRITY IN TESTING

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	SEC-1
Lab ID:	2014-039-001-002	Soil Color:	BROWN

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary		
Sieve Sizes (mm)		**Percentage**
Greater Than #4	*Gravel*	1.24
#4 To #200	*Sand*	89.20
Finer Than #200	*Silt & Clay*	9.56

		D60 =	**0.21**		
USCS Symbol	***SP-SM, TESTED (NON-PLASTIC FINES)***	**D30 =**	**0.13**	**CC =**	**0.99**
USCS Classification	***POORLY GRADED SAND WITH SILT***	**D10 =**	**0.0761**	**CU =**	**2.73**

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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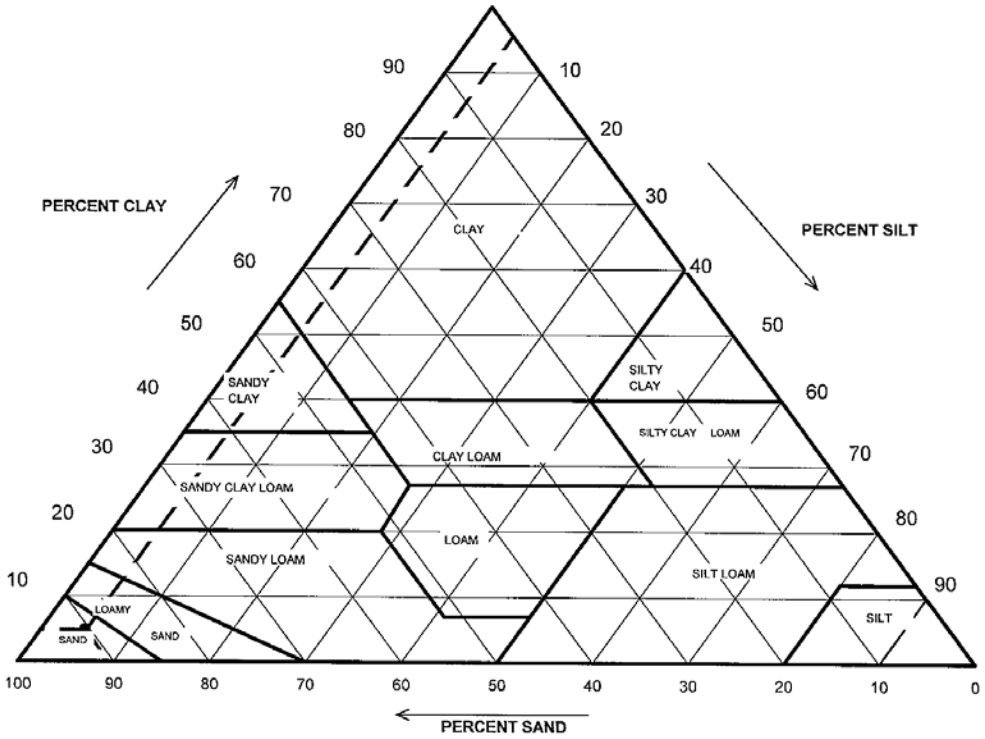
USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	SEC-1
Lab ID:	2014-039-001-002	Soil Color:	BROWN



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	1.64	**0.00**
2	98.36	*Sand*	89.06	**90.54**
0.05	9.31	*Silt*	4.53	**4.60**
0.002	4.78	*Clay*	4.78	**4.86**

USDA Classification: ***SAND***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	SEC-1
Lab ID:	2014-039-001-002	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1414	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	668.50	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	613.21	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	145.35	Weight of Tare (g)	NA
Weight of Water (g)	55.29	Weight of Water (g)	NA
Weight of Dry Specimen (g)	467.86	Weight of Dry Specimen (g)	NA
Moisture Content (%)	**11.8**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	467.86
Dry Weight of -3/4" Sample (g)	423.11	Weight of - #200 material (g)	44.75
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	423.11
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00		100.00	**100.00**
3/8"	9.50	3.89	0.83	0.83		99.17	**99.17**
#4	4.75	1.89	0.40	1.24		98.76	**98.76**
#10	2.00	1.88	0.40	1.64		98.36	**98.36**
#20	0.85	2.10	0.45	2.09		97.91	**97.91**
#40	0.425	17.83	3.81	5.90		94.10	**94.10**
#60	0.250	108.36	23.16	29.06		70.94	**70.94**
#140	0.106	238.01	50.87	79.93		20.07	**20.07**
#200	0.075	49.15	10.51	90.44		9.56	**9.56**
Pan	-	44.75	9.56	100.00		-	-

Tested By TB Date 9/27/13 Checked By KC Date 1/31/14

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

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INTEGRITY IN TESTING

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	SEC-1
Lab ID:	2014-039-001-002	Soil Color:	BROWN

Elapsed Time		R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)			(°C)			(%)		(mm)	(%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		11.5	21.1	5.12	6.4	95.0	0.01327	0.0356	**9.1**
5		10.5	21.1	5.12	5.4	80.1	0.01327	0.0227	**7.7**
15		10.0	21.1	5.12	4.9	72.7	0.01327	0.0131	**7.0**
30		9.5	21.1	5.12	4.4	65.2	0.01327	0.0093	**6.2**
60		9.5	20.8	5.21	4.3	63.8	0.01332	0.0066	**6.1**
250		8.5	20.9	5.18	3.3	49.4	0.01330	0.0032	**4.7**
1440		8.5	21.1	5.12	3.4	50.4	0.01327	0.0013	**4.8**

Soil Specimen Data		**Other Corrections**		
Tare No.	1321			
Weight of Tare & Dry Material (g)	109.35	a - Factor	0.99	
Weight of Tare (g)	97.7			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	9.56	
Weight of Dry Material (g)	6.65			
		Specific Gravity	2.7	Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 1/28/14 Checked By KC Date 1/31/14

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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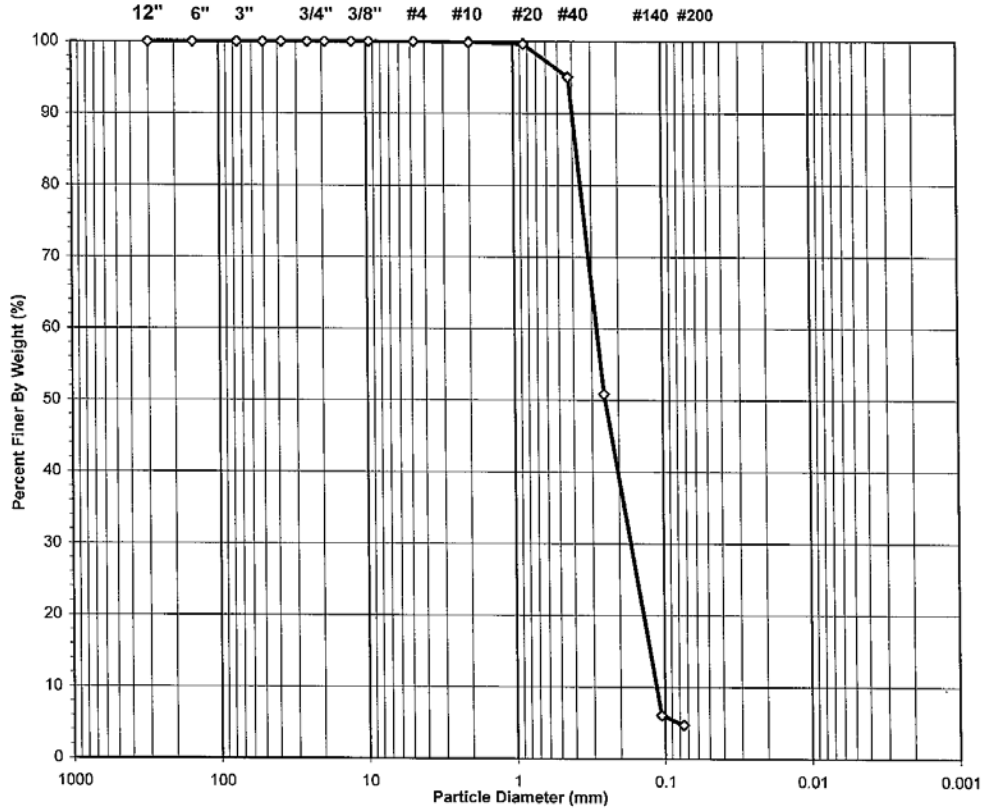
INTEGRITY IN TESTING

SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	WIL-1
Lab ID:	2014-039-001-003	Soil Color:	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol: ***SP, TESTED*** **D60 = 0.28** **CC = 0.88**

USCS Classification: ***POORLY GRADED SAND (NON-PLASTIC FINES)*** **D30 = 0.17** **CU = 2.44**

UNABLE TO RUN HYDROMETER **D10 = 0.11**

Tested By TB Date 9/27/13 Checked By KC Date 1/31/14

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	WIL-1
Lab ID:	2014-039-001-003	Soil Color:	BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	1431	Tare No.	NA
Wt. of Tare & Wet Sample (g)	720.50	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	695.17	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	144.41	Weight of Tare (g)	NA
Weight of Water (g)	25.33	Weight of Water (g)	NA
Weight of Dry Sample (g)	550.76	Weight of Dry Sample (g)	NA
Moisture Content (%)	**4.6**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	550.76
Dry Weight of - 3/4" Sample (g)	524.8	Weight of - #200 Sample (g)	25.96
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	524.80
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.60	0.11	0.11	99.89	**99.89**
#20	0.850	1.34	0.24	0.35	99.65	**99.65**
#40	0.425	25.26	4.59	4.94	95.06	**95.06**
#60	0.250	243.39	44.19	49.13	50.87	**50.87**
#140	0.106	246.93	44.83	93.96	6.04	**6.04**
#200	0.075	7.28	1.32	95.29	4.71	**4.71**
Pan	-	25.96	4.71	100.00	-	-

Tested By TB Date 9/27/13 Checked By KC Date 1/31/14

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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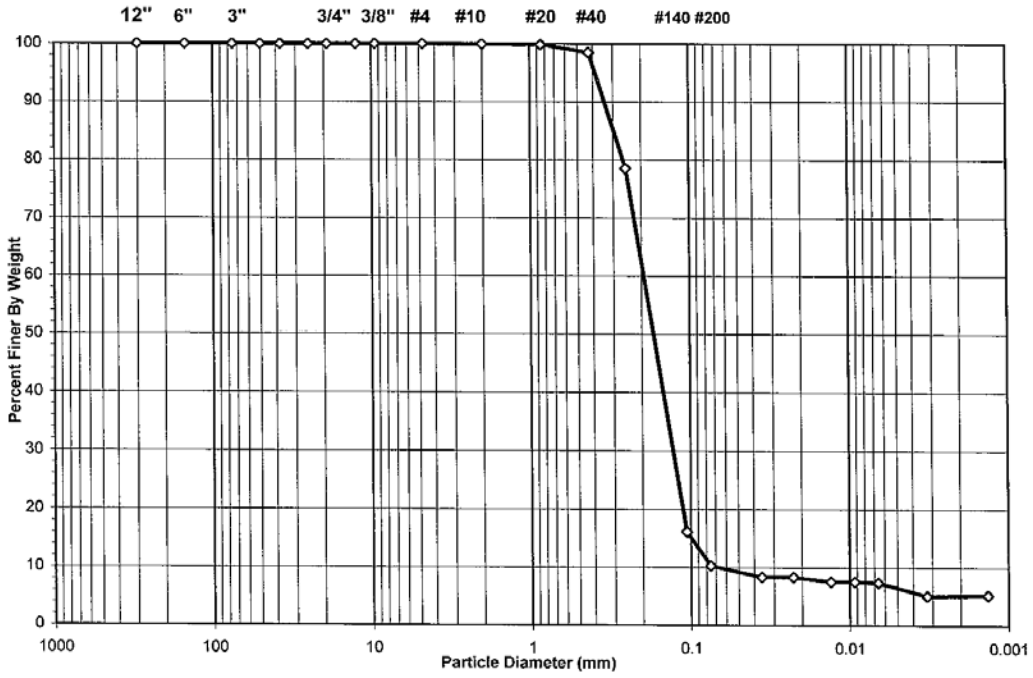
INTEGRITY IN TESTING

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	SWA-1
Lab ID:	2014-039-001-004	Soil Color:	BROWN

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary						
Sieve Sizes (mm)		**Percentage**				
Greater Than #4	*Gravel*	0.00				
#4 To #200	*Sand*	89.70				
Finer Than #200	*Silt & Clay*	10.30				
			D60 =	**0.19**		
USCS Symbol	***SP-SM, TESTED (NON-PLASTIC FINES)***		**D30 =**	**0.13**	**CC =**	**1.27**
USCS Classification	***POORLY GRADED SAND WITH SILT***		**D10 =**	**0.0670**	**CU =**	**2.89**

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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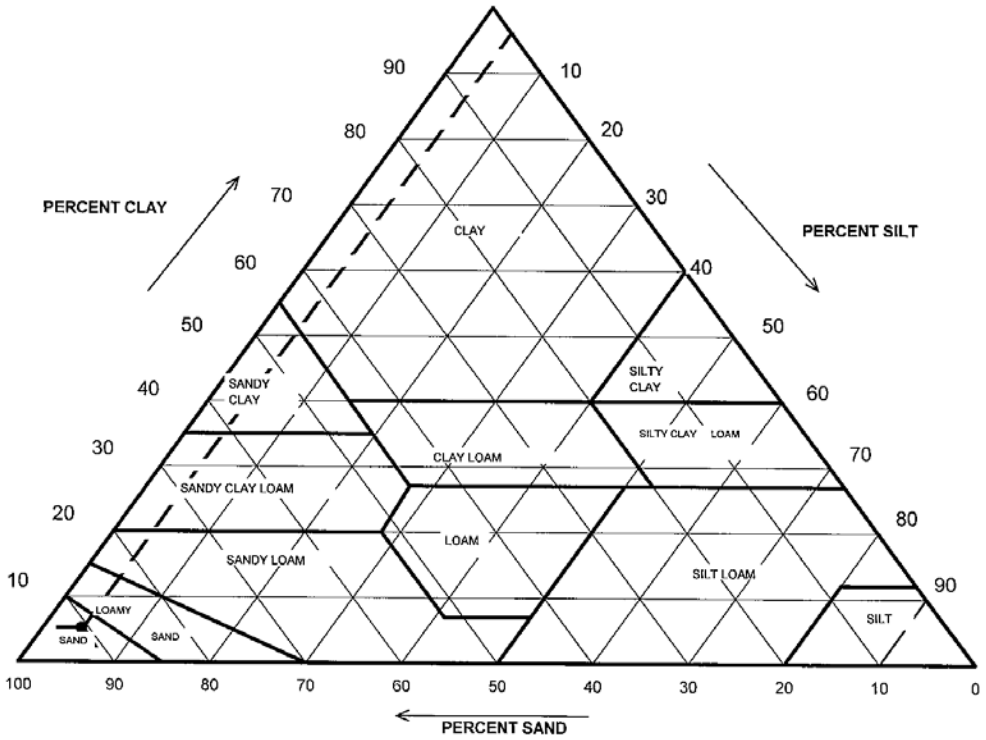
USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	SWA-1
Lab ID:	2014-039-001-004	Soil Color:	BROWN



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	0.04	**0.00**
2	99.96	*Sand*	90.73	**90.77**
0.05	9.23	*Silt*	4.03	**4.03**
0.002	5.20	*Clay*	5.20	**5.21**

USDA Classification: ***SAND***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	SWA-1
Lab ID:	2014-039-001-004	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1451	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	615.10	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	592.97	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	144.80	Weight of Tare (g)	NA
Weight of Water (g)	22.13	Weight of Water (g)	NA
Weight of Dry Specimen (g)	448.17	Weight of Dry Specimen (g)	NA
Moisture Content (%)	**4.9**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	448.17
Dry Weight of -3/4" Sample (g)	402.02	Weight of - #200 material (g)	46.15
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	402.02
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00		100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00		100.00	**100.00**
#4	4.75	0.00	0.00	0.00		100.00	**100.00**
#10	2.00	0.19	0.04	0.04		99.96	**99.96**
#20	0.85	0.37	0.08	0.12		99.88	**99.88**
#40	0.425	6.10	1.36	1.49		98.51	**98.51**
#60	0.250	89.52	19.97	21.46		78.54	**78.54**
#140	0.106	279.61	62.39	83.85		16.15	**16.15**
#200	0.075	26.23	5.85	89.70		10.30	**10.30**
Pan	-	46.15	10.30	100.00		-	-

Tested By TB Date 9/27/13 Checked By KC Date 1/31/14

DCN: CT-S3A DATE: 3/19/13 REVISION: 11

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HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	SWA-1
Lab ID:	2014-039-001-004	Soil Color:	BROWN

Elapsed Time		R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)			(°C)			(%)		(mm)	(%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		10.5	21.1	5.12	5.4	81.1	0.01327	0.0358	**8.4**
5		10.5	21.1	5.12	5.4	81.1	0.01327	0.0227	**8.4**
15		10.0	21.1	5.12	4.9	73.6	0.01327	0.0131	**7.6**
30		10.0	21.1	5.12	4.9	73.6	0.01327	0.0093	**7.6**
60		10.0	20.8	5.21	4.8	72.1	0.01332	0.0066	**7.4**
250		8.5	20.9	5.18	3.3	50.0	0.01330	0.0032	**5.2**
1440		8.5	21.1	5.12	3.4	51.0	0.01327	0.0013	**5.2**

Soil Specimen Data		Other Corrections		
Tare No.	929			
Weight of Tare & Dry Material (g)	112.91	a - Factor	0.99	
Weight of Tare (g)	101.34			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	10.30	
Weight of Dry Material (g)	6.57			
		Specific Gravity	2.7	Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 1/28/14 Checked By KC Date 1/31/14

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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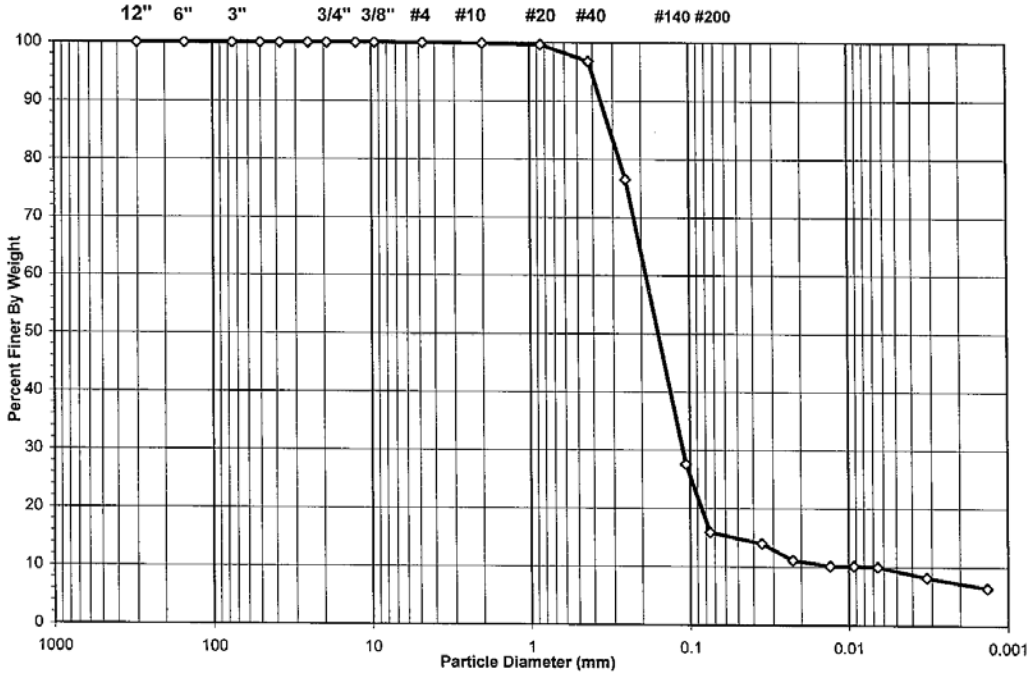
INTEGRITY IN TESTING

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	OTT-1
Lab ID:	2014-039-001-005	Soil Color:	BROWN

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary		
Sieve Sizes (mm)		**Percentage**
Greater Than #4	*Gravel*	0.01
#4 To #200	*Sand*	84.11
Finer Than #200	*Silt & Clay*	15.88

USCS Symbol ***SM, TESTED (NON-PLASTIC FINES)***

USCS Classification ***SILTY SAND***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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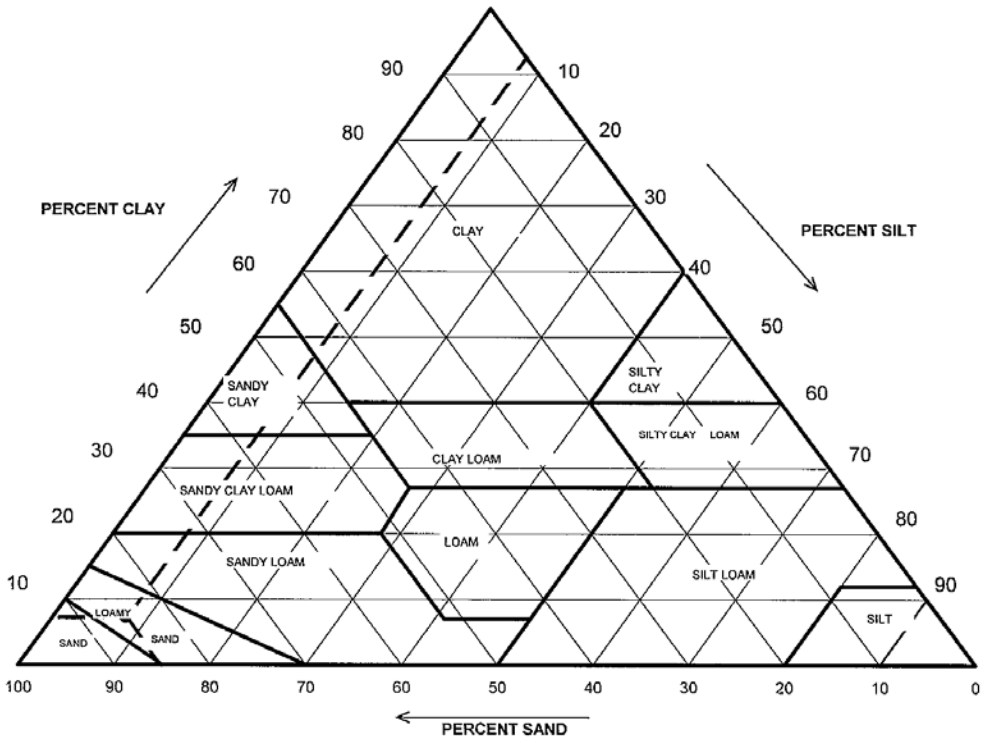
USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	OTT-1
Lab ID:	2014-039-001-005	Soil Color:	BROWN



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	0.11	**0.00**
2	99.89	*Sand*	85.04	**85.13**
0.05	14.85	*Silt*	7.65	**7.66**
0.002	7.20	*Clay*	7.20	**7.21**

USDA Classification: ***LOAMY SAND***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	OTT-1
Lab ID:	2014-039-001-005	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1443	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	580.00	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	563.58	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	145.09	Weight of Tare (g)	NA
Weight of Water (g)	16.42	Weight of Water (g)	NA
Weight of Dry Specimen (g)	418.49	Weight of Dry Specimen (g)	NA
Moisture Content (%)	**3.9**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	418.49
Dry Weight of -3/4" Sample (g)	352.05	Weight of - #200 material (g)	66.44
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	352.05
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00		100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00		100.00	**100.00**
#4	4.75	0.04	0.01	0.01		99.99	**99.99**
#10	2.00	0.42	0.10	0.11		99.89	**99.89**
#20	0.85	0.90	0.22	0.32		99.68	**99.68**
#40	0.425	11.94	2.85	3.18		96.82	**96.82**
#60	0.250	84.68	20.23	23.41		76.59	**76.59**
#140	0.106	205.08	49.00	72.42		27.58	**27.58**
#200	0.075	48.99	11.71	84.12		15.88	**15.88**
Pan	-	66.44	15.88	100.00		-	-

Tested By TB Date 9/27/13 Checked By KC Date 1/31/14

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)

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Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	OTT-1
Lab ID:	2014-039-001-005	Soil Color:	BROWN

Elapsed Time		R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)			(°C)			(%)		(mm)	(%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		12.5	21.1	5.12	7.4	88.1	0.01327	0.0354	**14.0**
5		11.0	21.1	5.12	5.9	70.2	0.01327	0.0226	**11.1**
15		10.5	21.1	5.12	5.4	64.2	0.01327	0.0131	**10.2**
30		10.5	21.1	5.12	5.4	64.2	0.01327	0.0092	**10.2**
60		10.5	20.8	5.21	5.3	63.1	0.01332	0.0066	**10.0**
250		9.5	20.9	5.18	4.3	51.5	0.01330	0.0032	**8.2**
1440		8.5	21.1	5.12	3.4	40.3	0.01327	0.0013	**6.4**

Soil Specimen Data		Other Corrections		
Tare No.	2324			
Weight of Tare & Dry Material (g)	111.92	a - Factor	0.99	
Weight of Tare (g)	98.62			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	15.88	
Weight of Dry Material (g)	8.3			
		Specific Gravity	2.7	Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 1/28/14 Checked By KC Date 1/31/14

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

Sievehyd.xls

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SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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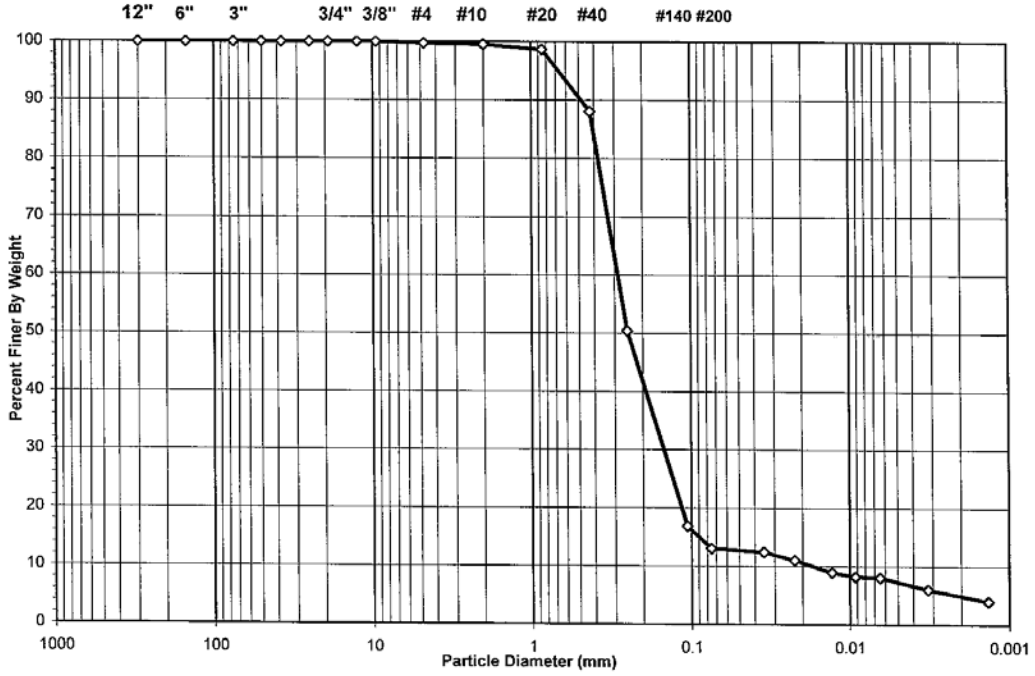
INTEGRITY IN TESTING

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	GRE-1
Lab ID:	2014-039-001-006	Soil Color:	BROWN

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.23
#4 To #200	*Sand*	86.75
Finer Than #200	*Silt & Clay*	13.02

USCS Symbol ***SM, TESTED (NON-PLASTIC FINES)***

USCS Classification ***SILTY SAND***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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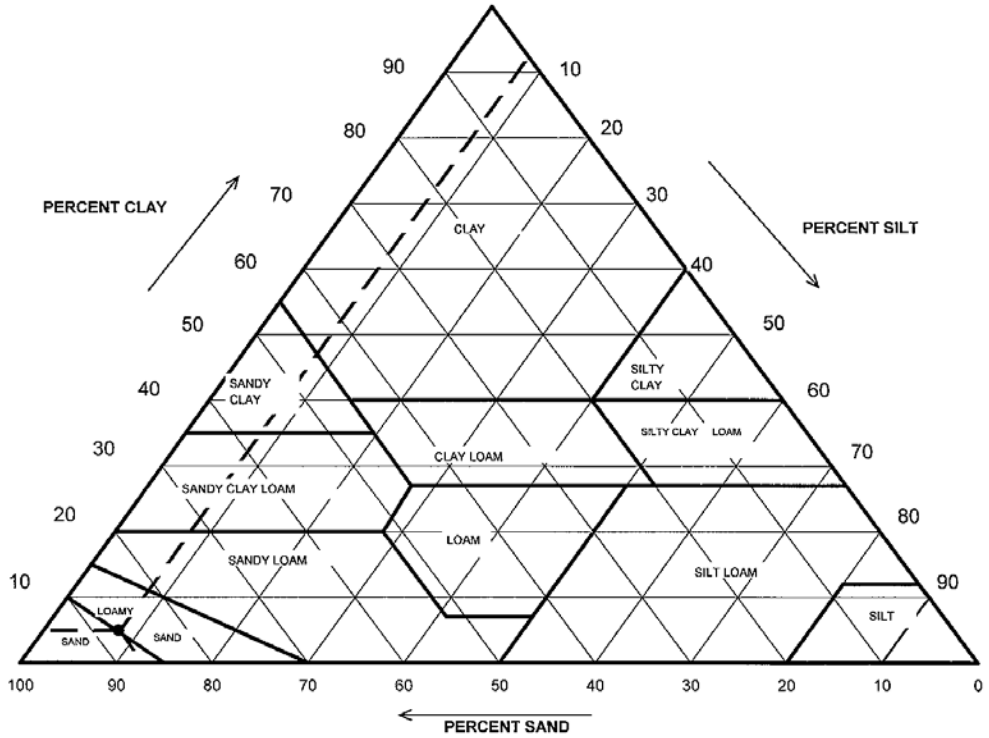
USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	GRE-1
Lab ID:	2014-039-001-006	Soil Color:	BROWN



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	0.45	**0.00**
2	99.55	*Sand*	86.86	**87.25**
0.05	12.70	*Silt*	7.77	**7.80**
0.002	4.93	*Clay*	4.93	**4.95**

USDA Classification: ***LOAMY SAND***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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INTEGRITY IN TESTING

WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	GRE-1
Lab ID:	2014-039-001-006	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1429	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	633.00	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	595.31	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	144.86	Weight of Tare (g)	NA
Weight of Water (g)	37.69	Weight of Water (g)	NA
Weight of Dry Specimen (g)	450.45	Weight of Dry Specimen (g)	NA
Moisture Content (%)	**8.4**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	450.45
Dry Weight of -3/4" Sample (g)	391.81	Weight of - #200 material (g)	58.64
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	391.81
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00		100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00		100.00	**100.00**
#4	4.75	1.05	0.23	0.23		99.77	**99.77**
#10	2.00	0.97	0.22	0.45		99.55	**99.55**
#20	0.85	3.98	0.88	1.33		98.67	**98.67**
#40	0.425	47.65	10.58	11.91		88.09	**88.09**
#60	0.250	169.58	37.65	49.56		50.44	**50.44**
#140	0.106	151.26	33.58	83.14		16.86	**16.86**
#200	0.075	17.32	3.85	86.98		13.02	**13.02**
Pan	-	58.64	13.02	100.00		-	-

Tested By TB Date 9/27/13 Checked By KC Date 1/31/14

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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HYDROMETER ANALYSIS
ASTM D 422-63 (2007)

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Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2014-039-001	Sample No.:	GRE-1
Lab ID:	2014-039-001-006	Soil Color:	BROWN

Elapsed Time		R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)			(°C)			(%)		(mm)	(%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		14.0	21.1	5.12	8.9	95.4	0.01327	0.0351	**12.4**
5		13.0	21.1	5.12	7.9	84.6	0.01327	0.0223	**11.0**
15		11.5	21.1	5.12	6.4	68.5	0.01327	0.0130	**8.9**
30		11.0	21.1	5.12	5.9	63.2	0.01327	0.0092	**8.2**
62		11.0	20.8	5.21	5.8	62.1	0.01332	0.0064	**8.1**
250		9.5	20.9	5.18	4.3	46.4	0.01330	0.0032	**6.0**
1440		8.0	21.1	5.12	2.9	30.9	0.01327	0.0014	**4.0**

Soil Specimen Data		Other Corrections		
Tare No.	656			
Weight of Tare & Dry Material (g)	109.89	a - Factor	0.99	
Weight of Tare (g)	95.67			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	13.02	
Weight of Dry Material (g)	9.22			
		Specific Gravity	2.7	Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 1/28/14 Checked By KC Date 1/31/14

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

Sievehyd.xls

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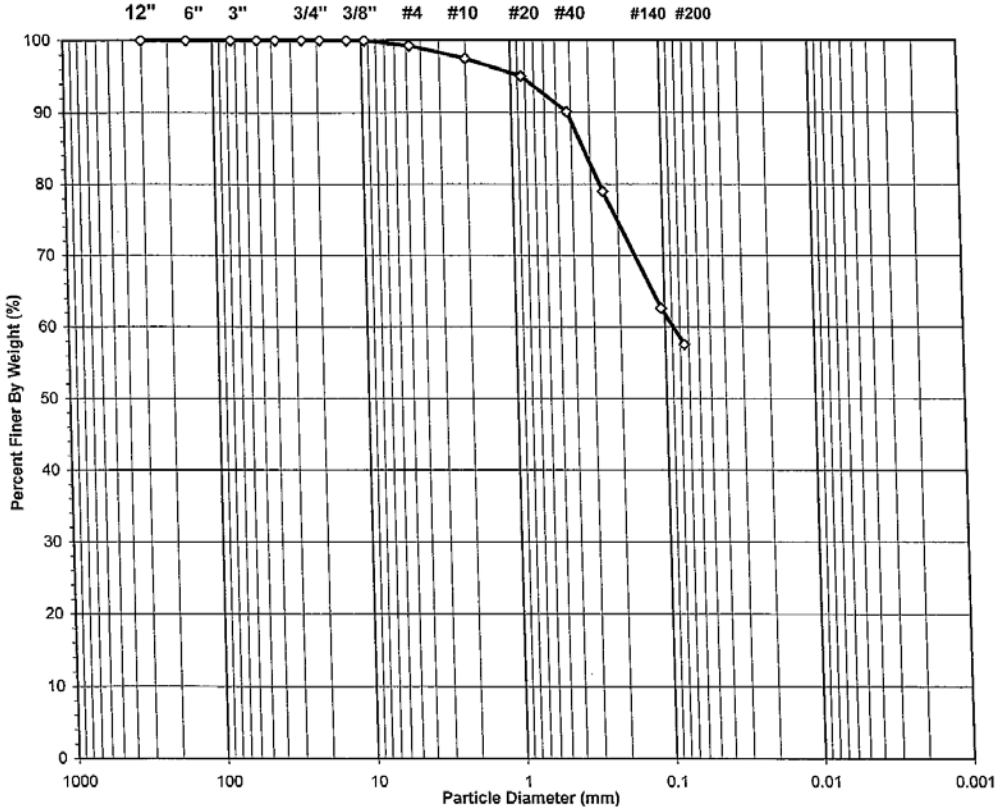
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	LAT-1
Lab ID:	2013-397-002-001	Soil Color:	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol: ***CL, TESTED***

USCS Classification: SANDY LEAN CLAY

Tested By TB Date 9/27/13 Checked By KC Date 9/30/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	LAT-1
Lab ID:	2013-397-002-001	Soil Color:	BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	1452	Tare No.	NA
Wt. of Tare & Wet Sample (g)	611.50	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	562.52	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	145.13	Weight of Tare (g)	NA
Weight of Water (g)	48.98	Weight of Water (g)	NA
Weight of Dry Sample (g)	417.39	Weight of Dry Sample (g)	NA
Moisture Content (%)	**11.7**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	417.39
Dry Weight of - 3/4" Sample (g)	177.0	Weight of - #200 Sample (g)	240.36
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	177.03
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.08	0.02	0.02	99.98	**99.98**
3/8"	9.50	0.05	0.01	0.03	99.97	**99.97**
#4	4.75	2.98	0.71	0.75	99.25	**99.25**
#10	2.00	7.34	1.76	2.50	97.50	**97.50**
#20	0.850	10.13	2.43	4.93	95.07	**95.07**
#40	0.425	20.61	4.94	9.87	90.13	**90.13**
#60	0.250	46.50	11.14	21.01	78.99	**78.99**
#140	0.106	68.31	16.37	37.38	62.62	**62.62**
#200	0.075	21.03	5.04	42.41	57.59	**57.59**
Pan	-	240.36	57.59	100.00	-	-

Tested By TB Date 9/27/13 Checked By KC Date 9/30/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	LAT-1
Lab ID:	2013-397-002-001	Soil Description:	**BROWN LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

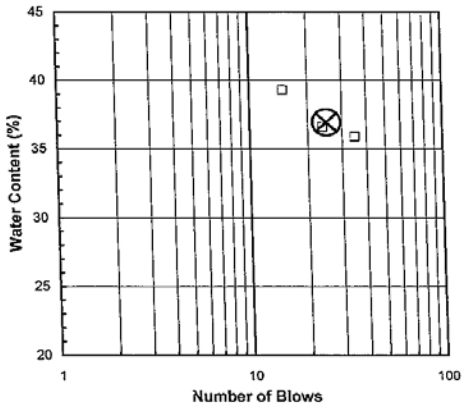
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	432	461	43	**U**
Wt. of Tare & Wet Sample (g)	44.37	38.25	40.12	**L**
Wt. of Tare & Dry Sample (g)	38.36	32.04	34.55	**T**
Wt. of Tare (g)	23.05	15.05	19.02	**I**
Wt. of Water (g)	6.0	6.2	5.6	**P**
Wt. of Dry Sample (g)	15.3	17.0	15.5	**O**
				I
Moisture Content (%)	**39.3**	**36.6**	**35.9**	**N**
Number of Blows	**15**	**24**	**35**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	473	151	
Wt. of Tare & Wet Sample (g)	28.38	25.40	
Wt. of Tare & Dry Sample (g)	27.30	24.41	
Wt. of Tare (g)	21.52	19.18	
Wt. of Water (g)	1.1	1.0	
Wt. of Dry Sample (g)	5.8	5.2	
Moisture Content (%)	**18.7**	**18.9**	**-0.2**

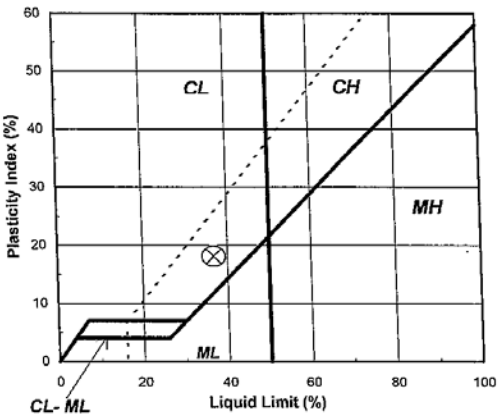
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**37**
Plastic Limit (%)	**19**
Plasticity Index (%)	**18**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By	*BK*	*Date*	*9/30/13*	*Checked By*	*KC*	*Date*	10/1/13	

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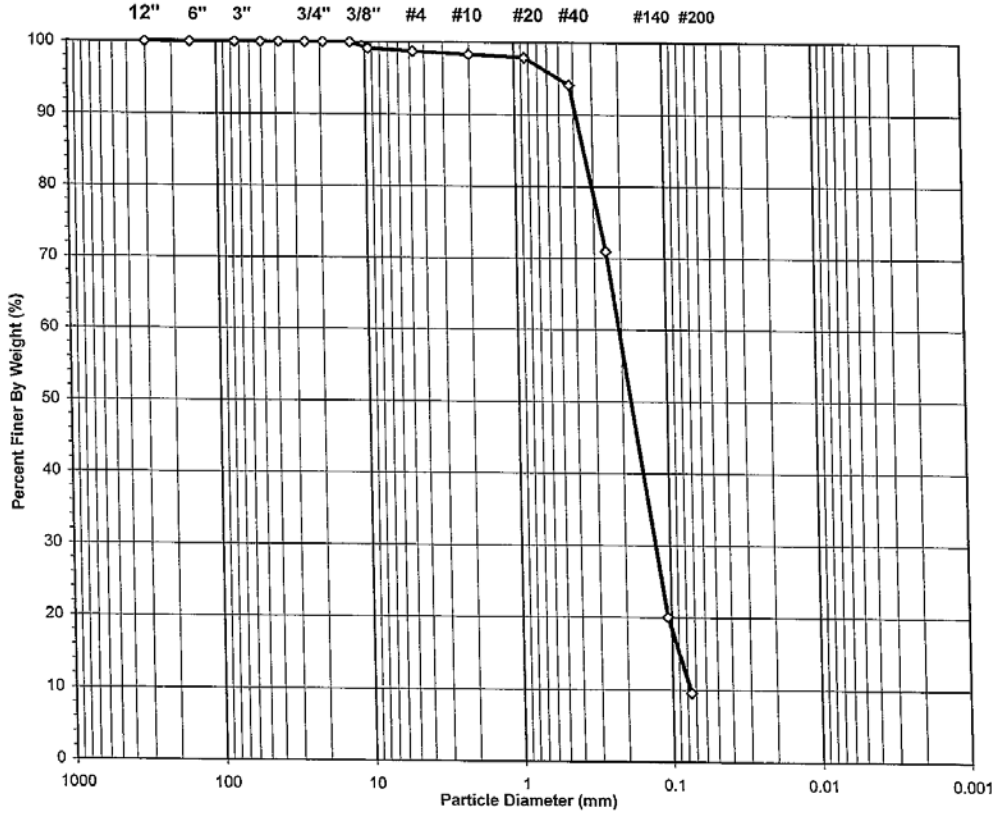
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	SEC-1
Lab ID:	2013-397-002-002	Soil Color:	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol: ***SP-SM, TESTED***

USCS Classification: ***POORLY GRADED SAND WITH SILT (NON-PLASTIC FINES)***

D60 =	**0.21**	**CC =**	**0.99**
D30 =	**0.13**	**CU =**	**2.73**
D10 =	**0.08**		

Tested By TB Date 9/27/13 Checked By KC Date 9/30/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	SEC-1
Lab ID:	2013-397-002-002	Soil Color:	BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	1414	Tare No.	NA
Wt. of Tare & Wet Sample (g)	668.50	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	613.21	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	145.35	Weight of Tare (g)	NA
Weight of Water (g)	55.29	Weight of Water (g)	NA
Weight of Dry Sample (g)	467.86	Weight of Dry Sample (g)	NA
Moisture Content (%)	**11.8**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	467.86
Dry Weight of - 3/4" Sample (g)	423.1	Weight of - #200 Sample (g)	44.75
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	423.11
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	3.89	0.83	0.83	99.17	**99.17**
#4	4.75	1.89	0.40	1.24	98.76	**98.76**
#10	2.00	1.88	0.40	1.64	98.36	**98.36**
#20	0.850	2.10	0.45	2.09	97.91	**97.91**
#40	0.425	17.83	3.81	5.90	94.10	**94.10**
#60	0.250	108.36	23.16	29.06	70.94	**70.94**
#140	0.106	238.01	50.87	79.93	20.07	**20.07**
#200	0.075	49.15	10.51	90.44	9.56	**9.56**
Pan	-	44.75	9.56	100.00	-	-

Tested By TB Date 9/27/13 Checked By KC Date 9/30/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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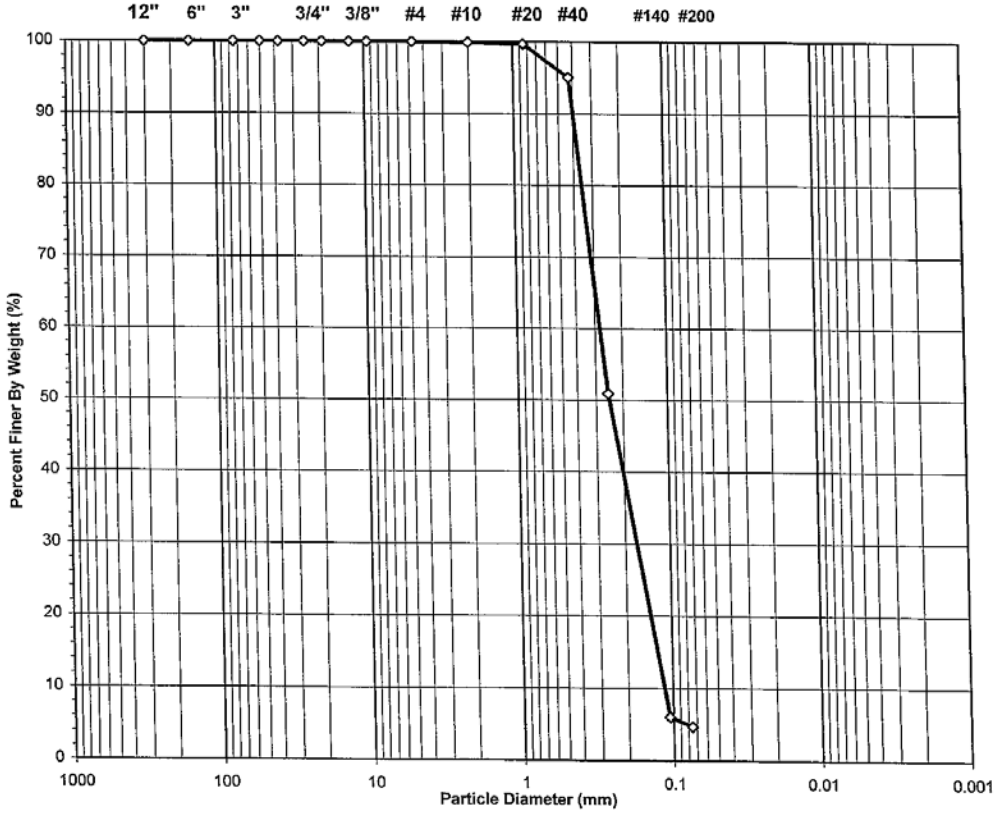
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	WIL-1
Lab ID:	2013-397-002-003	Soil Color:	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol: ***SP, TESTED***

USCS Classification: ***POORLY GRADED SAND (NON-PLASTIC FINES)***

D60 = 0.28 **CC = 0.88**

D30 = 0.17 **CU = 2.44**

D10 = 0.11

Tested By TB Date 9/27/13 Checked By KC Date 9/30/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	WIL-1
Lab ID:	2013-397-002-003	Soil Color:	BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	1431	Tare No.	NA
Wt. of Tare & Wet Sample (g)	720.50	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	695.17	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	144.41	Weight of Tare (g)	NA
Weight of Water (g)	25.33	Weight of Water (g)	NA
Weight of Dry Sample (g)	550.76	Weight of Dry Sample (g)	NA
Moisture Content (%)	**4.6**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	550.76
Dry Weight of - 3/4" Sample (g)	524.8	Weight of - #200 Sample (g)	25.96
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	524.80
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.60	0.11	0.11	99.89	**99.89**
#20	0.850	1.34	0.24	0.35	99.65	**99.65**
#40	0.425	25.26	4.59	4.94	95.06	**95.06**
#60	0.250	243.39	44.19	49.13	50.87	**50.87**
#140	0.106	246.93	44.83	93.96	6.04	**6.04**
#200	0.075	7.28	1.32	95.29	4.71	**4.71**
Pan	-	25.96	4.71	100.00	-	-

Tested By TB Date 9/27/13 Checked By KC Date 9/30/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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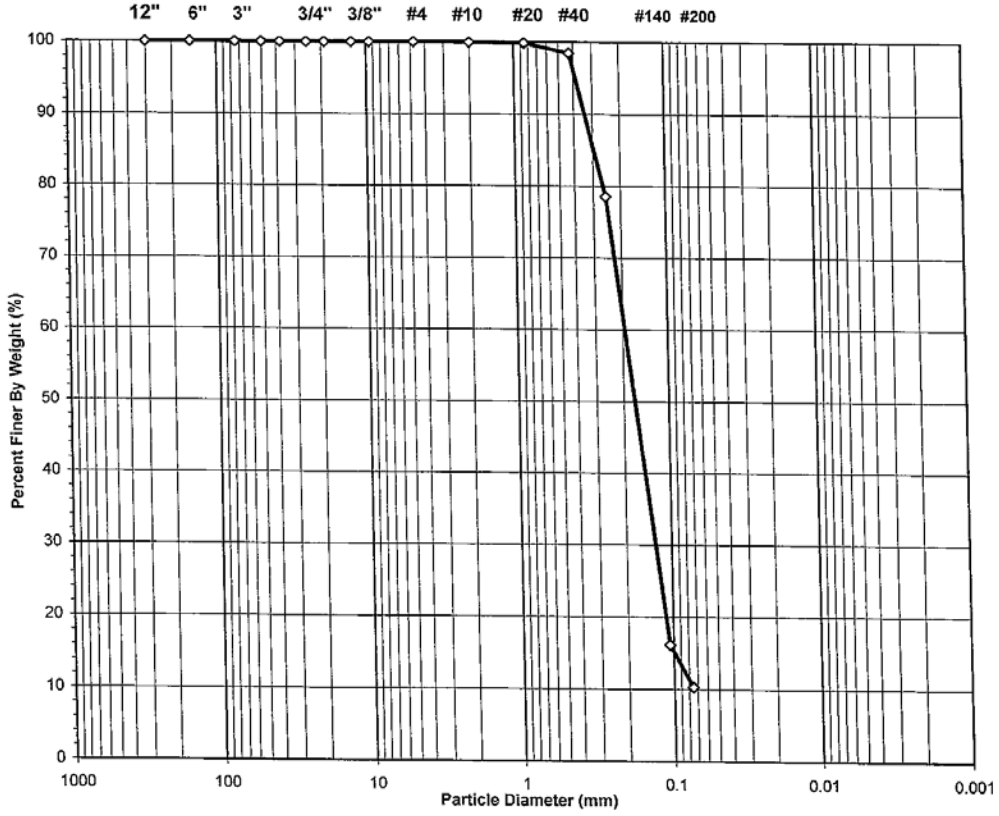
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	SWA-1
Lab ID:	2013-397-002-004	Soil Color:	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol: ***SP-SM, TESTED***

USCS Classification: ***POORLY GRADED SAND WITH SILT (NON-PLASTIC FINES)***

D60 = 0.19 **CC = 1.20**

D30 = 0.13 **CU = 2.75**

D10 = 0.07

Tested By TB Date 9/27/13 Checked By KC Date 9/30/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	SWA-1
Lab ID:	2013-397-002-004	Soil Color:	BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	1451	Tare No.	NA
Wt. of Tare & Wet Sample (g)	615.10	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	592.97	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	144.80	Weight of Tare (g)	NA
Weight of Water (g)	22.13	Weight of Water (g)	NA
Weight of Dry Sample (g)	448.17	Weight of Dry Sample (g)	NA
Moisture Content (%)	**4.9**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	448.17
Dry Weight of - 3/4" Sample (g)	402.0	Weight of - #200 Sample (g)	46.15
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	402.02
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.00	0.00	0.00	100.00	**100.00**
#10	2.00	0.19	0.04	0.04	99.96	**99.96**
#20	0.850	0.37	0.08	0.12	99.88	**99.88**
#40	0.425	6.10	1.36	1.49	98.51	**98.51**
#60	0.250	89.52	19.97	21.46	78.54	**78.54**
#140	0.106	279.61	62.39	83.85	16.15	**16.15**
#200	0.075	26.23	5.85	89.70	10.30	**10.30**
Pan	-	46.15	10.30	100.00	-	-

Tested By TB Date 9/27/13 Checked By KC Date 9/30/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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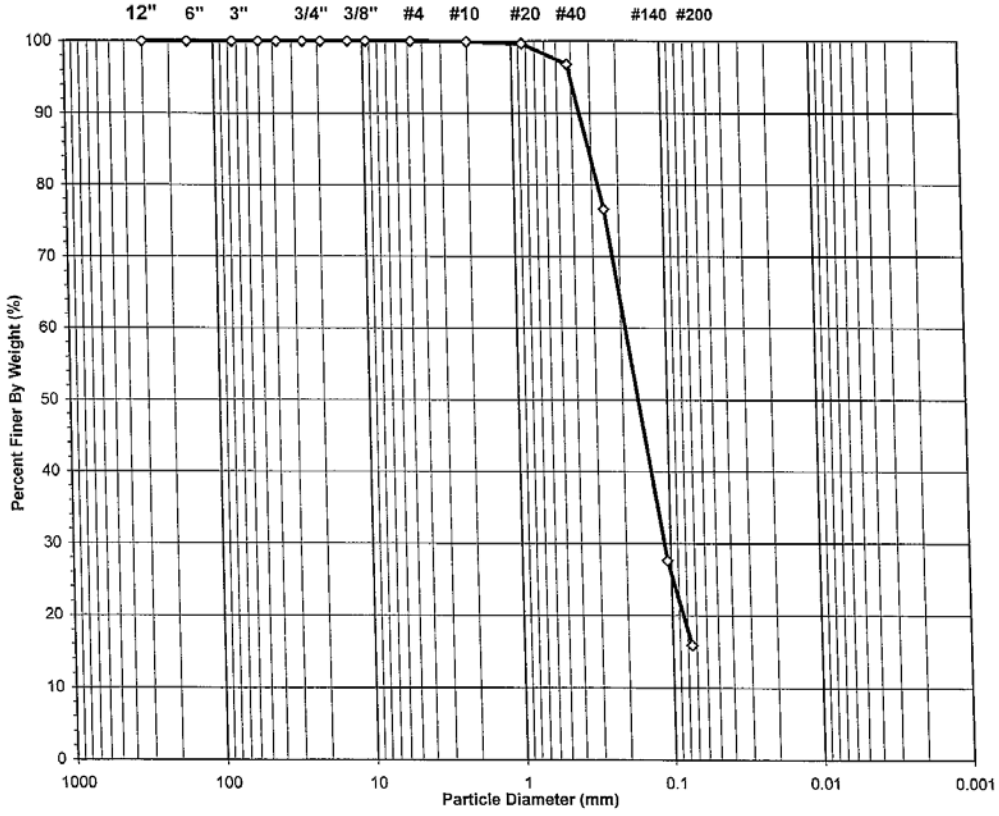
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	OTT-1
Lab ID:	2013-397-002-005	Soil Color:	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol: ***SM, TESTED***

USCS Classification: ***SILTY SAND***
(NON-PLASTIC FINES)

Tested By TB Date 9/27/13 Checked By KC Date 10/1/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	OTT-1
Lab ID:	2013-397-002-005	Soil Color:	BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	1443	Tare No.	NA
Wt. of Tare & Wet Sample (g)	580.00	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	563.58	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	145.09	Weight of Tare (g)	NA
Weight of Water (g)	16.42	Weight of Water (g)	NA
Weight of Dry Sample (g)	418.49	Weight of Dry Sample (g)	NA
Moisture Content (%)	**3.9**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	418.49
Dry Weight of - 3/4" Sample (g)	352.1	Weight of - #200 Sample (g)	66.44
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	352.05
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	0.04	0.01	0.01	99.99	**99.99**
#10	2.00	0.42	0.10	0.11	99.89	**99.89**
#20	0.850	0.90	0.22	0.32	99.68	**99.68**
#40	0.425	11.94	2.85	3.18	96.82	**96.82**
#60	0.250	84.68	20.23	23.41	76.59	**76.59**
#140	0.106	205.08	49.00	72.42	27.58	**27.58**
#200	0.075	48.99	11.71	84.12	15.88	**15.88**
Pan	-	66.44	15.88	100.00	-	-

Tested By TB Date 9/27/13 Checked By KC Date 10/1/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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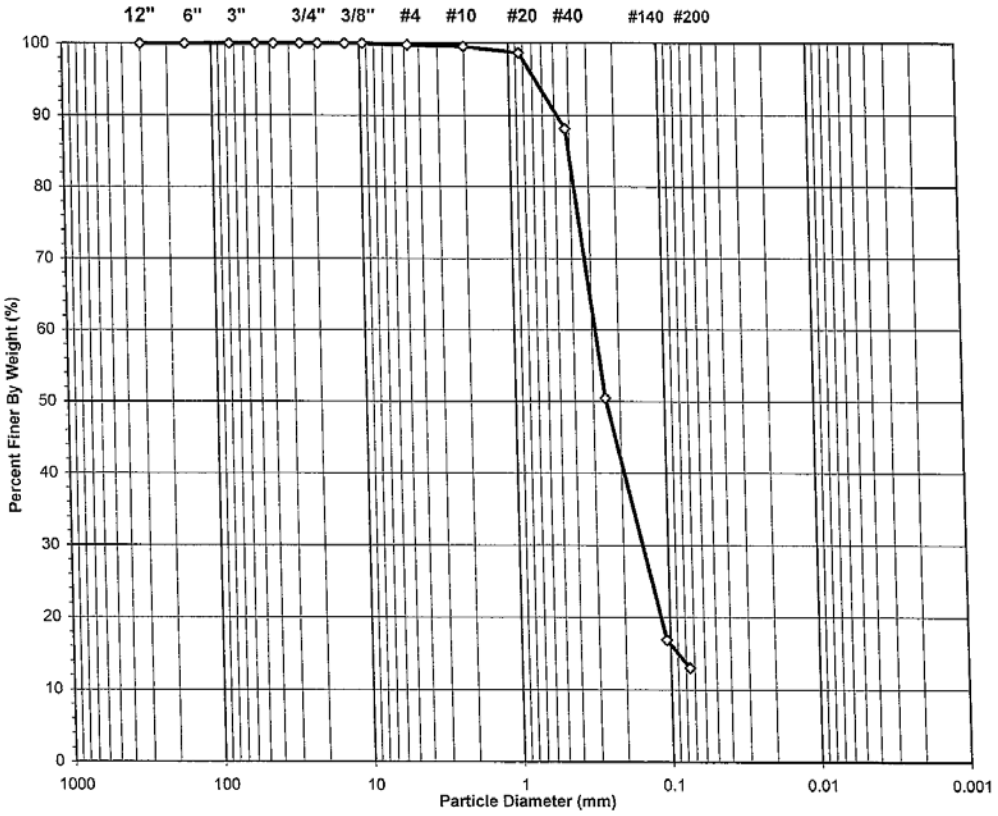
SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	GRE-1
Lab ID:	2013-397-002-006	Soil Color:	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol: ***SM, TESTED***

USCS Classification: ***SILTY SAND***
(NON-PLASTIC FINES)

Tested By TB Date 9/27/13 Checked By KC Date 10/1/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client:	MICROBAC	Boring No.:	NA
Client Reference:	OHIO EPA-DERR L13080981	Depth (ft):	NA
Project No.:	2013-397-002	Sample No.:	GRE-1
Lab ID:	2013-397-002-006	Soil Color:	BROWN

Moisture Content of Passing 3/4" Sample		Water Content of Retained 3/4" Sample	
Tare No.	1429	Tare No.	NA
Wt. of Tare & Wet Sample (g)	633.00	Weight of Tare & Wet Sample (g)	NA
Wt. of Tare & Dry Sample (g)	595.31	Weight of Tare & Dry Sample (g)	NA
Weight of Tare (g)	144.86	Weight of Tare (g)	NA
Weight of Water (g)	37.69	Weight of Water (g)	NA
Weight of Dry Sample (g)	450.45	Weight of Dry Sample (g)	NA
Moisture Content (%)	**8.4**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Sample (g)	450.45
Dry Weight of - 3/4" Sample (g)	391.8	Weight of - #200 Sample (g)	58.64
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 Sample (g)	391.81
Dry Weight of + 3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated Percent Finer (%)
12"	300	0.00	0.00	0.00	100.00	**100.00**
6"	150	0.00	0.00	0.00	100.00	**100.00**
3"	75	0.00	0.00	0.00	100.00	**100.00**
2"	50	0.00	0.00	0.00	100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00	100.00	**100.00**
1"	25.0	0.00	0.00	0.00	100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00	100.00	**100.00**
1/2"	12.50	0.00	0.00	0.00	100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00	100.00	**100.00**
#4	4.75	1.05	0.23	0.23	99.77	**99.77**
#10	2.00	0.97	0.22	0.45	99.55	**99.55**
#20	0.850	3.98	0.88	1.33	98.67	**98.67**
#40	0.425	47.65	10.58	11.91	88.09	**88.09**
#60	0.250	169.58	37.65	49.56	50.44	**50.44**
#140	0.106	151.26	33.58	83.14	16.86	**16.86**
#200	0.075	17.32	3.85	86.98	13.02	**13.02**
Pan	-	58.64	13.02	100.00	-	-

Tested By TB Date 9/27/13 Checked By KC Date 10/1/13

DCN: CT-S3C DATE 3/20/13 REVISION: 3

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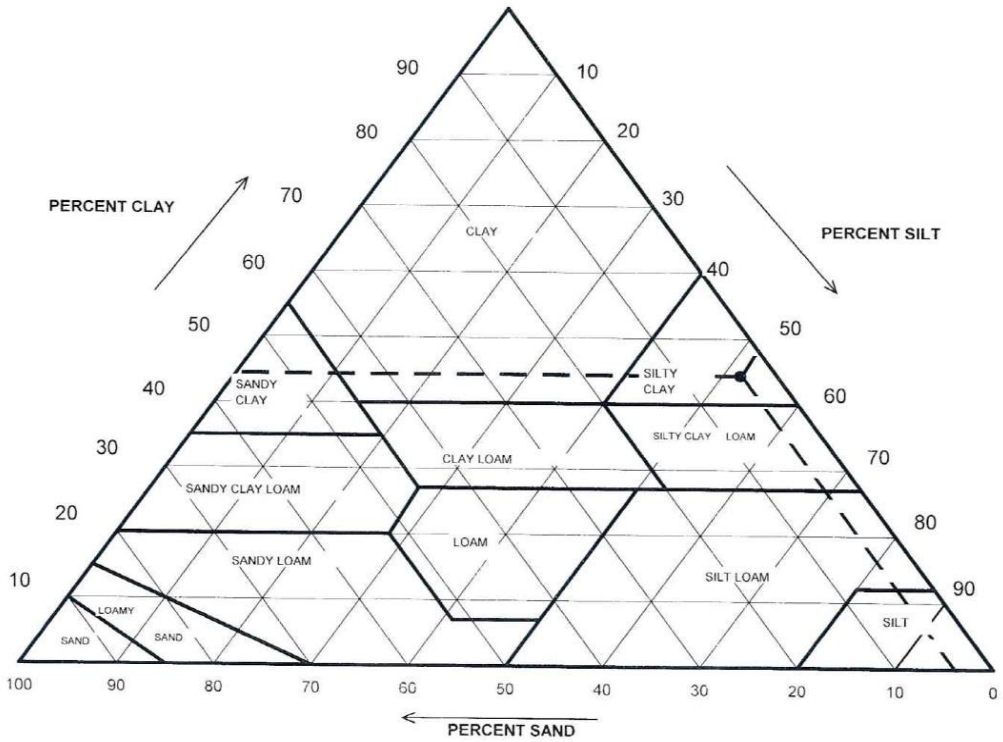
USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	PEA-1
Lab ID:	2013-454-001-001	Soil Color:	DARK BROWN



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	0.07	**0.00**
2	99.93	*Sand*	3.78	**3.78**
0.05	96.15	*Silt*	51.79	**51.83**
0.002	44.36	*Clay*	44.36	**44.39**

USDA Classification: ***SILTY CLAY***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	PEA-1
Lab ID:	2013-454-001-001	Soil Color:	DARK BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	702	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	530.57	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	448.65	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	95.32	Weight of Tare (g)	NA
Weight of Water (g)	81.92	Weight of Water (g)	NA
Weight of Dry Specimen (g)	353.33	Weight of Dry Specimen (g)	NA
Moisture Content (%)	**23.2**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	353.33
Dry Weight of -3/4" Sample (g)	6.22	Weight of - #200 material (g)	347.11
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	6.22
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00		100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00		100.00	**100.00**
#4	4.75	0.00	0.00	0.00		100.00	**100.00**
#10	2.00	0.25	0.07	0.07		99.93	**99.93**
#20	0.85	0.53	0.15	0.22		99.78	**99.78**
#40	0.425	0.59	0.17	0.39		99.61	**99.61**
#60	0.250	0.72	0.20	0.59		99.41	**99.41**
#140	0.106	2.51	0.71	1.30		98.70	**98.70**
#200	0.075	1.62	0.46	1.76		98.24	**98.24**
Pan	-	347.11	98.24	100.00		-	-

Tested By PC Date 3/18/13 Checked By KC Date 10/17/13

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	PEA-1
Lab ID:	2013-454-001-001	Soil Color:	DARK BROWN

Elapsed Time		R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)			(°C)			(%)		(mm)	(%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		53.0	23.1	4.49	48.5	94.3	0.01296	0.0253	**92.6**
5		50.0	23.1	4.49	45.5	88.5	0.01296	0.0165	**86.9**
15		43.5	23.1	4.49	39.0	75.8	0.01296	0.0101	**74.5**
30		40.0	23.1	4.49	35.5	69.0	0.01296	0.0074	**67.8**
60		36.0	22.4	4.71	31.3	60.8	0.01307	0.0054	**59.8**
298		29.5	22.2	4.77	24.7	48.1	0.01310	0.0026	**47.2**
1440		25.0	22.1	4.80	20.2	39.3	0.01311	0.0012	**38.6**

Soil Specimen Data		Other Corrections		
Tare No.	947			
Weight of Tare & Dry Material (g)	156.72	a - Factor	0.99	
Weight of Tare (g)	100.79			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	98.24	
Weight of Dry Material (g)	50.93			
		Specific Gravity	2.7	Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

Sievehyd.xls

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	Ohio EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	PEA-1
Lab ID:	2013-454-001-001	Soil Description:	**DARK BROWN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

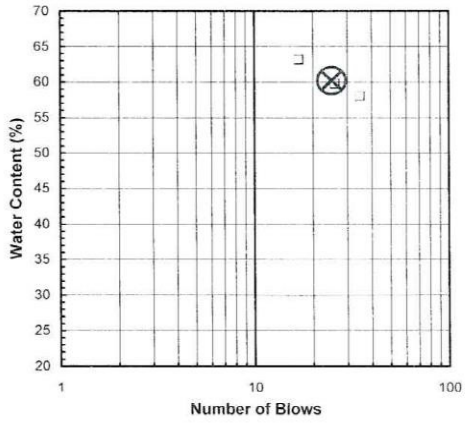
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	399	1247	374	U
Wt. of Tare & Wet Sample (g)	34.67	39.37	34.65	L
Wt. of Tare & Dry Sample (g)	26.53	31.72	27.13	T
Wt. of Tare (g)	13.63	18.91	14.15	I
Wt. of Water (g)	8.1	7.7	7.5	P
Wt. of Dry Sample (g)	12.9	12.8	13.0	O
				I
Moisture Content (%)	**63.1**	**59.7**	**57.9**	N
Number of Blows	**17**	**26**	**35**	T

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	446	468	
Wt. of Tare & Wet Sample (g)	26.54	16.63	
Wt. of Tare & Dry Sample (g)	25.36	15.47	
Wt. of Tare (g)	20.30	10.43	
Wt. of Water (g)	1.2	1.2	
Wt. of Dry Sample (g)	5.1	5.0	
Moisture Content (%)	**23.3**	**23.0**	**0.3**

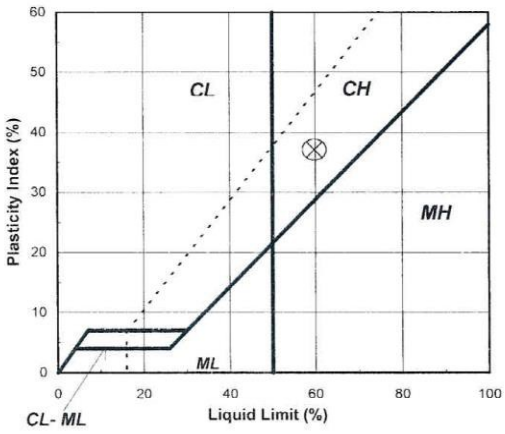
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**60**
Plastic Limit (%)	**23**
Plasticity Index (%)	**37**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*BK*	*Date*	*10/5/13*	*Checked By*	*KC*	*Date*	10/7/13

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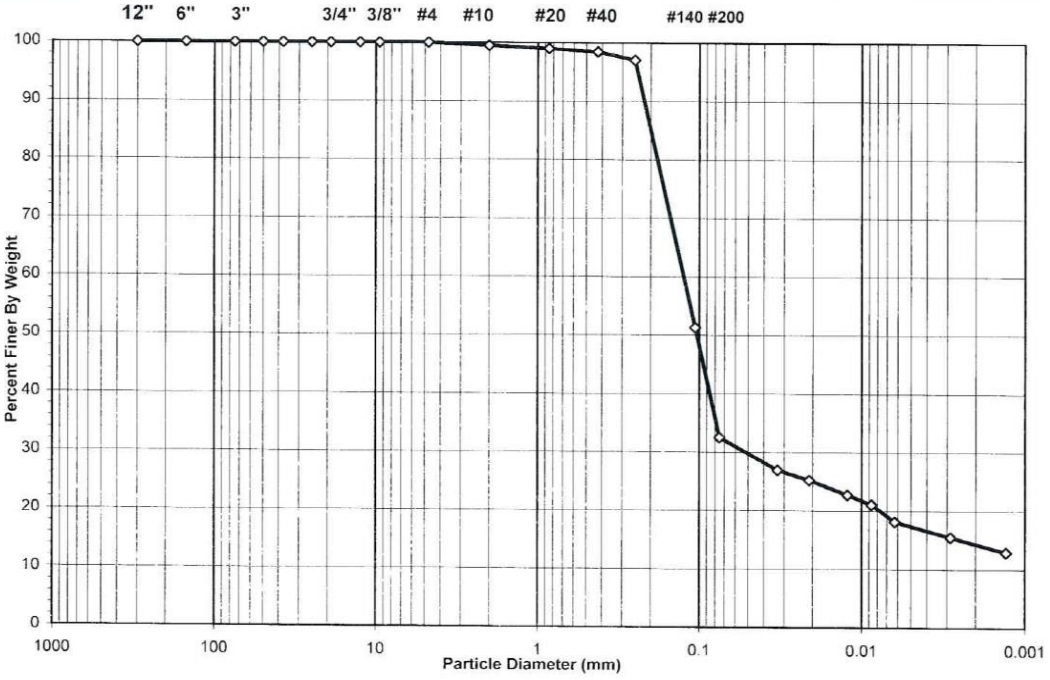
SIEVE AND HYDROMETER ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	WOO-1
Lab ID:	2013-454-001-002	Soil Color:	DARK BROWN

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary

Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	67.52
Finer Than #200	*Silt & Clay*	32.48

USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND (NON-PLASTIC FINES)***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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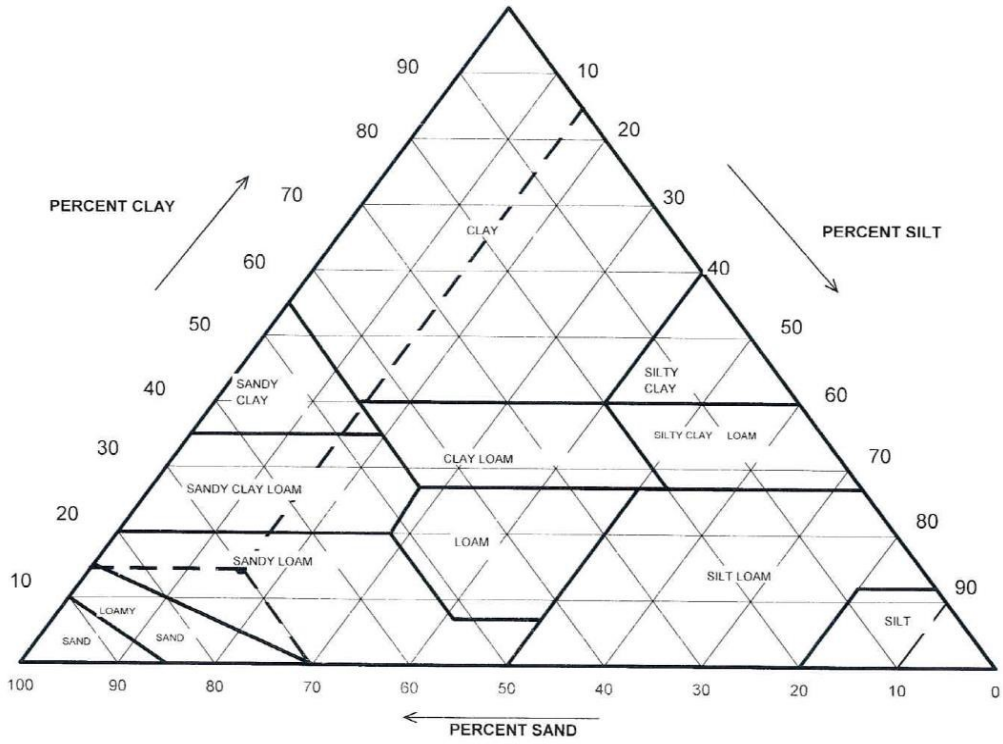
USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	WOO-1
Lab ID:	2013-454-001-002	Soil Color:	DARK BROWN



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	0.48	**0.00**
2	99.52	*Sand*	69.77	**70.11**
0.05	29.75	*Silt*	15.39	**15.46**
0.002	14.36	*Clay*	14.36	**14.43**

USDA Classification: ***SANDY LOAM***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	WOO-1
Lab ID:	2013-454-001-002	Soil Color:	DARK BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	963	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	476.95	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	436.92	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	101.62	Weight of Tare (g)	NA
Weight of Water (g)	40.03	Weight of Water (g)	NA
Weight of Dry Specimen (g)	335.30	Weight of Dry Specimen (g)	NA
Moisture Content (%)	**11.9**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	335.30
Dry Weight of -3/4" Sample (g)	226.40	Weight of - #200 material (g)	108.90
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	226.40
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00		100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00		100.00	**100.00**
#4	4.75	0.00	0.00	0.00		100.00	**100.00**
#10	2.00	1.61	0.48	0.48		99.52	**99.52**
#20	0.85	1.75	0.52	1.00		99.00	**99.00**
#40	0.425	1.77	0.53	1.53		98.47	**98.47**
#60	0.250	4.69	1.40	2.93		97.07	**97.07**
#140	0.106	153.41	45.75	48.68		51.32	**51.32**
#200	0.075	63.17	18.84	67.52		32.48	**32.48**
Pan	-	108.90	32.48	100.00		-	-

Tested By PC Date 10/7/13 Checked By KC Date 10/17/13

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

geotechnics
INTEGRITY IN TESTING

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	WOO-1
Lab ID:	2013-454-001-002	Soil Color:	DARK BROWN

Elapsed Time		R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)			(°C)			(%)		(mm)	(%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		20.5	23.1	4.49	16.0	83.0	0.01296	0.0330	**26.9**
5		19.5	23.1	4.49	15.0	77.8	0.01296	0.0210	**25.3**
15		18.0	23.1	4.49	13.5	70.0	0.01296	0.0122	**22.7**
30		17.0	23.1	4.49	12.5	64.8	0.01296	0.0087	**21.1**
60		15.5	22.4	4.71	10.8	55.9	0.01307	0.0063	**18.2**
295		14.0	22.2	4.77	9.2	47.8	0.01310	0.0029	**15.5**
1440		12.5	22.1	4.80	7.7	39.9	0.01311	0.0013	**13.0**

Soil Specimen Data		Other Corrections		
Tare No.	968			
Weight of Tare & Dry Material (g)	125.21	a - Factor	0.99	
Weight of Tare (g)	101.1			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	32.48	
Weight of Dry Material (g)	19.11			
		Specific Gravity	2.7	Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

Sievehyd.xls

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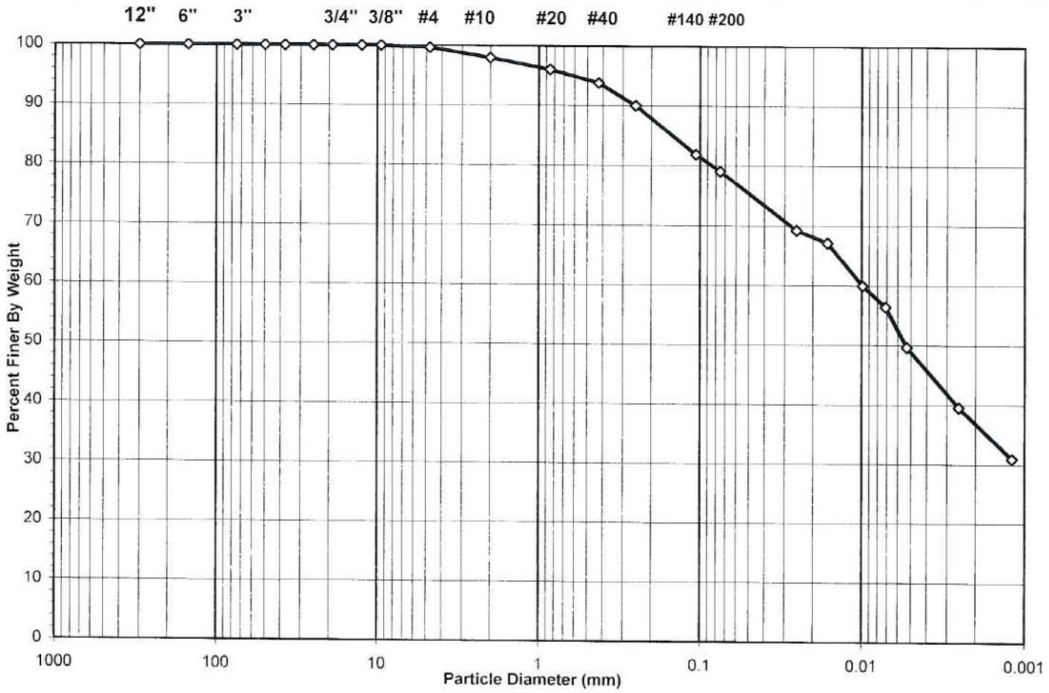
SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	SID-1
Lab ID:	2013-454-001-003	Soil Color:	BROWN

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



Sieve Sizes (mm)	USCS Summary	Percentage
Greater Than #4	*Gravel*	0.34
#4 To #200	*Sand*	20.60
Finer Than #200	*Silt & Clay*	79.06

USCS Symbol *CL, TESTED*

USCS Classification *LEAN CLAY WITH SAND*

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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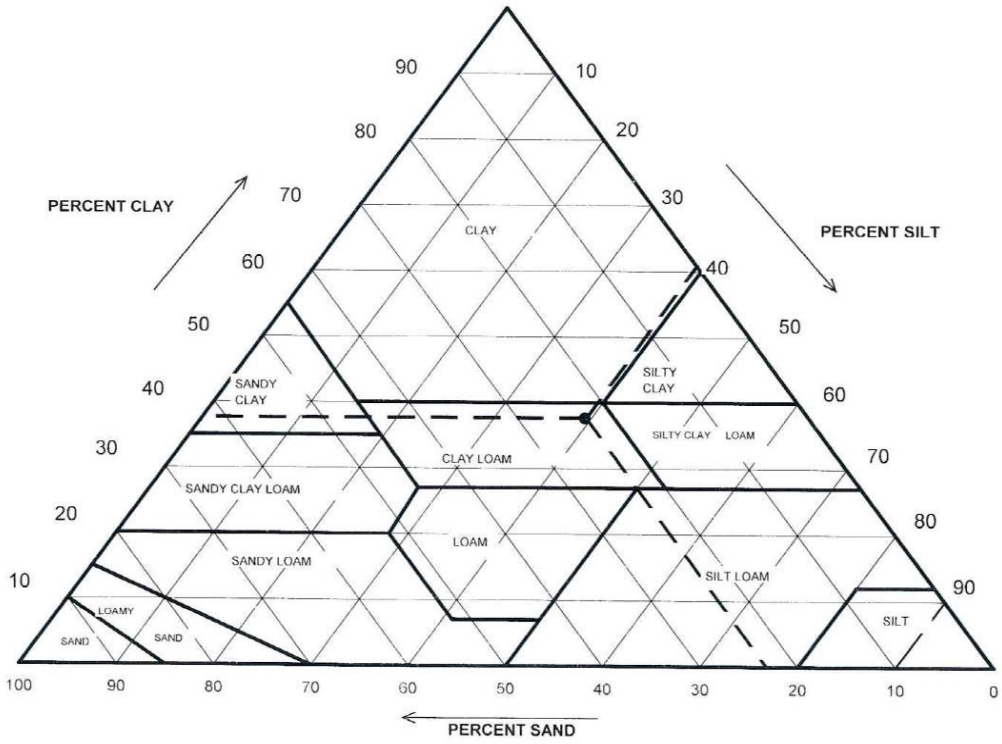
USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	SID-1
Lab ID:	2013-454-001-003	Soil Color:	BROWN



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	2.01	**0.00**
2	97.99	*Sand*	22.58	**23.04**
0.05	75.41	*Silt*	38.54	**39.33**
0.002	36.87	*Clay*	36.87	**37.62**

USDA Classification: ***CLAY LOAM***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	SID-1
Lab ID:	2013-454-001-003	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	692	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	565.12	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	496.98	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	94.86	Weight of Tare (g)	NA
Weight of Water (g)	68.14	Weight of Water (g)	NA
Weight of Dry Specimen (g)	402.12	Weight of Dry Specimen (g)	NA
Moisture Content (%)	**16.9**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	402.12
Dry Weight of -3/4" Sample (g)	84.21	Weight of - #200 material (g)	317.91
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	84.21
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00		100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00		100.00	**100.00**
#4	4.75	1.37	0.34	0.34		99.66	**99.66**
#10	2.00	6.73	1.67	2.01		97.99	**97.99**
#20	0.85	7.77	1.93	3.95		96.05	**96.05**
#40	0.425	9.09	2.26	6.21		93.79	**93.79**
#60	0.250	15.20	3.78	9.99		90.01	**90.01**
#140	0.106	32.69	8.13	18.12		81.88	**81.88**
#200	0.075	11.36	2.83	20.94		79.06	**79.06**
Pan	-	317.91	79.06	100.00		-	-

Tested By PC Date 10/7/13 Checked By KC Date 10/17/13

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	SID-1
Lab ID:	2013-454-001-003	Soil Color:	BROWN

Elapsed Time		R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)			(°C)			(%)		(mm)	(%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		53.0	23.1	4.49	48.5	87.6	0.01296	0.0253	**69.3**
5		51.5	23.1	4.49	47.0	84.9	0.01296	0.0162	**67.1**
15		46.5	23.1	4.49	42.0	75.9	0.01296	0.0099	**60.0**
30		44.0	23.1	4.49	39.5	71.4	0.01296	0.0071	**56.4**
60		39.5	22.4	4.71	34.8	62.8	0.01307	0.0053	**49.7**
292		32.5	22.2	4.77	27.7	50.1	0.01310	0.0025	**39.6**
1440		26.5	22.1	4.80	21.7	39.2	0.01311	0.0012	**31.0**

Soil Specimen Data		Other Corrections		
Tare No.	2331			
Weight of Tare & Dry Material (g)	154.58	a - Factor	0.99	
Weight of Tare (g)	94.76			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	79.06	
Weight of Dry Material (g)	54.82			
		Specific Gravity	2.7	Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

Sievehyd.xls

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	Ohio EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	SID-1
Lab ID:	2013-454-001-003	Soil Description:	**BROWN LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

Liquid Limit Test	**1**	**2**	**3**
Tare Number	117	1293	375
Wt. of Tare & Wet Sample (g)	40.77	41.18	34.31
Wt. of Tare & Dry Sample (g)	34.06	34.75	27.87
Wt. of Tare (g)	20.20	20.74	13.18
Wt. of Water (g)	6.7	6.4	6.4
Wt. of Dry Sample (g)	13.9	14.0	14.7
Moisture Content (%)	**48.4**	**45.9**	**43.8**
Number of Blows	**15**	**23**	**35**

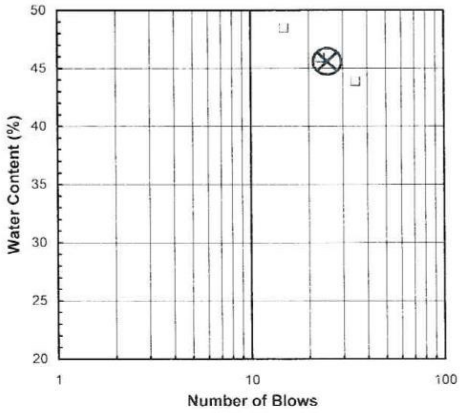
MULTIPOINT

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	1288	1290	
Wt. of Tare & Wet Sample (g)	19.32	20.96	
Wt. of Tare & Dry Sample (g)	18.29	20.02	
Wt. of Tare (g)	12.57	14.77	
Wt. of Water (g)	1.0	0.9	
Wt. of Dry Sample (g)	5.7	5.3	
Moisture Content (%)	**18.0**	**17.9**	**0.1**

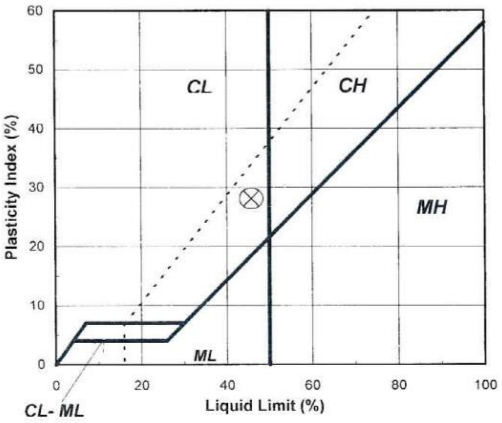
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**46**
Plastic Limit (%)	**18**
Plasticity Index (%)	**28**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By	*BK*	*Date*	*10/5/13*	*Checked By*	*KC*	*Date*	10/7/13

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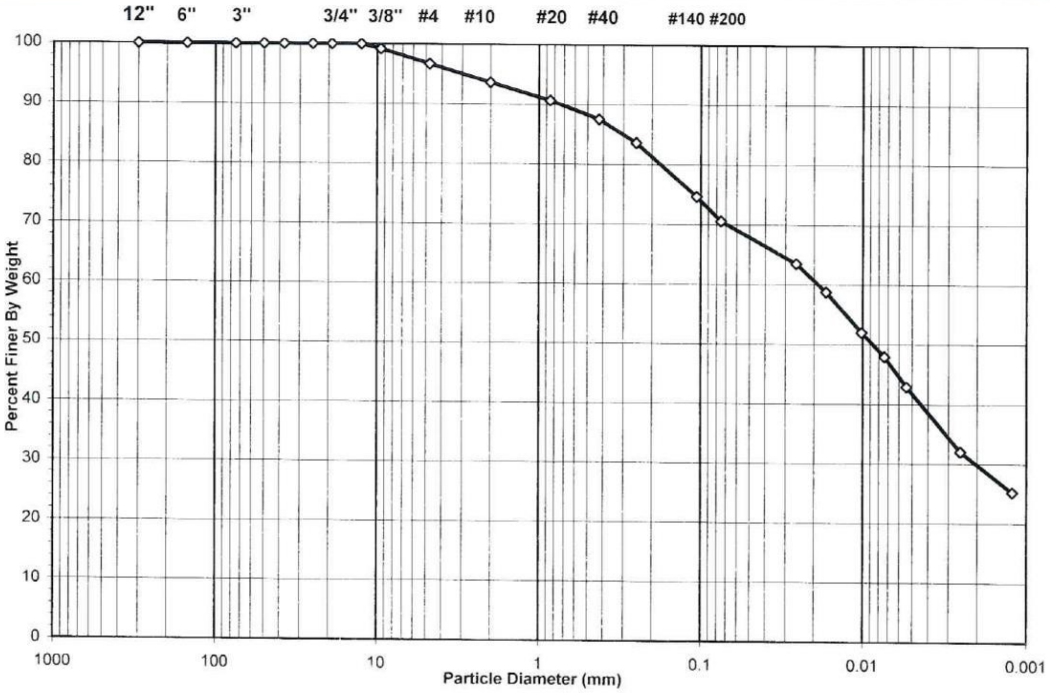
SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	FAR-1
Lab ID:	2013-454-001-004	Soil Color:	BROWN

	SIEVE ANALYSIS				HYDROMETER	
USCS	cobbles	gravel	sand		silt and clay fraction	
USDA	cobbles	gravel	sand		silt	clay



USCS Summary		
Sieve Sizes (mm)		**Percentage**
Greater Than #4	*Gravel*	3.29
#4 To #200	*Sand*	26.12
Finer Than #200	*Silt & Clay*	70.58

USCS Symbol *CL, TESTED*

USCS Classification *LEAN CLAY WITH SAND*

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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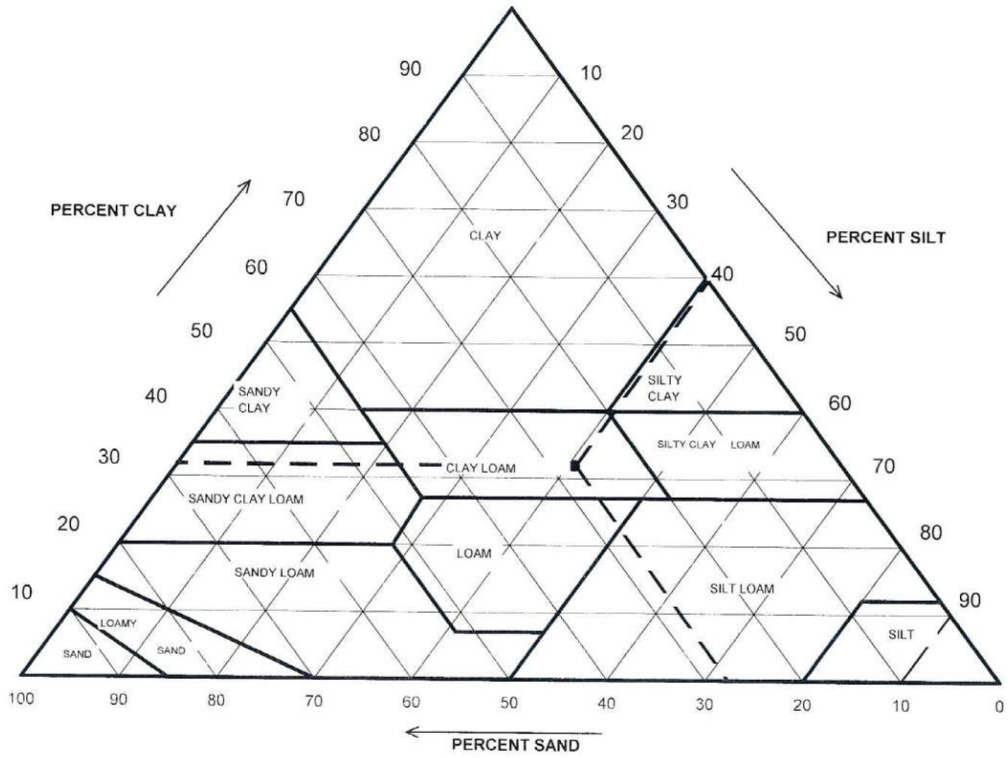
USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	FAR-1
Lab ID:	2013-454-001-004	Soil Color:	BROWN



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	6.38	**0.00**
2	93.62	*Sand*	25.72	**27.47**
0.05	67.90	*Silt*	38.06	**40.65**
0.002	29.85	*Clay*	29.85	**31.88**

USDA Classification: ***CLAY LOAM***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	FAR-1
Lab ID:	2013-454-001-004	Soil Color:	BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	926	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	617.16	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	543.43	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	95.45	Weight of Tare (g)	NA
Weight of Water (g)	73.73	Weight of Water (g)	NA
Weight of Dry Specimen (g)	447.98	Weight of Dry Specimen (g)	NA
Moisture Content (%)	**16.5**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	447.98
Dry Weight of -3/4" Sample (g)	131.78	Weight of - #200 material (g)	316.20
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	131.78
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00		100.00	**100.00**
3/8"	9.50	3.78	0.84	0.84		99.16	**99.16**
#4	4.75	10.98	2.45	3.29		96.71	**96.71**
#10	2.00	13.80	3.08	6.38		93.62	**93.62**
#20	0.85	13.28	2.96	9.34		90.66	**90.66**
#40	0.425	14.04	3.13	12.47		87.53	**87.53**
#60	0.250	17.47	3.90	16.37		83.63	**83.63**
#140	0.106	40.09	8.95	25.32		74.68	**74.68**
#200	0.075	18.34	4.09	29.42		70.58	**70.58**
Pan	-	316.20	70.58	100.00		-	-

Tested By PC Date 10/7/13 Checked By KC Date 10/17/13

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	FAR-1
Lab ID:	2013-454-001-004	Soil Color:	BROWN

Elapsed Time		R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)			(°C)			(%)		(mm)	(%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		51.5	23.1	4.49	47.0	90.0	0.01296	0.0257	**63.5**
5		48.0	23.1	4.49	43.5	83.3	0.01296	0.0168	**58.8**
15		43.0	23.1	4.49	38.5	73.7	0.01296	0.0102	**52.0**
30		40.0	23.1	4.49	35.5	68.0	0.01296	0.0074	**48.0**
60		36.5	22.4	4.71	31.8	60.8	0.01307	0.0054	**42.9**
310		28.5	22.2	4.77	23.7	45.4	0.01310	0.0025	**32.0**
1440		23.5	22.1	4.80	18.7	35.8	0.01311	0.0012	**25.3**

Soil Specimen Data		Other Corrections		
Tare No.	961			
Weight of Tare & Dry Material (g)	158.46	a - Factor	0.99	
Weight of Tare (g)	101.72			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	70.58	
Weight of Dry Material (g)	51.74			
		Specific Gravity	2.7	Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

Sievehyd.xls

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	Ohio EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	FAR-1
Lab ID:	2013-454-001-004	Soil Description:	**BROWN LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

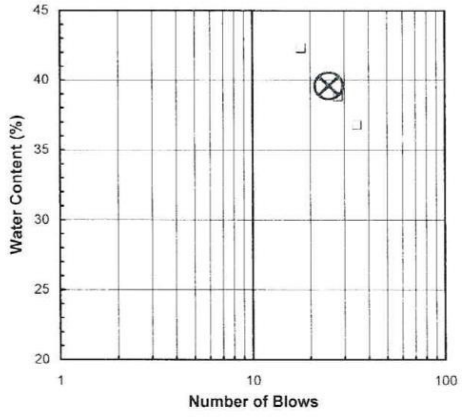
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	1235	1251	1283	**U**
Wt. of Tare & Wet Sample (g)	31.73	36.65	31.73	**L**
Wt. of Tare & Dry Sample (g)	25.76	30.58	26.17	**T**
Wt. of Tare (g)	11.64	14.94	11.05	**I**
Wt. of Water (g)	6.0	6.1	5.6	**P**
Wt. of Dry Sample (g)	14.1	15.6	15.1	**O**
				I
Moisture Content (%)	**42.3**	**38.8**	**36.8**	**N**
Number of Blows	**18**	**28**	**35**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	151	366	
Wt. of Tare & Wet Sample (g)	25.72	23.93	
Wt. of Tare & Dry Sample (g)	24.59	22.75	
Wt. of Tare (g)	19.18	17.09	
Wt. of Water (g)	1.1	1.2	
Wt. of Dry Sample (g)	5.4	5.7	
Moisture Content (%)	**20.9**	**20.9**	**0.0**

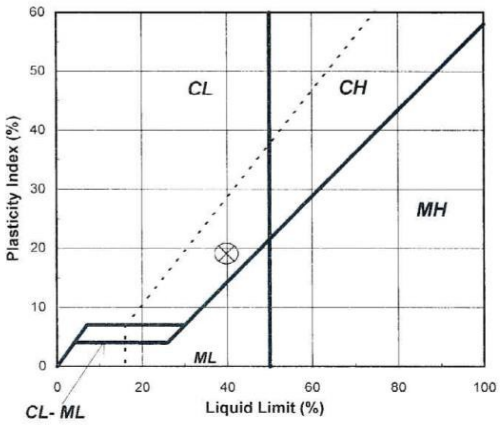
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**40**
Plastic Limit (%)	**21**
Plasticity Index (%)	**19**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By BK *Date* 10/5/13 *Checked By* KC *Date* 10/7/13

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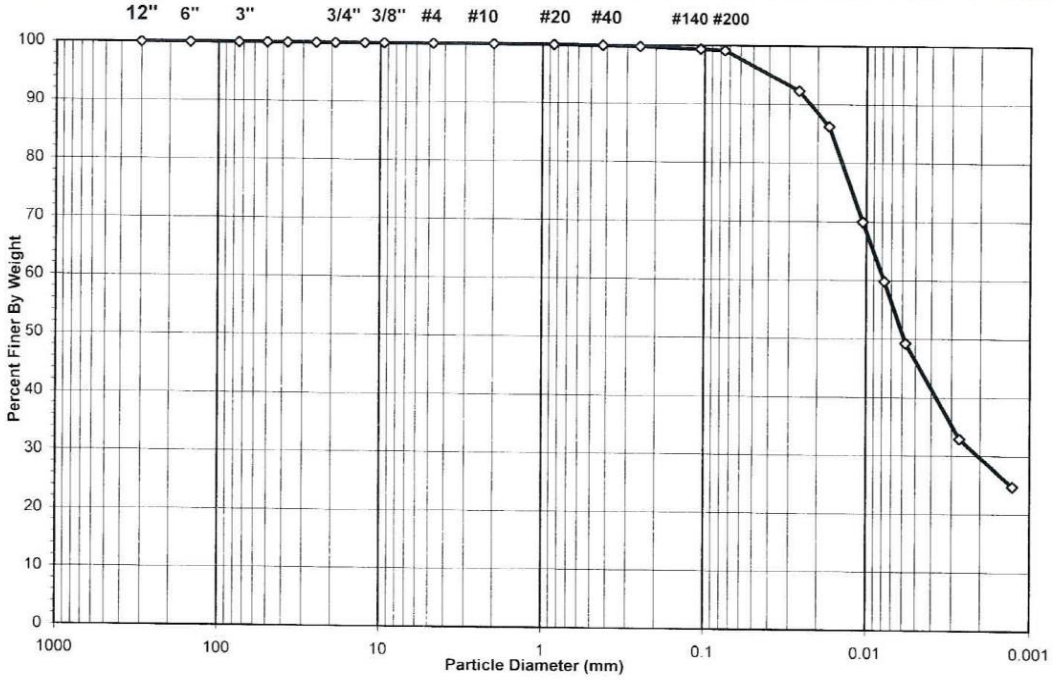
SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	DET-1
Lab ID:	2013-454-001-005	Soil Color:	DARK BROWN

	SIEVE ANALYSIS				HYDROMETER	
USCS	cobbles	gravel	sand		silt and clay fraction	
USDA	cobbles	gravel	sand		silt	clay



USCS Summary		
Sieve Sizes (mm)		**Percentage**
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	0.88
Finer Than #200	*Silt & Clay*	99.12

USCS Symbol *CH, TESTED*

USCS Classification *FAT CLAY*

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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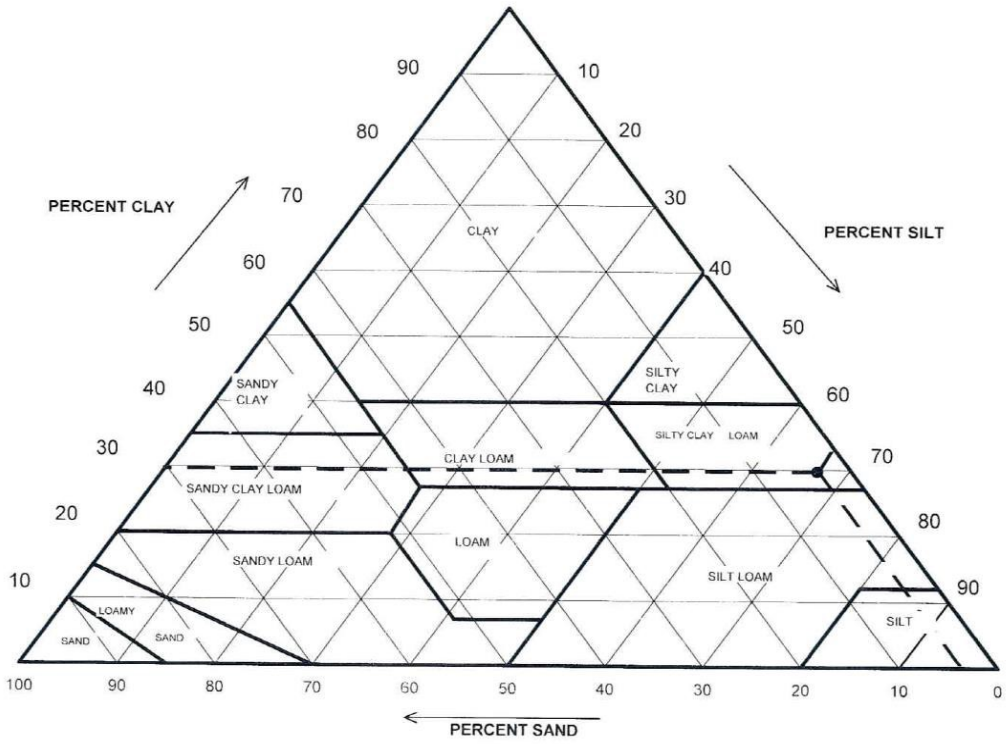
USDA CLASSIFICATION CHART

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	DET-1
Lab ID:	2013-454-001-005	Soil Color:	DARK BROWN



Particle Size	Percent Finer	USDA SUMMARY	Actual Percentage	Corrected % of Minus 2.0 mm material for USDA Classificat.
(mm)	(%)		(%)	(%)
		Gravel	0.00	**0.00**
2	100.00	*Sand*	3.49	**3.49**
0.05	96.51	*Silt*	66.80	**66.80**
0.002	29.71	*Clay*	29.71	**29.71**

USDA Classification: ***SILTY CLAY LOAM***

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	DET-1
Lab ID:	2013-454-001-005	Soil Color:	DARK BROWN

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	1139	Tare No.	NA
Wt. of Tare & Wet Specimen (g)	493.48	Wt. of Tare & Wet Specimen (g)	NA
Wt. of Tare & Dry Specimen (g)	384.57	Wt. of Tare & Dry Specimen (g)	NA
Weight of Tare (g)	97.10	Weight of Tare (g)	NA
Weight of Water (g)	108.91	Weight of Water (g)	NA
Weight of Dry Specimen (g)	287.47	Weight of Dry Specimen (g)	NA
Moisture Content (%)	**37.9**	**Moisture Content (%)**	**NA**

Wet Weight of -3/4" Sample (g)	NA	Weight of the Dry Specimen (g)	287.47
Dry Weight of -3/4" Sample (g)	2.52	Weight of - #200 material (g)	284.95
Wet Weight of +3/4" Sample (g)	NA	Weight of + #200 material (g)	2.52
Dry Weight of +3/4" Sample (g)	0.00		
Total Dry Weight of Sample (g)	NA		

Sieve Size	Sieve Opening	Weight of Soil Retained	Percent Retained	Accumulated Percent Retained		Percent Finer	Accumulated Percent Finer
	(mm)	(g)	(%)	(%)		(%)	(%)
12"	300	0.00	0.00	0.00		100.00	**100.00**
6"	150	0.00	0.00	0.00		100.00	**100.00**
3"	75	0.00	0.00	0.00		100.00	**100.00**
2"	50	0.00	0.00	0.00		100.00	**100.00**
1 1/2"	37.5	0.00	0.00	0.00		100.00	**100.00**
1"	25.0	0.00	0.00	0.00		100.00	**100.00**
3/4"	19.0	0.00	0.00	0.00		100.00	**100.00**
1/2"	12.5	0.00	0.00	0.00		100.00	**100.00**
3/8"	9.50	0.00	0.00	0.00		100.00	**100.00**
#4	4.75	0.00	0.00	0.00		100.00	**100.00**
#10	2.00	0.00	0.00	0.00		100.00	**100.00**
#20	0.85	0.10	0.03	0.03		99.97	**99.97**
#40	0.425	0.26	0.09	0.13		99.87	**99.87**
#60	0.250	0.33	0.11	0.24		99.76	**99.76**
#140	0.106	1.08	0.38	0.62		99.38	**99.38**
#200	0.075	0.75	0.26	0.88		99.12	**99.12**
Pan	-	284.95	99.12	100.00		-	-

Tested By PC Date 10/7/13 Checked By KC Date 10/17/13

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

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HYDROMETER ANALYSIS

ASTM D 422-63 (2007)/AASHTO T88-00

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	OHIO EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	DET-1
Lab ID:	2013-454-001-005	Soil Color:	DARK BROWN

Elapsed Time		R Measured	Temp.	Composite Correction	R Corrected	N	K Factor	Diameter	N'
(min)			(°C)			(%)		(mm)	(%)
0		NA	NA	NA	NA	NA	NA	NA	NA
2		50.0	23.1	4.49	45.5	93.1	0.01296	0.0261	**92.3**
5		47.0	23.1	4.49	42.5	87.0	0.01296	0.0170	**86.2**
15		39.0	23.1	4.49	34.5	70.6	0.01296	0.0105	**70.0**
30		34.0	23.1	4.49	29.5	60.4	0.01296	0.0077	**59.9**
60		29.0	22.4	4.71	24.3	49.7	0.01307	0.0057	**49.3**
307		21.0	22.2	4.77	16.2	33.2	0.01310	0.0027	**32.9**
1440		17.0	22.1	4.80	12.2	25.0	0.01311	0.0013	**24.7**

Soil Specimen Data		Other Corrections		
Tare No.	929			
Weight of Tare & Dry Material (g)	155	a - Factor	0.99	
Weight of Tare (g)	101.62			
Weight of Deflocculant (g)	5.0	Percent Finer than # 200	99.12	
Weight of Dry Material (g)	48.38			
		Specific Gravity	2.7	Assumed

Note: *Hydrometer test is performed on - # 200 sieve material.*

Tested By TO Date 10/8/13 Checked By KC Date 10/17/13

DCN: CT-S3A DATE: 3/18/13 REVISION: 11

Sievehyd.xls

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10

Client:	MICROBAC	Boring No.:	SOIL
Client Reference:	Ohio EPA-DERR-SIFU L13091659	Depth (ft):	NA
Project No.:	2013-454-001	Sample No.:	DET-1
Lab ID:	2013-454-001-005	Soil Description:	**DARK BROWN FAT CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

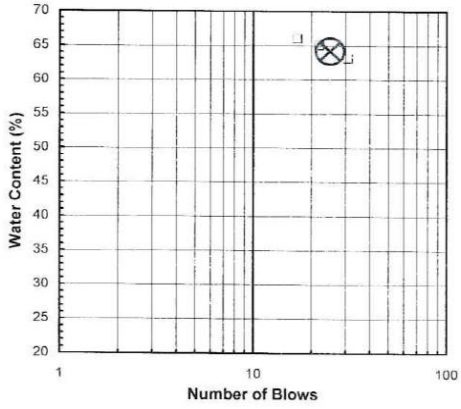
Liquid Limit Test	**1**	**2**	**3**	
				M
Tare Number	415	1232	1284	**U**
Wt. of Tare & Wet Sample (g)	35.18	40.77	34.70	**L**
Wt. of Tare & Dry Sample (g)	26.53	32.15	25.28	**T**
Wt. of Tare (g)	12.82	18.89	11.00	**I**
Wt. of Water (g)	8.7	8.6	9.4	**P**
Wt. of Dry Sample (g)	13.7	13.3	14.3	**O**
				I
Moisture Content (%)	**63.1**	**65.0**	**66.0**	**N**
Number of Blows	**31**	**22**	**17**	**T**

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	443	1286	
Wt. of Tare & Wet Sample (g)	21.74	26.99	
Wt. of Tare & Dry Sample (g)	20.28	25.53	
Wt. of Tare (g)	15.51	20.67	
Wt. of Water (g)	1.5	1.5	
Wt. of Dry Sample (g)	4.8	4.9	
Moisture Content (%)	**30.6**	**30.0**	**0.6**

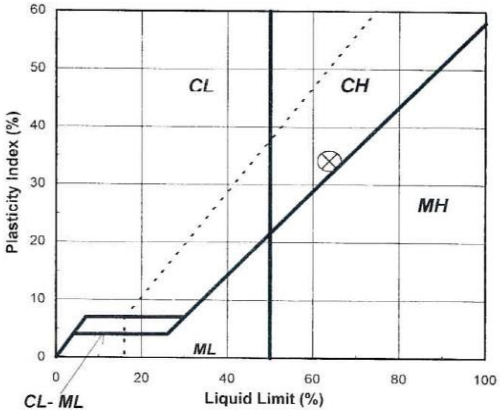
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**64**
Plastic Limit (%)	**30**
Plasticity Index (%)	**34**
USCS Symbol	**CH**

Flow Curve



Plasticity Chart



Tested By	*TO*	*Date*	*10/9/13*	*Checked By*	*KC*	*Date*	10/17/13

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APPENDIX D

PROUCL DATASET RUNS

From File: G:\Projects2\background\Lucas_As_total.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Lucas_As_clay	50	3.3	9.36	6.373	6.535	2.706	1.645	1.772	-0.174	-1.016	0.258

Normal Background Statistics for Full Data Sets

User Selected Options

From File	G:\Projects2\background\Lucas_As_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1

Lucas_As_clay

Raw Statistics

Number of Valid Observations	50
Number of Distinct Observations	47
Minimum	3.3
Maximum	9.36
Second Largest	8.77
Mean	6.373
First Quartile	4.978
Median	6.535
Third Quartile	7.573
SD	1.645
Coefficient of Variation	0.258
Skewness	-0.174

Normal Distribution Test

Shapiro Wilk Test Statistic	0.949
5% Shapiro Wilk Critical Value	0.947

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

90% Percentile (z)	8.481
95% Percentile (z)	9.079
99% Percentile (z)	10.2
95% UTL with 95% Coverage	9.759
95% UPL (t)	9.158

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\Lucas_As_total.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Lucas_As_sandy	60	0.399	2.52	1.206	1.17	0.197	0.444	0.352	0.794	0.755	0.368

Lognormal Background Statistics for Full Data Sets

User Selected Options

From File	G:\Projects2\background\Lucas_As_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	2000

Lucas_As_sandy

Log-Transformed Statistics

Number of Valid Observations	60
Number of Distinct Observations	53
Minimum	-0.919
Maximum	0.924
Second Largest	0.833
Mean	0.12
First Quartile	-0.0712
Median	0.157
Third Quartile	0.341
SD	0.379

Lognormal Distribution Test

Lilliefors Test Statistic	0.0743
5% Lilliefors Critical Value	0.114

Data appear Lognormal at 5% Significance Level

Background Statistics Assuming Lognormal Distribution

90% Percentile (z)	1.832
95% Percentile (z)	2.103
99% Percentile (z)	2.723
95% UPL	2.135
95% UTL with 95% Coverage	2.421

Some Nonparametric Background Statistics

95% Chebyshev UPL	3.158
95% Bootstrap BCA UTL with 95% Coverage	2.3
95% Percentile Bootstrap UTL with 95% Coverage	2.3

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\Lucas_Ba_total.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Lucas_Ba_Clay	50	43.5	85.6	68.18	68.4	121.5	11.02	14.68	-0.12	-1.002	0.162

Normal Background Statistics for Full Data Sets

User Selected Options

From File	G:\Projects2\background\Lucas_Ba_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1

Lucas_Ba_Clay

Raw Statistics

Number of Valid Observations	50
Number of Distinct Observations	47
Minimum	43.5
Maximum	85.6
Second Largest	85.4
Mean	68.18
First Quartile	57.38
Median	68.4
Third Quartile	78.05
SD	11.02
Coefficient of Variation	0.162
Skewness	-0.12

Normal Distribution Test

Shapiro Wilk Test Statistic	0.95
5% Shapiro Wilk Critical Value	0.947

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

90% Percentile (z)	82.31
95% Percentile (z)	86.31
99% Percentile (z)	93.83
95% UTL with 95% Coverage	90.87
95% UPL (t)	86.85

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\Lucas_Ba_total.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Lucas_Ba_sandy	60	7.41	43.8	19.42	15.45	96.7	9.834	5.856	1.039	-0.107	0.506

Nonparametric Background Statistics for Full Data Sets

User Selected Options

From File	G:\Projects2\background\Lucas_Ba_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Number of Bootstrap Operations	2000

Lucas_Ba_sandy

Some Non-Parametric Statistics

Number of Valid Observations	60
Number of Distinct Observations	49
Minimum	7.41
Maximum	43.8
Second Largest	41
Mean	19.42
First Quartile	12.1
Median	15.45
Third Quartile	24.28
SD	9.834
Variance	96.7
Coefficient of Variation	0.506
Skewness	1.039
Mean of Log-Transformed data	2.853
SD of Log-Transformed data	0.469

Data do not follow a Discernable Distribution (0.05)

Non-Parametric Background Statistics

90% Percentile	36.76
95% Percentile	40.72
99% Percentile	43.8

95% UTL with 95% Coverage

Order Statistic	59
Achieved CC	0.954
UTL	41

95% BCA Bootstrap UTL with 95% Coverage	41
95% Percentile Bootstrap UTL with 95% Coverage	41

95% UPL	40.72
95% Chebyshev UPL	62.64

Upper Limit Based upon IQR	42.54

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\Lucas_Cr_total.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Lucas_Cr_clay	50	10.2	24	15.99	15.5	9.701	3.115	2.15	0.763	0.238	0.195

Lognormal Background Statistics for Full Data Sets

User Selected Options

From File	G:\Projects2\background\Lucas_Cr_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	2000

Lucas_Cr_clay

Log-Transformed Statistics

Number of Valid Observations	50
Number of Distinct Observations	40
Minimum	2.322
Maximum	3.178
Second Largest	3.122
Mean	2.754
First Quartile	2.644
Median	2.741
Third Quartile	2.849
SD	0.189

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.969
5% Shapiro Wilk Critical Value	0.947

Data appear Lognormal at 5% Significance Level

Background Statistics Assuming Lognormal Distribution

90% Percentile (z)	20.01
95% Percentile (z)	21.43
99% Percentile (z)	24.38
95% UPL	21.63
95% UTL with 95% Coverage	23.17

Some Nonparametric Background Statistics

95% Chebyshev UPL	29.71
95% Bootstrap BCA UTL with 95% Coverage	22.95
95% Percentile Bootstrap UTL with 95% Coverage	23.35

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\Lucas_Cr_total.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Lucas_Cr_sandy	60	2.28	7.42	3.997	3.24	2.556	1.599	0.689	0.988	-0.66	0.4

Nonparametric Background Statistics for Full Data Sets

User Selected Options

From File	G:\Projects2\background\Lucas_Cr_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Number of Bootstrap Operations	2000

Lucas_Cr_sandy

Some Non-Parametric Statistics

Number of Valid Observations	60
Number of Distinct Observations	53
Minimum	2.28
Maximum	7.42
Second Largest	7.14
Mean	3.997
First Quartile	2.85
Median	3.24
Third Quartile	5.435
SD	1.599
Variance	2.556
Coefficient of Variation	0.4
Skewness	0.988
Mean of Log-Transformed data	1.317
SD of Log-Transformed data	0.36

Data do not follow a Discernable Distribution (0.05)

Non-Parametric Background Statistics

90% Percentile	6.813
95% Percentile	7.13
99% Percentile	7.42

95% UTL with 95% Coverage

Order Statistic	59
Achieved CC	0.954
UTL	7.14

95% BCA Bootstrap UTL with 95% Coverage	7.14
95% Percentile Bootstrap UTL with 95% Coverage	7.14

95% UPL	7.13
95% Chebyshev UPL	11.02

Upper Limit Based upon IQR	9.313

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\Lucas_Pb_total.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Lucas_Pb_clay	50	9.44	17.6	13.35	13.6	3.339	1.827	1.483	-0.197	0.28	0.137

Normal Background Statistics for Full Data Sets

User Selected Options

From File	G:\Projects2\background\Lucas_Pb_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1

Lucas_Pb_clay

Raw Statistics

Number of Valid Observations	50
Number of Distinct Observations	37
Minimum	9.44
Maximum	17.6
Second Largest	17.5
Mean	13.35
First Quartile	12.3
Median	13.6
Third Quartile	14.35
SD	1.827
Coefficient of Variation	0.137
Skewness	-0.197

Normal Distribution Test

Shapiro Wilk Test Statistic	0.961
5% Shapiro Wilk Critical Value	0.947

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

90% Percentile (z)	15.69
95% Percentile (z)	16.36
99% Percentile (z)	17.6
95% UTL with 95% Coverage	17.11
95% UPL (t)	16.44

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\Lucas_Pb_total.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Lucas_Pb_sandy	60	2.77	14.7	6.578	6.03	5.011	2.239	2.572	0.986	1.865	0.34

Lognormal Background Statistics for Full Data Sets

User Selected Options	
From File	G:\Projects2\background\Lucas_Pb_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	2000

Lucas_Pb_sandy

Log-Transformed Statistics	
Number of Valid Observations	60
Number of Distinct Observations	57
Minimum	1.019
Maximum	2.688
Second Largest	2.51
Mean	1.829
First Quartile	1.617
Median	1.797
Third Quartile	2.078
SD	0.334

Lognormal Distribution Test	
Lilliefors Test Statistic	0.108
5% Lilliefors Critical Value	0.114

Data appear Lognormal at 5% Significance Level

Background Statistics Assuming Lognormal Distribution	
90% Percentile (z)	9.557
95% Percentile (z)	10.79
99% Percentile (z)	13.55
95% UPL	10.94
95% UTL with 95% Coverage	12.22

Some Nonparametric Background Statistics	
95% Chebyshev UPL	16.42
95% Bootstrap BCA UTL with 95% Coverage	12.3
95% Percentile Bootstrap UTL with 95% Coverage	12.3

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\lucas_Hg_total.wst

Summary Statistics for Raw Dataset with NDs

					Raw Statistics using Detected Observations							
Variable		Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median	SD	MAD/0.675	Skewness	CV
	total	101	8	7.34%	0.0102	0.0478	0.026	0.0245	0.00953	0.012	0.0972	0.367

Normal Background Statistics for Data Sets with Non-Detects

User Selected Options

From File	G:\Projects2\background\lucas_Hg_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1

total

Raw Statistics

Total Number of Data	109
Number of Non-Detect Data	8
Number of Detected Data	101
Minimum Detected	0.0102
Maximum Detected	0.0478
Percent Non-Detects	7.34%
Minimum Non-detect	0.241
Maximum Non-detect	0.308
Mean of Detected Data	0.026
SD of Detected Data	0.00953

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.076
5% Lilliefors Critical Value	0.0882

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

DL/2 Substitution Method

Mean	0.0339
SD	0.0301
95% UTL 95% Coverage	0.0915
95% UPL (t)	0.0841
90% Percentile (z)	0.0725
95% Percentile (z)	0.0835
99% Percentile (z)	0.104

Note: DL/2 is not a recommended method.

Maximum Likelihood Estimate (MLE) Method

MLE Method is Not Appliable for This Data

Kaplan-Meier (KM) Method

Mean	0.026
SD	0.00948
SE of Mean	9.4786E-4
95% UTL with 95% Coverage	0.0441
95% KM UPL (t)	0.0418
95% KM Chebyshev UPL	0.0675
90% Percentile (z)	0.0381

95% Percentile (z)	0.0416
99% Percentile (z)	0.048

Note: UPL (or upper percentile for gamma distributed data)
represents a preferred estimate of BTV. For an Example:
KM-UPL may be used when multiple detection limits are present

From File: G:\Projects2\background\Lucas_Ni_total.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Lucas_Ni_clay	50	14.5	29.6	22.45	22.5	8.89	2.982	2.372	-0.0777	0.411	0.133

Normal Background Statistics for Full Data Sets

User Selected Options

From File	G:\Projects2\background\Lucas_Ni_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1

Lucas_Ni_clay

Raw Statistics

Number of Valid Observations	50
Number of Distinct Observations	38
Minimum	14.5
Maximum	29.6
Second Largest	28.4
Mean	22.45
First Quartile	20.65
Median	22.5
Third Quartile	24.03
SD	2.982
Coefficient of Variation	0.133
Skewness	-0.0777

Normal Distribution Test

Shapiro Wilk Test Statistic	0.99
5% Shapiro Wilk Critical Value	0.947

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

90% Percentile (z)	26.27
95% Percentile (z)	27.35
99% Percentile (z)	29.38
95% UTL with 95% Coverage	28.59
95% UPL (t)	27.5

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\Lucas_Ni_total.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Lucas_Ni_sandy	59	1.8	7.1	3.614	3.48	1.14	1.068	1.038	0.762	0.738	0.295

Lognormal Background Statistics for Full Data Sets

User Selected Options

From File	G:\Projects2\background\Lucas_Ni_total.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	2000

Lucas_Ni_sandy

Log-Transformed Statistics

Number of Valid Observations	59
Number of Distinct Observations	54
Minimum	0.588
Maximum	1.96
Second Largest	1.735
Mean	1.243
First Quartile	1.026
Median	1.247
Third Quartile	1.477
SD	0.293

Lognormal Distribution Test

Lilliefors Test Statistic	0.08
5% Lilliefors Critical Value	0.115

Data appear Lognormal at 5% Significance Level

Background Statistics Assuming Lognormal Distribution

90% Percentile (z)	5.045
95% Percentile (z)	5.611
99% Percentile (z)	6.851
95% UPL	5.679
95% UTL with 95% Coverage	6.264

Some Nonparametric Background Statistics

95% Chebyshev UPL	8.309
95% Bootstrap BCA UTL with 95% Coverage	5.67
95% Percentile Bootstrap UTL with 95% Coverage	5.742

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\Lucas_Tl.wst

Summary Statistics for Raw Full Dataset

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Tl-Clay	50	0.133	0.438	0.288	0.268	0.00533	0.073	0.0682	0.376	-0.751	0.253

Lognormal Background Statistics for Full Data Sets

User Selected Options

From File	G:\Projects2\background\Lucas_Tl.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	2000

Tl-Clay

Log-Transformed Statistics

Number of Valid Observations	50
Number of Distinct Observations	46
Minimum	-2.017
Maximum	-0.826
Second Largest	-0.868
Mean	-1.275
First Quartile	-1.458
Median	-1.319
Third Quartile	-1.038
SD	0.257

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.958
5% Shapiro Wilk Critical Value	0.947

Data appear Lognormal at 5% Significance Level

Background Statistics Assuming Lognormal Distribution

90% Percentile (z)	0.388
95% Percentile (z)	0.426
99% Percentile (z)	0.508
95% UPL	0.432
95% UTL with 95% Coverage	0.474

Some Nonparametric Background Statistics

95% Chebyshev UPL	0.61
95% Bootstrap BCA UTL with 95% Coverage	0.424
95% Percentile Bootstrap UTL with 95% Coverage	0.429

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV

From File: G:\Projects2\background\Lucas_Tl.wst

Summary Statistics for Raw Dataset with NDs

Raw Statistics using Detected

Variable	Num Ds	NumNDs	% NDs	Minimum	Maximum	Mean	Median
Tl-Sandy	53	7	11.67%	0.0218	0.0914	0.0351	0.0316

Observations

SD	MAD/0.675	Skewness	CV
0.0131	0.00949	2.013	0.372

Lognormal Background Statistics for Data Sets with Non-Detects

User Selected Options

From File	G:\Projects2\background\Lucas_TI.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	2000

TI-Sandy

Log-Transformed Statistics

Total Number of Data	60
Number of Non-Detect Data	7
Number of Detected Data	53
Minimum Detected	-3.826
Maximum Detected	-2.393
Percent Non-Detects	11.67%
Minimum Non-detect	-3.237
Maximum Non-detect	-3.01
Mean of Detected data	-3.403
SD of Detected data	0.317

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.118
5% Lilliefors Critical Value	0.122

Data appear Lognormal at 5% Significance Level

Background Statistics Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)	-3.455
SD (Log Scale)	0.331
95% UTL 95% Coverage	0.0616
95% UPL	0.0552
90% Percentile (z)	0.0483
95% Percentile (z)	0.0545
99% Percentile (z)	0.0682

Note: DL/2 is not a recommended method.

Log ROS Method

Mean in Log Scale	-3.414
SD in Log Scale	0.299
Mean in Orignal Scale	0.0345
SD in Original Scale	0.0124
95% UTL 95% Coverage	0.0601
95% BCA UTL with 95% Coverage	0.0672
95% Bootstrap (%) UTL with 95% Coverage	0.0672
95% UPL (t)	0.0545
90% Percentile (z)	0.0483
95% Percentile (z)	0.0538

99% Percentile (z)	0.066

Kaplan Meier (KM) Method

Mean	0.0345
SD	0.0125
SE of Mean	0.00165
95% UTL 95% Coverage	0.0596
95% KM Chebyshev UPL	0.0892
95% KM UPL (t)	0.0555
95% KM Percentile (z)	0.055

Note: UPL (or upper percentile for gamma distributed data) represents a preferred estimate of BTV. For an Example: KM-UPL may be used when multiple detection limits are present