



BELLBROOK CITY COUNCIL AGENDA
July 26, 2021

City of Bellbrook
15 E. Franklin Street
Bellbrook, Ohio 45305

T (937) 848-4666
F (937) 848-5190

www.cityofbellbrook.org

6:00 pm- Work Session to discuss results of Little Sugarcreek Borings

7:00 pm-Regular Meeting

1. Call to Order
2. Pledge of Allegiance
3. Roll Call
4. Approval of the minutes of the June 28 regular meeting
5. Mayor's Announcements and Special Guest
6. Public Hearing of Ordinances
7. Introduction of Ordinances
8. Resolutions
9. Old Business
 - 2021 Goals Update
10. New Business
11. City Manager Report
12. Committee Reports
 - A. Service
 - B. Safety
 - C. Finance/Audit
 - D. Community Affairs
13. Clerk's Update
14. Open Discussion
15. Public Comment
16. **Executive Session to discuss the employment of a public employee**
17. **Adjournment**

Future Agenda Items (dates are subject to change)

- October 11 – 6pm Budget Work Session– Administration & Service Departments
- October 25 - 6pm Budget Work Session– Police & Fire Departments
- November 8 – 6pm Budget Work Session– Capital Improvement Plan

- November 22 – Introduction of 2022 Budget Ordinance
- December 13 - Public Hearing of 2022 Budget Ordinance



Geotechnical Engineering Report

**Slope Stabilization and Pedestrian Access
Bellbrook, Greene County, Ohio**

May 17, 2021

Terracon Project No. N1205425

Prepared for:

City of Bellbrook
Bellbrook, Ohio

Prepared by:

Terracon Consultants, Inc.
Cincinnati, Ohio



May 17, 2021

City of Bellbrook
15 East Franklin Street
Bellbrook, Ohio 45305



Attn: Ms. Melissa Dodd – City Manager
P: (937) 310-3222
E: M.Dodd@cityofbellbrook.org

Re: Geotechnical Engineering Report
Slope Stabilization and Pedestrian Access
Little Sugarcreek Road
Bellbrook, Greene County, Ohio
Terracon Project No. N1205425

Dear Ms. Dodd:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with revised Terracon Proposal No. PN1205425 dated March 9, 2021 and authorized on March 11, 2021. This report presents the findings of the subsurface exploration and provides a conceptual discussion regarding options for the pedestrian facilities and slope stabilization as well as preliminary designs for drilled shaft retaining walls.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.



Russ Gatermann, P.E.
Project Engineer

FOR : Craig M .Davis, P.E., CPESC
Geotechnical Department Manager

REPORT TOPICS

INTRODUCTION.....	1
SITE CONDITIONS.....	2
PROJECT DESCRIPTION.....	2
GEOTECHNICAL CHARACTERIZATION.....	3
GEOTECHNICAL CONSIDERATIONS.....	6
DRILLED PIER WALL PRELIMINARY DESIGNS.....	9
GENERAL COMMENTS.....	10
FIGURES.....	11

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLAN
EXPLORATION RESULTS
SUPPORTING INFORMATION

Geotechnical Engineering Report
Slope Stabilization and Pedestrian Access
Little Sugarcreek Road
Bellbrook, Greene County, Ohio
Terracon Project No. N1205425
May 17, 2021

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for slope stabilization and pedestrian access along Little Sugarcreek Road in Bellbrook, Greene County, Ohio. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil and rock conditions
- short-term groundwater conditions
- Conceptual discussion regarding options for the pedestrian facilities and slope stabilization
- Preliminary pier wall design for various subsurface conditions

The geotechnical engineering Scope of Services for this project included the advancement of ten (10) test boring to approximate depths of 17.4 to 30 feet below the existing road grade. The test borings were performed in the northbound lane of Little Sugarcreek Road starting about 175 feet north of West Franklin Street and ending about 2,100 feet north of West Franklin Street. The test borings were spaced about 190 feet to 360 feet from one another.

In addition to the test borings, geophysical exploration services, consisting of a refraction seismic survey using the Multi-Channel Analysis of Surface Waves (MASW) method, were performed. The primary survey (Line 1) was performed in the northbound lane of Little Sugarcreek Road starting near Test Boring B-1 and extending to about Test Boring B-10. Two additional, shorter surveys were performed east, off of the road in the unpaved shoulder near Test Borings B-3 and B-8.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section. Graphical outputs from the MASW surveys are provided in **Figures**.

The **General Comments** section provides an understanding of the report limitations

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the staking of borings (performed on March 24, 2021), field exploration and our review of select publicly-available geologic and topographic maps.

Item	Description
<p>Parcel Information</p>	<p>§ The project site is located along the east side of Little Sugarcreek Road in Bellbrook, Greene County, Ohio. The project alignment starts at W. Franklin Street (Sta. 10+60) and ends near Magee Park (Sta. 32+40).</p> <p>§ Start: Latitude: 39.6362, Longitude: -84.0757 (approx.)</p> <p>§ End: Latitude: 39.6412, Longitude: -84.0801 (approx.)</p> <p>§ Site Location</p>
<p>Existing Improvements</p>	<p>Little Sugarcreek Road is an existing asphalt-paved road with one approximately 11-foot-wide lane and approximately 1-foot-wide paved shoulder in each direction. A sanitary sewer runs along Little Sugar Creek. There are overhead utilities along the west side of Little Sugarcreek Road from approximately Sta. 12+00 to Sta. 18+50.</p>
<p>Existing Topography (from Google Earth Pro)</p>	<p>Elevations along Little Sugarcreek Road generally increase from about El. 790 to about El. 810 from south to north. Grades slope from the road down to Little Sugar Creek on the east side of the road with slopes ranging from about 1H:1V to 2H:1V. Little Sugar Creek is about 15 to 20 feet below the road. Near Sta. 28+00, Little Sugar Creek meanders away from Little Sugarcreek Road and Magee Park is located between Little Sugarcreek Road and Little Sugarcreek.</p>
<p>Geology</p>	<p>Based on the review of SSURGO database of the USDA-NCRS Soil Survey Map of Greene County, the surficial soils at the site belong to the Casco and Miamian Soil Series. The Casco Series consists of sandy outwash and the Miamian Series consists of glacial till. Bedrock at the site is mapped as belonging to the Waynesville and Arnheim Formation, which consists of interbedded shale and limestone.</p>

PROJECT DESCRIPTION

Our understanding of the project is described in this section. The following information was provided:

- § Geotechnical Report – Little Sugarcreek Road Landslide (Geotechnology Report No. J033975, July 9, 2019)
- § Little Sugarcreek Road – Pedestrian Access and Slope Stability Feasibility Study (LJB, July 31, 2019)
- § Topographic data and project stationing provided by LJB via email
- § Various information provided by Mr. Dan Hoying via email and in phone conversations

We understand there have been slope stability issues on the downslope (east) side of Little Sugarcreek Road for a number of years. Stability issues affecting the road have been typically repaired at the surface by building back up the subgrade as necessary and re-paving/patching the asphalt. We understand a landslide occurred on the east side of Little Sugarcreek Road in February 2019, approximately 1,400 feet north of W. Franklin Road (approximately Sta. 24+00 to 25+00). This area had undergone movement in the past, but the additional movement in February 2019 displaced the guardrail. A head scarp (differential vertical movement, often at the top/crest of a landslide) formed about 2 to 3 feet away from the pavement edge.

LJB and Geotechnology were retained by the City of Bellbrook to perform a feasibility study for remediation of the landslide in conjunction with providing pedestrian facilities along Little Sugarcreek Road. Geotechnology performed four (4) test borings along the approximately 100-foot-long landslide area. The feasibility study recommended a drilled pier wall consisting of structural piers and plug piers to remediate the landslide and support the pedestrian facilities. Three Alternatives were proposed (all including a drilled pier wall):

- § Alternate A: curb and gutter along Little Sugarcreek Road, 7-foot-wide sidewalk, and concrete barrier constructed above the wall
- § Alternate B: guardrail only with no curb or pedestrian facilities
- § Alternate C: curb and gutter along Little Sugarcreek Road, 7-foot-wide sidewalk, and a railing above the wall (face of wall set back farther from road than in Alternative A).

Cost estimates were provided to the City of Bellbrook as part of the feasibility study. Total costs for the alternates (both phases) ranged from about \$6.5 million to \$9.0 million. Alternate C was recommended in the feasibility study.

We understand the City of Bellbrook intends to construct the stabilization and pedestrian access project in segments as funding becomes available. The City of Bellbrook would like to prioritize areas that are most vulnerable to slope movement, ultimately stabilizing the entire corridor. Accommodations for the sidewalk would be implemented into each segment of the project and the sidewalk would be constructed after the stabilization methods have been implemented along the entire corridor.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation. Conditions encountered at the exploration points are indicated on the boring log in the **Exploration Results** section of this report. The GeoModel can be found in the **Figures** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Surficial materials encountered in the test borings include asphalt pavement and granular base. The encountered asphalt pavement thickness ranged from about 4 to 18 inches thick. Where encountered, the encountered granular base thickness ranged from about 3 to 20 inches thick.

Model Layer	Layer Name	General Description
1	Existing Fill	Well-graded gravel with sand, lean clay, clayey sand, clayey sand with gravel, and sandy lean clay; encountered in all test borings to depths ranging from 3.5 to 13.5 feet below existing road grades
2	Natural Cohesive	Lean clay and sandy lean clay; encountered in all test borings except B-2; consistency ranges from medium stiff to hard
3	Natural Granular	Well-graded gravel; only encountered in B-3; dense
4	Weathered Bedrock	Brown to brown and gray shale with limestone fragments and layers; shale: very weak (in terms of rock strength)
5	Bedrock	Interbedded gray shale and limestone: Shale: gray: slightly weathered to weathered, weak, very thin to thin bedded, 80% to 90% of the rock matrix (as encountered in rock cores) Limestone: gray, unweathered, strong, very thin bedded, 10% to 20% of the rock matrix (as encountered in rock cores)

Groundwater Conditions

The boreholes were observed while drilling and immediately after their completion for the presence and level of groundwater. The short-term water levels observed in the boreholes are noted on the test boring logs and are summarized below.

Boring	Approximate depth to groundwater while drilling, feet	Approximate depth to groundwater after drilling, feet
B-1	20	18.7
B-2	Not encountered	Not encountered
B-3	Not encountered	-- ¹
B-4	Not encountered	16
B-5	Not encountered	Not encountered
B-6	Not encountered	-- ¹
B-7	Not encountered	Not encountered
B-8	Not encountered	Not encountered
B-9	20	-- ¹
B-10	20	20.7

1. Water added to borehole for rock coring purposes. Recorded water levels not representative of actual groundwater conditions.

Short-term groundwater observations are inadequate to characterize long-term groundwater conditions over the design life of the structure(s). Long-term observations in piezometers or observation wells sealed from the influence of surface water are required to characterize groundwater levels. From experience, seepage is commonly encountered within existing fill (trapped/perched water), along the fill/natural soil interface, within granular strata of glacial profiles such as those at this site, and at the soil/bedrock interface.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the test boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Geophysical Surveys

Terracon Consultants, Inc. (Terracon) performed geophysical exploration services consisting of a refraction seismic survey using the Multi-Channel Analysis of Surface Waves (MASW) method. The primary goal of this survey was to characterize the site subsurface conditions, particularly the depth to bedrock. The primary survey (Line 1) was performed in the northbound lane of Little Sugarcreek Road starting near Test Boring B-1 and extending to about Test Boring B-10. Two additional, shorter surveys were performed east, off of the road in the unpaved shoulder near Test Borings B-3 and B-8.

The shear wave velocity cross-sections are provided in **MASW Cross-Sections** in **Figures**. The different seismic velocities, combined with the boring logs, were used to identify subsurface strata, top of weathered bedrock, and top of bedrock. Based on corroboration with the test borings, the top of weathered bedrock (brown shale) was identified at a shear wave velocity of 1,200 ft/sec. Interbedded gray shale and limestone bedrock was identified at a shear wave velocity of about 1,500 ft/sec. The approximate top of weathered bedrock and top of bedrock are identified by dashed lines on the exhibit. The top of bedrock elevations should be considered approximate. Actual depths may vary from those identified.

In general, the top of brown shale ranged from about 8 to 20 feet below existing grades. The top of interbedded limestone and gray shale ranged from about 10 to 25 feet below existing grades.

The depth to interbedded gray shale and limestone bedrock was about 20 feet at B-3 in Line 1. It was also about 20 feet deep in Line 2, performed off the road near B-3. The depth to weathered brown shale bedrock was about 15 feet and the depth to interbedded gray shale and limestone bedrock was about 20 feet at B-8 in Line 1. The depths to bedrock were similar in Line 3, which was performed east of the road near B-8. This indicates bedrock is relatively level moving from west to east perpendicular to the road.

GEOTECHNICAL CONSIDERATIONS

The test borings encountered variable depths of existing fill underlain by natural cohesive and granular soils. All test borings terminated in interbedded gray shale and limestone bedrock. Existing fill was encountered to depths ranging from about 3.5 to 13.5 feet below road grades. The existing fill included both cohesive and granular materials. We anticipate the existing fill was placed during construction of Little Sugarcreek Road, which would have been common to typical historic balanced-cut-and-fill construction techniques. We have interpreted the existing fill to be undocumented/uncontrolled, or at-least significantly weathered.

Natural cohesive soils consisting of lean clay and sandy lean clay were encountered underlying the existing fill with consistencies ranging from medium stiff to hard. Some layers were identified as glacial till and residuum. Glacial till is material deposited by glaciers and typically consists of material of various sizes mixed together. It classifies as sandy lean clay at this site. Residuum is soil formed from the in-place weathering of the parent bedrock and classifies as lean clay with limestone fragments.

Bedrock consists of weathered brown shale with limestone layers that transitions into interbedded gray shale and limestone with depth. The weathered brown shale layer was not encountered in all test borings. However, it may be present but did not fall within the sampling interval depths of the test borings. Five feet of rock coring of the interbedded gray shale and limestone was performed in three test borings, B-3, B-6, and B-9. The rock quality designation (RQD) of the rock core samples ranged from 30% to 95%. Shale comprised about 80% to 90% of the retrieved rock cores with limestone comprised the remaining portion.

We understand a landslide occurred on the east side of Little Sugarcreek Road in February 2019 approximately 1,400 feet north of W. Franklin Road (approximately Sta. 24+00 to 25+00). We understand there have been additional areas of instability along the downslope side of Little Sugarcreek Road. Evidence of landslides/slope movement was observed in three areas during the reconnaissance performed on March 24, 2021. Head scarps (differential vertical ground movement, often at the top of a landslide) were observed between Test Borings B-2 and B-3 (approximately 150 feet long), between Test Borings B-6 and B-7 (February 2019 slide), and near Test Boring B-8 (approximately 100 feet long).

Slope movement along roadsides constructed along hillsides are common in the region. Slope movement is particularly common along the downslope side of roads that are constructed by excavating into the upslope side and placing fill on the downslope side – such as the construction of Little Sugarcreek Road. Slope movement, which is the condition where the driving forces exceed the resisting forces, can occur for a number of reasons, including:

- § Weak fill soils due to inadequate compaction effort and moisture control during fill placement, or long-term weathering
- § Fill soils placed on the downslope sides of roads are placed too steep (generally steeper than about 3H:1V), or not properly benched onto stable soils

- § The roads are constructed on natural soils that are already weak or inclined
- § The soil and underlying bedrock weather over time due to environmental weathering, such as freeze/thaw and wet/dry cycles, or the permeation of the roots of vegetation
- § Water is not shed properly, and pore water pressures build up in the soil, which can weaken the soil

The distance from the edge of the existing pavement to the crest of the slope is variable along Little Sugarcreek Road, ranging from zero (crest of the slope is immediately adjacent to the road) to about 30 feet. While it may be possible to construct a sidewalk in some areas along the east side of the road with minimal new fill placement, fill will primarily be required to facilitate sidewalk construction. Placing fill to accommodate sidewalk construction can trigger or accelerate slope movement by increasing the driving forces. The following approaches should be considered to address slope stabilization and sidewalk construction.

- § **Do-Nothing Approach:** No stabilization measures could be implemented. In areas where feasible, the sidewalk could be constructed at/near existing grade with little to no new fill placement. This would leave both the roadway and new sidewalk susceptible to future slope movement. It is very difficult to predict timing, location, and rate of future slope movement.
- § **“Short” Retaining Structures:** Relatively short retaining walls (such as cast-in-place concrete or reinforced block walls) could be constructed to accommodate sidewalk construction. However, these types of retaining walls would not stabilize deeper slope instability and would not protect the sidewalk against deep-seated failures. It is our opinion that these walls would not be worth the investment to construct as they, along with the sidewalk, would be susceptible to slope movement.
- § **Earthwork Solutions:** Earthwork solutions could be implemented to both stabilize existing slopes in conjunction with providing room to construct the sidewalk. Final, permanent slopes (without other reinforcement) would generally need to be at least 2.5H:1V or flatter. An earthwork approach would likely take a significant amount of earthwork and fill placement. In areas where Little Sugar Creek is close to Little Sugarcreek Road, an earthwork approach would likely not be feasible due to space constraints toward constructing new slopes. Right-of-way would also need to be considered. Erosion control measured would need to be implemented to protect any slopes from erosion from Little Sugar Creek. In addition, final slopes would need to be designed to an appropriate factor of safety and consider existing failure planes, which may dictate slopes flatter than 3H:1V, benches, toe keys, rock toes, or other measures to improve the factor of safety. Generally speaking, an earthwork solution would be a “significant” undertaking in both design and construction. We also anticipate it would be difficult to implement an earthwork solution in a segmented fashion. One area where an earthwork solution may be feasible is at the north end of the alignment where Magee Park is below Little Sugarcreek Road, the height of the slope is less, and Little Sugar Creek is not immediately below Little Sugarcreek Road.
- § **Soil Nail Stabilization:** A soil nail remediation could stabilize the slope by removing some of the slide mass and launching and/or drilling soil nails into the slope. The process begins

by excavating some of the slide mass on the face of the slope. After the excavation, the soil nails are launched and/or drilled into the slope face and pressure grouted. The soil nail installation can likely be performed from the crest of the slope. The pressure grouting increases the bond between the soil nails and the surrounding soil. The slope face is then lined with mesh and shotcrete is placed. The slope face can also be lined with vegetation. Some clearing of trees near the crest of the slope would likely be required. Soil nail systems are usually designed and installed by specialty contractors. In our experience, soil nail systems are typically comparable in cost to drilled pier retaining walls. Soil nail systems are suited to remediate existing slope failures but may be difficult to implement with the need for sidewalk construction. It is our opinion that soil nail stabilization is not the best remediation option for this project.

§ **Drilled Pier Retaining Wall:** A drilled-pier-and-plug-pier retaining wall consists of drilled concrete structural and plug piers. The structural piers would be drilled to bedrock and would be reinforced with steel beams or a reinforcing steel cage. Unreinforced plug piers would be drilled behind the structural piers to fill in the gap between the structural piers. There are typically two plug piers in each gap. The drilled shaft and plug pier wall could be installed from the crest of the slope. The piers are typically excavated by a tracked excavator with an auger. Minimal earthwork may be need after the piers are installed to clean up and re-grade the slope. Little to no clearing of trees on the slope would be required. A drilled pier retaining wall would provide stabilization for Little Sugarcreek Road and could be constructed to allow fill placement for sidewalk construction. It is our opinion that a drilled pier retaining wall is well-suited for the project goals.

We understand the City of Bellbrook intends to construct the project in segments and would like to target areas most prone to landslide movement first. Note that it will likely be more expensive to construct intermittent repairs than to perform all construction at one time. It is very difficult to predict landslide movements – including where they will occur, when they will occur, and rate of movement. However, the following are general recommendations on how to prioritize the work:

- § Areas that have moved in the past are likely to move in the future. Evidence of landslide movement was observed at three locations: between Test Borings B-2 and B-3, between Test Borings B-6 and B-7 (February 2019 slide), and near Test Boring B-8. It is our opinion that these areas are the best place to start with stabilization measures.
- § Areas where the crest of the existing slope is closest to the edge of the roadway. If the crest of the slope is adjacent to the roadway and movement occurs, there is no buffer between the slope movement and the roadway and the roadway will be directly impacted. In areas where the crest of the slope is way from the edge of the roadway, there is time to react if slope movement occurs due to the buffer between the edge of pavement and crest of the slope.
- § Steeper slopes are generally more prone to movement than less steep slopes. Targeting areas with the steepest slopes is a recommended approach.
- § Areas of existing fill are likely more susceptible to slope movement. Deeper existing fills were encountered in Test Borings B-1, B-2 and B-3.

DRILLED PIER WALL PRELIMINARY DESIGNS

The following table includes preliminary design information for a plug and pier lagging wall along Little Sugarcreek Road. The preliminary designs consider no passive soil resistance above weathered bedrock. The analysis is based on the retaining wall being constructed about 24 feet from the centerline of the existing road. The analysis is based on bedrock depths encountered in the test borings and identified in the MASW survey and considers a rock slope of about 6H:1V. Therefore, the depth of bedrock considered in the evaluation below is about 3 feet deeper than encountered in the test borings and MASW survey in the road. The preliminary designs consider the top of the drilled shaft retaining wall will be near the elevations of Little Sugarcreek Road to create a level shoulder and sidewalk.

The information below should be considered preliminary and for budgeting purposes only. Final, detailed design would be required for construction purposes. Note that additional wall configurations (alternate combinations of pier spacing, pier diameters, reinforcing options, etc.) may also be suitable.

Relevant Test Borings	Type ²	Depth to Top of Bedrock (feet) ¹	Structural Shaft Diameter (inches)	Structural Shaft Center-to-Center Spacing (feet)	Total Shaft Length (feet)	Reinforcing – Steel Beam Option	Reinforcing – Reinforcing Cage Option – Longitudinal Reinforcing
B-5, B-6	Type 1	up to 13	30	6	25	W21x62	(5) #9 bars upslope (2) #9 bars downslope
B-2, B-4, B-7, B-8	Type 2	up to 18	36	6	36	W27x114	(8) #10 bars upslope (2) #10 bars downslope
B-1, B-3	Type 3	up to 23	36	6	44	W24x207	(10) #14 bars upslope (2) #14 bars downslope
B-9, B-10	Type 4	greater than 23	(see discussion below)				

1. Top of bedrock is considered weathered brown shale for this evaluation
2. Type 1 approximate stations: 20+95 to 22+45, 23+45 to 25+45, 26+20 to 27+20
 Type 2 approximate stations: 14+20 to 15+70, 17+20 to 18+45, 19+70 to 20+95, 27+95 to 28+95
 Type 3 approximate stations: 12+70 to 14+20, 15+70 to 17+20, 18+45 to 19+70, 22+45 to 23+45, 25+45 to 26+20, 27+20 to 27+95
 Type 4 approximate stations: 28+95 to 31+70

Cantilevers greater than about 20 to 25 feet become increasingly expensive to construct due to the significant reinforcement that is required. Additional study in these areas is recommended. Passive resistance above the top of bedrock may be considered. In addition, this is the area above Magee Park and an alternate solution to a drilled shaft wall, such as an earthwork solution, may be viable.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur away from exploration point location or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental, ecological, cultural or biological assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination, impact or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

FIGURES

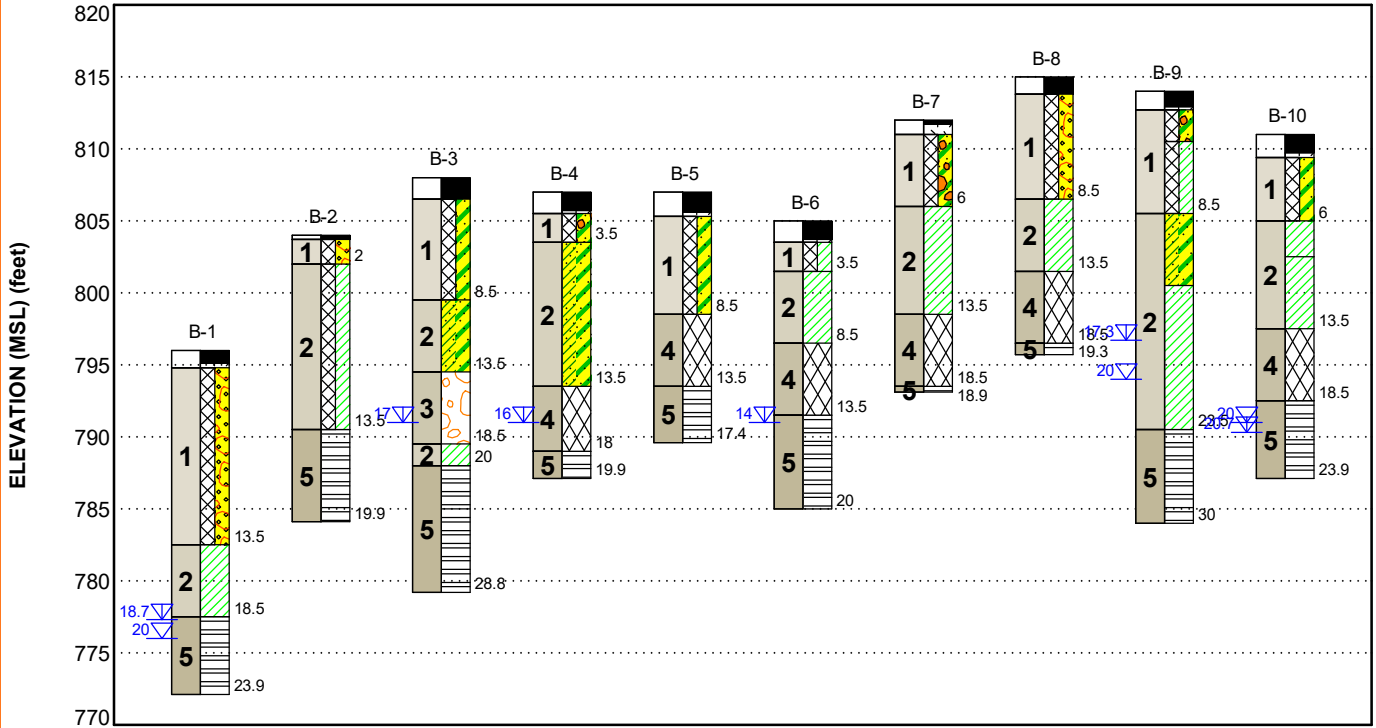
Contents:

GeoModel

MASW Cross-Sections

GEOMODEL

Little Sugarcreek Road Stabilization and Pedestrian Access ■ Bellbrook, OH
Terracon Project No. N1205425



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Existing Fill	Cohesive and granular materials; encountered in all test borings to depths ranging from 3.5 to 13.5 feet below existing road grades
2	Natural Cohesive	Lean clay and sandy lean clay; encountered in all test borings except B-2; consistency ranges from medium stiff to hard
3	Natural Granular	Well-graded gravel; only encountered in B-3; dense
4	Weathered Bedrock	Brown to brown and gray shale with limestone fragments and layers; shale: very weak (in terms of rock strength)
5	Bedrock	Interbedded gray shale (about 80% to 90% of rock matrix) and limestone (about 10% to 20% of rock matrix)

LEGEND

- Asphalt
- Lean Clay
- Sandy Lean Clay/Clayey Sand
- Highly Weathered Shale
- Base
- Shale
- Well-graded Gravel
- Clayey Sand
- Clayey Sand with Gravel
- Well-graded Gravel w/sand

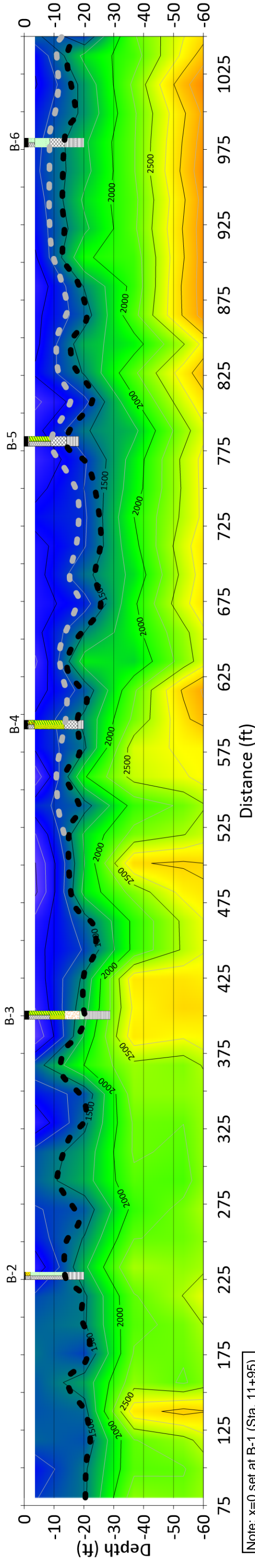
- First Water Observation
- Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

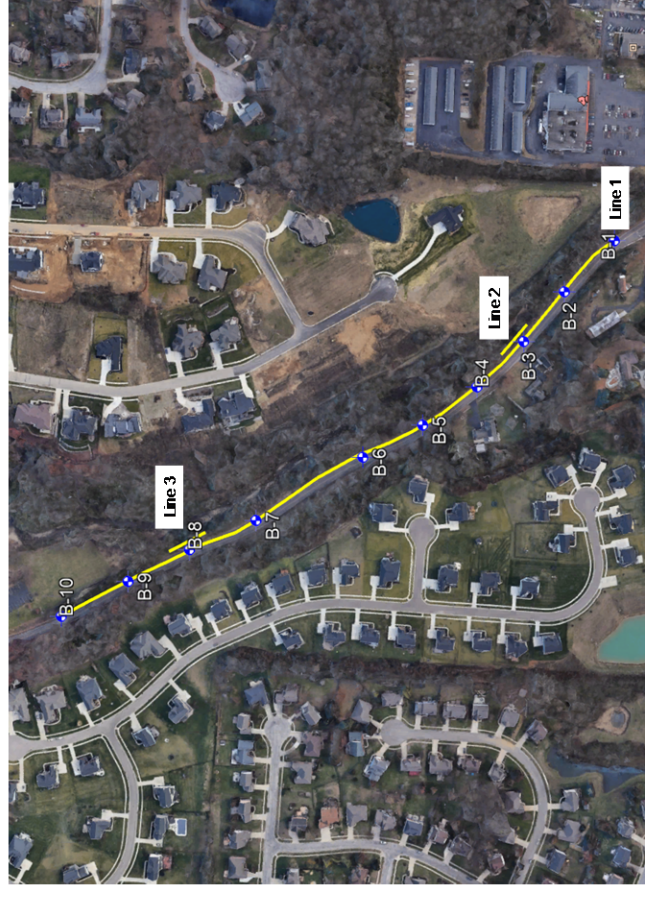
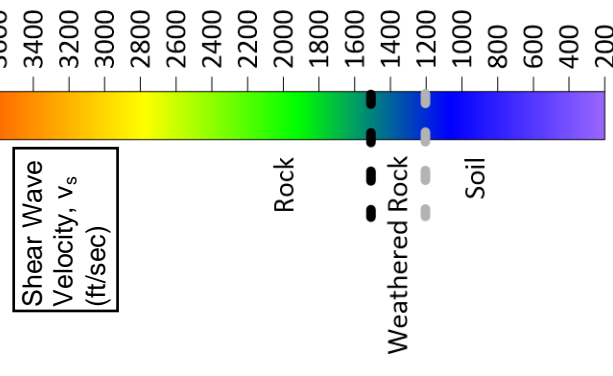
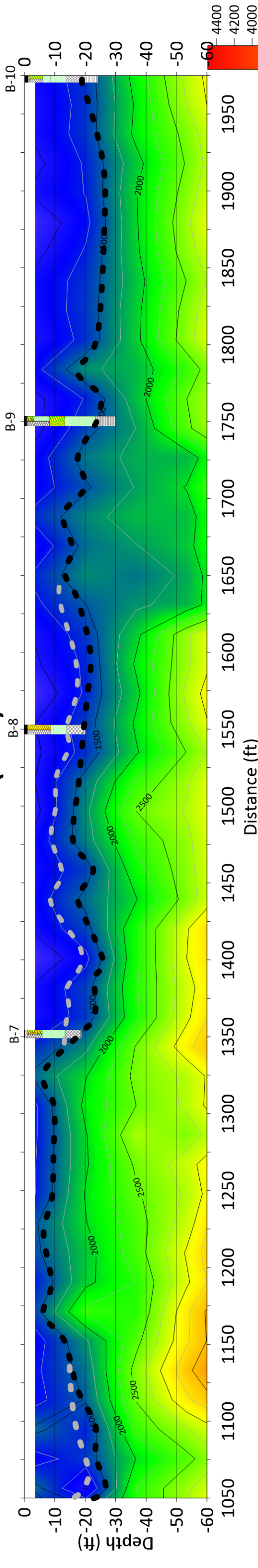
NOTES:

Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

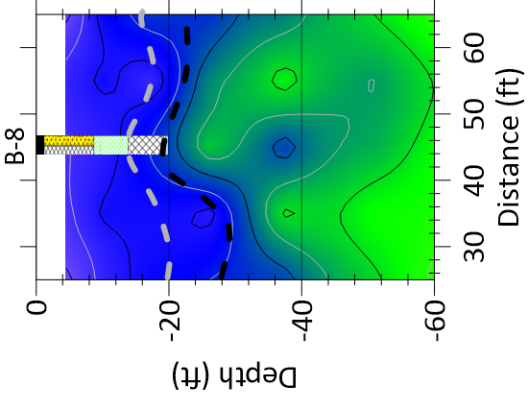
LINE 1



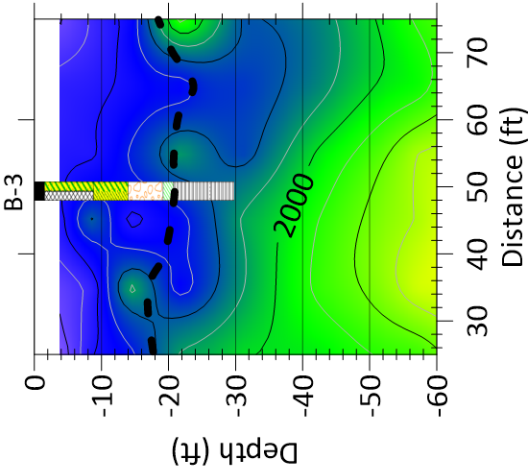
LINE 1 (cont)



LINE 3



LINE 2



MASW CROSS-SECTIONS
 Pedestrian Access and Slope Stabilization
 Little Sugarcreek Road
 Bellbrook, Greene County, Ohio



Project Manager:	RMG	Project No.:	N1205425
Drawn by:	JCT	Scale:	As Shown
Checked by:	KJS	File Name:	MAP
Approved by:	CMD	Date:	04/27/2021

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet) ¹	Drilled Location
10	45	Northbound lane of Little Sugarcreek Road

1. Below ground surface

Boring Layout and Elevation: Terracon personnel provided the boring layout. Coordinates and elevations were obtained with a survey-grade Zeno GPS unit. The locations and elevations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted rotary drill rig using continuous-flight-hollow-stem augers. Four samples were obtained in the upper 10 feet of the boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring log at the test depths. Thin-walled samples (Shelby tubes) were pushed at select depths in some test borings to obtain relatively undisturbed soil sample. Upon encountering bedrock, five feet of rock coring was performed using NQ2-size rock coring tools in three test borings – B-3, B-6, and B-9. Water was used as a drilling fluid to aid in the coring of the bedrock. In test borings where rock coring was not performed, rock samples were collected by overdriving the split-barrel sampler and the borings were terminated.

In addition, we observed and recorded short-term groundwater levels during drilling and sampling. Groundwater was not observed in the test boring during the short-term observation. For safety purposes, the boring was backfilled with auger cuttings immediately upon its completion. Asphalt cold patch was placed at the surface of the test borings.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring log. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring log as part of the drilling operations. The field log included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring log, prepared from the field log, represents the Geotechnical Engineer's

interpretation of the field log and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil and rock strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

The laboratory testing program included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Rock classification was conducted using locally-accepted practices for engineering purposes. Boring log rock classification was determined using Terracon's **Description of Rock Properties**, attached to this report.

Geophysical Methods

The investigation used a roll along MASW method and involved a vehicle to pull a land-streamer geophysical array along linear paths. The array consisted of 24 4.5Hz geophones, spaced approximately 5 feet apart along the land-streamer for a total line length 115 feet. The array was pulled at ten-foot intervals and a source strike was completed with a sledge hammer at each interval while recording the seismic response. Two additional stationary MASW lines were also performed at borings B-3 and B-8 on the east side of the guard rail.

The data was then processed using dispersion analysis software (SurfSeis, engineered by the Kansas Geological Survey) that extracts the fundamental-mode dispersion curve(s). The curves are inverted and modeled to yield a 1D shear-wave velocity profile along the array for a corresponding depth. At each strike source, the 1D profiles are created and then combined to yield a 2D profile. These 2D profiles are then examined for changes in shear wave velocities to indicate the top of bedrock.

Limitations: All geophysical testing methods rely on instrument signals to indicate physical conditions in the field. Signal information can be affected by on-site conditions beyond the control of the operator, such as, but not limited to, cultural features, standing water, ground water, buried

Geotechnical Engineering Report

Slope Stabilization and Pedestrian Access ■ Bellbrook, Greene County, Ohio
May 17, 2021 ■ Terracon Project No. N1205425



objects, and cultural noise (e.g. traffic). Interpretation of those signals is based on a combination of known factors combined with the experience of the operator and geophysical scientist evaluating the results. The provided depth measurements are estimations based on an estimation of the electrical properties of the subsurface material. This report has been prepared for the application discussed and in accordance with generally accepted geophysical practices. No warranties, expressed or implied, are intended or made. The findings presented in this report are based upon the data obtained from the geophysical surveys and from other information discussed in this report. This report does not reflect variations that may occur in areas not tested or inaccessible to the geophysical equipment, across the site, or due to the modifying effects of construction or weather.

SITE LOCATION AND EXPLORATION PLAN

Contents:

Site Location Plan

Exploration Plan

SITE LOCATION

Slope Stabilization and Pedestrian Access ■ Bellbrook, Greene County, Ohio
May 17, 2021 ■ Terracon Project No. N1205425

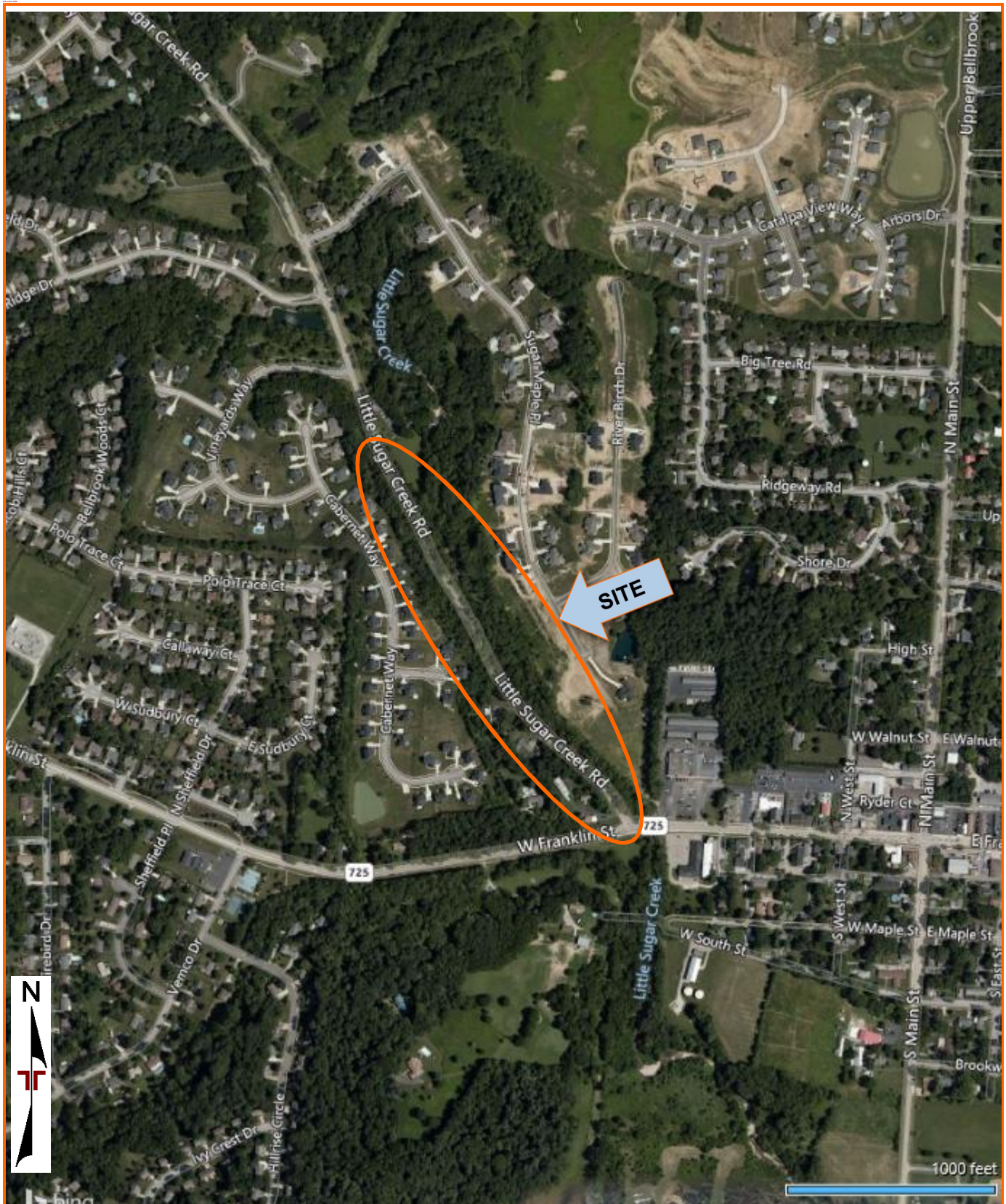


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

Slope Stabilization and Pedestrian Access ■ Bellbrook, Greene County, Ohio
May 17, 2021 ■ Terracon Project No. N1205425



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Boring Logs (B-1 through B-10)

BORING LOG NO. B-1

PROJECT: Little Sugarcreek Road Stabilization and Pedestrian Access

CLIENT: City of Bellbrook OH
Bellbrook, OH

SITE: Little Sugarcreek Road
Bellbrook, OH

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.6366° Longitude: -84.0761° Station: 11+95 Offset: 9' R Approximate Surface Elev.: 796 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD%	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		DEPTH ELEVATION (Ft.)											
	ASPHALT (11")		0.9										
	GRANULAR BASE (3")		1.2										
1	FILL - WELL GRADED GRAVEL WITH SAND (GW), trace clay, brown		795+/- 795+/-		X	44	8-6-4 N=10						
			5		X	44	4-3-3 N=6				8.3		
			10		X	67	4-5-6 N=11						
			15		X	100	10-15-50/5"		4.5+ (HP)		20.8		
2	LEAN CLAY (CL), trace sand, trace gravel, brown, hard, (GLACIAL TILL)		13.5										
			20	▽	X	83	12-10-13 N=23				14.7		
5	INTERBEDDED GRAY SHALE AND LIMESTONE SHALE, gray, slightly weathered to unweathered, very weak LIMESTONE, gray, unweathered, strong		18.5	▽									
			23.9	X			50/4"						
	Split Spoon Refusal and Boring Terminated at 23.9 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

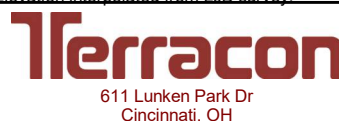
See [Supporting Information](#) for explanation of symbols and abbreviations.

Coordinates from Terracon Leica Zeno survey.
Elevation interpolated from LJB survey.

WATER LEVEL OBSERVATIONS

▽ Water observed at 20' during drilling
▽ Water observed at 18.7' after drilling

Wet cave-in encountered at 22'



Boring Started: 03-29-2021

Boring Completed: 03-29-2021

Drill Rig: CME55

Driller: CK

Project No.: N1205425

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N1205425 LITTLE SUGARCREEK.GPJ TERRACON_DATATEMPLATE.GDT 5/13/21

BORING LOG NO. B-2

PROJECT: Little Sugarcreek Road Stabilization and Pedestrian Access

CLIENT: City of Bellbrook OH
Bellbrook, OH

SITE: Little Sugarcreek Road
Bellbrook, OH

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N1205425 LITTLE SUGARCREEK.GPJ TERRACON_DATATEMPLATE.GDT 5/13/21

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.6370° Longitude: -84.0766° Station: 14+05 Offset: 9' R Approximate Surface Elev.: 804 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD%	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
		DEPTH ELEVATION (Ft.)											LL-PL-PI
1		0.3 ASPHALT (4") 803.5+/-											
		FILL - WELL GRADED GRAVEL WITH SAND (GW) , trace fines, gray, (AGGREGATE BASE) 802+/-				67	8-4-3 N=7						
		FILL - LEAN CLAY (CL) , with gravel, trace sand, dark brown to gray, trace asphalt fragments	5			67	3-1-2 N=3		0.5 (HP)		15.4		
		-clay drain tile fragments at 6 feet				22	3-2-3 N=5		0.75 (HP)		15.1		
2			10			50	PUSH 2.0'						28-15-13
			15			78	12-16-13 N=29				11.9		
5		INTERBEDDED GRAY SHALE AND LIMESTONE SHALE , gray, slightly weathered to unweathered, very weak LIMESTONE , gray, unweathered, strong				88	24-38-50/5"				10.1		
		13.5 790.5+/-											
		Split Spoon Refusal and Boring Terminated at 19.9 Feet	19.9 784+/-										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

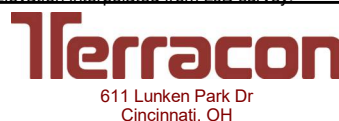
See [Supporting Information](#) for explanation of symbols and abbreviations.

Coordinates from Terracon Leica Zeno survey.
Elevation interpolated from LJB survey.

WATER LEVEL OBSERVATIONS

No water observed during drilling
No water observed after drilling

Wet cave-in encountered at 16.5'



Boring Started: 03-29-2021

Boring Completed: 03-29-2021

Drill Rig: CME55

Driller: CK

Project No.: N1205425

BORING LOG NO. B-3

PROJECT: Little Sugarcreek Road Stabilization and Pedestrian Access

**CLIENT: City of Bellbrook OH
Bellbrook, OH**

**SITE: Little Sugarcreek Road
Bellbrook, OH**

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_N1205425 LITTLE SUGARCREEK.GPJ TERRACON_DATATEMPLATE.GDT 5/13/21

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.6374° Longitude: -84.0771° Station: 15+95 Offset: 9' R Approximate Surface Elev.: 808 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD%	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	ASPHALT (18")		1.5										
1	FILL - CLAYEY SAND (SC), with gravel, brown to dark brown		806.5+/-		X	89	4-4-3 N=7				8.7		
			5		X	44	1-1-1 N=2				10.3		
			8.5		X	44	1-0-2 N=2				13.4		
2	SANDY LEAN CLAY (CL), with gravel, brown, medium stiff, (possible fill)		799.5+/-		X	67	1-3-6 N=9		0.5 (HP)		11.3		
			13.5		X	78	18-12-23 N=35						
3	WELL GRADED GRAVEL (GW), trace sand, trace fines, brown to reddish brown, dense, (possible fill)		794.5+/-	▽									
			18.5		X	67	14-16-8 N=24				15.3		
2	LEAN CLAY (CL), brown, hard, with limestone fragments and layers, trace bedding planes, (RESIDUUM)		788+/-		X	100	50/4"				9.4		
			20.0	▽		94		30					
5	INTERBEDDED GRAY SHALE AND LIMESTONE SHALE (85%), gray, very thin to thin bedding, slightly weathered to unweathered, very weak LIMESTONE (15%), gray, very thin bedding, unweathered, strong		779+/-		X	100	50/4"				9.4		
			25		X	94		30					
			28.8		X	94		30					
		Boring Terminated at 28.8 Feet											

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

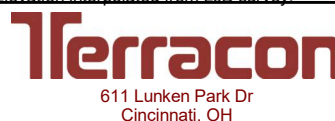
See [Supporting Information](#) for explanation of symbols and abbreviations.

Coordinates from Terracon Leica Zeno survey.
Elevation interpolated from LJB survey.

WATER LEVEL OBSERVATIONS

No water observed during drilling
▽ Water observed at 17' after drilling

Wet cave-in encountered at 21.5'



Boring Started: 03-29-2021

Boring Completed: 03-29-2021

Drill Rig: CME55

Driller: CK

Project No.: N1205425

BORING LOG NO. B-4

PROJECT: Little Sugarcreek Road Stabilization and Pedestrian Access

CLIENT: City of Bellbrook OH
Bellbrook, OH

SITE: Little Sugarcreek Road
Bellbrook, OH

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N1205425 LITTLE SUGARCREEK.GPJ TERRACON_DATATEMPLATE.GDT 5/13/21

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.6377° Longitude: -84.0776° Station: 17+85 Offset: 9' R Approximate Surface Elev.: 807 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD%	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	ASPHALT (15")		1.3										
1	AGGREGATE BASE (3")		1.5			67	7-4-3 N=7				6.4		
	FILL - CLAYEY SAND WITH GRAVEL (SC), brown		3.5										
	SANDY LEAN CLAY (CL), with gravel, brown, medium stiff				X	33	2-1-2 N=3		1.0 (HP)		12.5		
2	-dark brown at 8.5 feet				87		PUSH 2.0'			0.96	12.1	124	
	SHALE, brown with some gray, highly weathered, very weak, trace limestone fragments and layers				X	78	7-9-8 N=17		4.5 (HP)		21.2		
4	INTERBEDDED GRAY SHALE AND LIMESTONE		13.5	16.6									
	SHALE, gray, slightly weathered to unweathered, very weak				X	94	24-28-50/5"				9.1		
5	LIMESTONE, gray, unweathered, strong		18.0	17.6									
	Split Spoon Refusal and Boring Terminated at 19.9 Feet		19.9	787+/-									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

Coordinates from Terracon Leica Zeno survey.
Elevation interpolated from LJB survey.

WATER LEVEL OBSERVATIONS

No water observed during drilling

Water observed at 16' after drilling

Wet cave-in encountered at 17.6'



Boring Started: 03-29-2021

Boring Completed: 03-29-2021

Drill Rig: CME55

Driller: CK

Project No.: N1205425

BORING LOG NO. B-5

PROJECT: Little Sugarcreek Road Stabilization and Pedestrian Access

CLIENT: City of Bellbrook OH
Bellbrook, OH

SITE: Little Sugarcreek Road
Bellbrook, OH

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N1205425 LITTLE SUGARCREEK.GPJ TERRACON_DATATEMPLATE.GDT 5/13/21

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.6382° Longitude: -84.0780° Station: 19+80 Offset: 9' R Approximate Surface Elev.: 807 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD%	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	ASPHALT (17")		1.4										
	AGGREGATE BASE (3")		1.7										
	FILL - SANDY LEAN CLAY (CL), with gravel, dark brown to gray		8.5										
1	FILL - SANDY LEAN CLAY (CL), with gravel, dark brown to gray		1.4 - 1.7			78	2-1-2 N=3		0.5 (HP)		12.7		
	FILL - SANDY LEAN CLAY (CL), with gravel, dark brown to gray		1.7 - 8.5			44	2-1-1 N=2		1.0 (HP)		15.2		
	FILL - SANDY LEAN CLAY (CL), with gravel, dark brown to gray		8.5 - 13.5			78	2-1-4 N=5		1.5 (HP)		23.3		
4	SHALE, brown and gray, highly weathered, very weak, trace limestone fragments and layers		13.5			67	7-7-10 N=17		4.5+ (HP)		17.8		
	SHALE, brown and gray, highly weathered, very weak, trace limestone fragments and layers		13.5 - 17.4			89	29-28-50 N=78				13.4		
5	INTERBEDDED GRAY SHALE AND LIMESTONE		17.4			100	20-49-50/5"				9.8		
	SHALE, gray, slightly weathered to unweathered, very weak												
	LIMESTONE, gray, unweathered, strong												
	Split Spoon Refusal and Boring Terminated at 17.4 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

Coordinates from Terracon Leica Zeno survey.
Elevation interpolated from LJB survey.

WATER LEVEL OBSERVATIONS

No water observed during drilling
No water observed after drilling

Dry cave-in encountered at 15.8'



Boring Started: 03-29-2021

Boring Completed: 03-29-2021

Drill Rig: CME55

Driller: CK

Project No.: N1205425

BORING LOG NO. B-6

PROJECT: Little Sugarcreek Road Stabilization and Pedestrian Access

CLIENT: City of Bellbrook OH
Bellbrook, OH

SITE: Little Sugarcreek Road
Bellbrook, OH

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N1205425 LITTLE SUGARCREEK.GPJ TERRACON_DATATEMPLATE.GDT 5/13/21

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.6387° Longitude: -84.0783° Station: 21+75 Offset: 9' R Approximate Surface Elev.: 805 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD%	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	ASPHALT (15")		1.3										
1	AGGREGATE BASE (3")		1.5										
	FILL - LEAN CLAY (CL), with sand, with gravel, dark brown to gray		3.5			89	2-2-2 N=4		0.75 (HP)		21.8		
2	LEAN CLAY (CL), brown and gray, trace bedding planes, trace limestone fragments and layers, (RESIDUUM)		5			78	3-12-9 N=21		3.0 (HP)		27.7		
	SHALE, brown and gray, highly weathered, very weak, trace limestone fragments and layers		8.5			67	14-9-7 N=16		4.0 (HP)		19.8		45-22-23
4	SHALE, brown and gray, highly weathered, very weak, trace limestone fragments and layers		10			78	4-7-13 N=20		4.5 (HP)		20.5		
	INTERBEDDED GRAY SHALE AND LIMESTONE		13.5	▽		94	14-24-50/5"				10.5		
5	SHALE (90%), gray, very thin to thin bedding, slightly weathered to unweathered, very weak LIMESTONE (10%), gray, very thin bedding, unweathered, strong		15	▽		100		94					
	Boring Terminated at 20 Feet		20										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

Coordinates from Terracon Leica Zeno survey.
Elevation interpolated from LJB survey.

WATER LEVEL OBSERVATIONS

No water observed during drilling
▽ Water observed at 14' after drilling

Wet cave-in encountered at 17.6'



Boring Started: 03-29-2021

Boring Completed: 03-29-2021

Drill Rig: CME55

Driller: CK

Project No.: N1205425

BORING LOG NO. B-7

PROJECT: Little Sugarcreek Road Stabilization and Pedestrian Access

CLIENT: City of Bellbrook OH
Bellbrook, OH

SITE: Little Sugarcreek Road
Bellbrook, OH

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_N1205425 LITTLE SUGARCREEK.GPJ TERRACON_DATATEMPLATE.GDT 5/13/21

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.6395° Longitude: -84.0790° Station: 25+35 Offset: 9' R Approximate Surface Elev.: 812 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD%	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS
		DEPTH ELEVATION (Ft.)											LL-PL-PI
	0.3 1.0	ASPHALT (4") 811.5+/- 811+/-											
1	6.0	AGGREGATE BASE (8") FILL - CLAYEY SAND WITH GRAVEL (SC) , brown, trace asphalt fragments	5		X	67	8-4-4 N=8				7.3		
			5		X	53	3-2-3 N=5				8.6		
2		LEAN CLAY (CL) , trace sand, trace gravel, brown, stiff	10		X	78	1-2-3 N=5		1.5 (HP)		21.1		44-18-26
			10		X	78	2-3-4 N=7		2.0 (HP)		16.0		
4		SHALE , brown and gray, highly weathered, very weak, trace limestone fragments and layers	15		X	78	30-14-24 N=38				15.4		
5		INTERBEDDED GRAY SHALE AND LIMESTONE SHALE , gray, slightly weathered to unweathered, very weak LIMESTONE , gray, unweathered, strong <i>Split Spoon Refusal and Boring Terminated at 18.9 Feet</i>	18.9		X	100	50/4"				4.8		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

Coordinates from Terracon Leica Zeno survey.
Elevation interpolated from LJB survey.

WATER LEVEL OBSERVATIONS

No water observed during drilling
No water observed after drilling

Dry cave-in encountered at 16.9'



611 Lunken Park Dr
Cincinnati, OH

Boring Started: 03-29-2021

Boring Completed: 03-29-2021

Drill Rig: CME55

Driller: CK

Project No.: N1205425

BORING LOG NO. B-8

PROJECT: Little Sugarcreek Road Stabilization and Pedestrian Access

CLIENT: City of Bellbrook OH
Bellbrook, OH

SITE: Little Sugarcreek Road
Bellbrook, OH

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_N1205425 LITTLE SUGARCREEK.GPJ TERRACON_DATATEMPLATE.GDT 5/13/21

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.6400° Longitude: -84.0793° Station: 27+50 Offset: 9' R Approximate Surface Elev.: 815 (Ft.) +/- DEPTH ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD%	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		ASPHALT (14")	814+/-										
1		FILL - WELL GRADED GRAVEL WITH SAND (GW) , brown and gray -mostly gravel/rock fragments recovered at 3.5 and 6 feet	5			67	6-5-5 N=10						
			8.5			16	4-3-2 N=5						
			8.5			16	4-4-4 N=8						
2		LEAN CLAY (CL) , with gravel, trace sand, brown, stiff	10			100	4-4-7 N=11		1.5 (HP)		17.3		
			13.5										
4		SHALE , brown and gray, highly weathered, very weak, trace limestone fragments and layers	15			78	6-12-14 N=26		4.5 (HP)		18.2		
			18.5										
5		INTERBEDDED GRAY SHALE AND LIMESTONE SHALE , gray, slightly weathered to unweathered, very weak LIMESTONE , gray, unweathered, strong <i>Split Spoon Refusal and Boring Terminated at 19.3 Feet</i>	19.3			100	48-50/4"				3.9		
			19.3										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

Coordinates from Terracon Leica Zeno survey.
Elevation interpolated from LJB survey.

WATER LEVEL OBSERVATIONS

No water observed during drilling
No water observed after drilling

Dry cave-in encountered at 16.5'



Boring Started: 03-29-2021

Boring Completed: 03-29-2021

Drill Rig: CME55

Driller: CK

Project No.: N1205425

BORING LOG NO. B-9

PROJECT: Little Sugarcreek Road Stabilization and Pedestrian Access

CLIENT: City of Bellbrook OH
Bellbrook, OH

SITE: Little Sugarcreek Road
Bellbrook, OH

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL N1205425 LITTLE SUGARCREEK.GPJ TERRACON_DATATEMPLATE.GDT 5/13/21

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.6405° Longitude: -84.0796° Station: 29+45 Offset: 9' R Approximate Surface Elev.: 814 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD%	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
		DEPTH ELEVATION (Ft.)											
	ASPHALT	ASPHALT (13")	1.1										
	AGGREGATE BASE	AGGREGATE BASE (3")	1.3										
	FILL - CLAYEY SAND WITH GRAVEL	FILL - CLAYEY SAND WITH GRAVEL (SC) , dark brown to gray	3.5			78	6-5-2 N=7				7.2		
1	FILL - LEAN CLAY	FILL - LEAN CLAY (CL) , trace sand, trace gravel, dark brown to gray	8.5			78	1-2-2 N=4		0.5 (HP)		19.8		
	SANDY LEAN CLAY	SANDY LEAN CLAY (CL) , with gravel, brown, very stiff, (possible fill)	13.5	10		100	PUSH 2.0'			1.03	22.3	103	
	LEAN CLAY	LEAN CLAY (CL) , olive brown and gray, very stiff to hard, trace bedding planes, trace limestone fragments and layers, (RESIDUUM)	23.5	15		89	3-5-3 N=8		2.5 (HP)		12.6		
2	LEAN CLAY	LEAN CLAY (CL) , olive brown and gray, very stiff to hard, trace bedding planes, trace limestone fragments and layers, (RESIDUUM)	23.5	20		89	6-6-7 N=13		4.5 (HP)		20.8		
	INTERBEDDED GRAY SHALE AND LIMESTONE	INTERBEDDED GRAY SHALE AND LIMESTONE SHALE (80%) , gray, very thin to thin bedding, slightly weathered to unweathered, very weak LIMESTONE (20%) , gray, very thin bedding, unweathered, strong	23.5	25		75	23-13-50/2"		2.5 (HP)		25.0		
5	INTERBEDDED GRAY SHALE AND LIMESTONE	INTERBEDDED GRAY SHALE AND LIMESTONE SHALE (80%) , gray, very thin to thin bedding, slightly weathered to unweathered, very weak LIMESTONE (20%) , gray, very thin bedding, unweathered, strong	23.5	25		100	50/4"						
	Boring Terminated	Boring Terminated at 30 Feet	30.0	30		100		50					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

Coordinates from Terracon Leica Zeno survey.
Elevation interpolated from LJB survey.

WATER LEVEL OBSERVATIONS

▽ Water observed at 20' during drilling
▽ Water observed at 17.3' after drilling

☞ Wet cave-in encountered at 22.3'



Boring Started: 03-29-2021

Boring Completed: 03-29-2021

Drill Rig: CME55

Driller: CK

Project No.: N1205425

BORING LOG NO. B-10

PROJECT: Little Sugarcreek Road Stabilization and Pedestrian Access

CLIENT: City of Bellbrook OH
Bellbrook, OH

SITE: Little Sugarcreek Road
Bellbrook, OH

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL_N1205425 LITTLE SUGARCREEK.GPJ TERRACON_DATATEMPLATE.GDT 5/13/21

MODEL LAYER	GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 39.6411° Longitude: -84.0799° Station: 31+70 Offset: 9' R Approximate Surface Elev.: 811 (Ft.) +/-	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	FIELD TEST RESULTS	RQD%	LABORATORY HP (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
	ASPHALT (16")		1.3 809.5+/-										
	AGGREGATE BASE (3")		4.6 809.5+/-										
1	FILL - SANDY LEAN CLAY WITH GRAVEL (CL), grayish brown		6.0 805+/-		X	67	5-4-4 N=8		1.0 (HP)		12.7		
			8.5 802.5+/-		X	53	5-0-1 N=1				10.7		
	LEAN CLAY (CL), trace sand, trace gravel, dark brown, stiff		13.5 797.5+/-		X	67	3-1-3 N=4		1.5 (HP)		23.0		
2	LEAN CLAY (CL), with sand, trace gravel, brown, very stiff, (GLACIAL TILL)		18.5 792.5+/-		X	67	2-4-3 N=7		3.5 (HP)		15.7		
4	SHALE, brown and gray, highly weathered, very weak, trace limestone fragments and layers		23.9 787+/-		X	89	10-12-16 N=28		4.5 (HP)		21.1		
5	INTERBEDDED GRAY SHALE AND LIMESTONE SHALE, gray, slightly weathered to unweathered, very weak LIMESTONE, gray, unweathered, strong			▽ ▽ ▽ ▽ ▽	X	89	32-42-45 N=87						
	Split Spoon Refusal and Boring Terminated at 23.9 Feet				X	100	50/4"						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
3.25-inch Continuous-Flight Hollow-Stem Augers
2-inch Split-Barrel Sampler

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

See [Supporting Information](#) for explanation of symbols and abbreviations.

Coordinates from Terracon Leica Zeno survey.
Elevation interpolated from LJB survey.

WATER LEVEL OBSERVATIONS

▽ Water observed at 20' during drilling
▽ Water observed at 20.7' after drilling

Wet cave-in encountered at 21.4'



Boring Started: 03-29-2021

Boring Completed: 03-29-2021

Drill Rig: CME55

Driller: CK

Project No.: N1205425

SUPPORTING INFORMATION

Contents:

General Notes

Unified Soil Classification System








Description of Rock Properties

.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

Little Sugarcreek Road Stabilization and Pedestrian Access ■ Bellbrook, OH
Terracon Project No. N1205425

SAMPLING	WATER LEVEL	FIELD TESTS
 Rock Core  Shelby Tube  Standard Penetration Test	 Water Initially Encountered  Water Level After a Specified Period of Time  Water Level After a Specified Period of Time  Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See [Exploration and Testing Procedures](#) in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS <small>(More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance</small>		CONSISTENCY OF FINE-GRAINED SOILS <small>(50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance</small>		
Descriptive Term (Density)	Standard Penetration or N-Value Blows/Ft.	Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (tsf)	Standard Penetration or N-Value Blows/Ft.
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A				Soil Classification		
				Group Symbol	Group Name ^B	
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines ^C	$Cu \geq 4$ and $1 \leq Cc \leq 3$ ^E	GW	Well-graded gravel ^F	
			$Cu < 4$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ ^E	GP	Poorly graded gravel ^F	
		Gravels with Fines: More than 12% fines ^C	Fines classify as ML or MH	GM	Silty gravel ^{F, G, H}	
			Fines classify as CL or CH	GC	Clayey gravel ^{F, G, H}	
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines ^D	$Cu \geq 6$ and $1 \leq Cc \leq 3$ ^E	SW	Well-graded sand ^I	
			$Cu < 6$ and/or $[Cc < 1 \text{ or } Cc > 3.0]$ ^E	SP	Poorly graded sand ^I	
		Sands with Fines: More than 12% fines ^D	Fines classify as ML or MH	SM	Silty sand ^{G, H, I}	
			Fines classify as CL or CH	SC	Clayey sand ^{G, H, I}	
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	$PI > 7$ and plots on or above "A" line	CL	Lean clay ^{K, L, M}	
			$PI < 4$ or plots below "A" line ^J	ML	Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay ^{K, L, M, N}
			Liquid limit - not dried			Organic silt ^{K, L, M, O}
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above "A" line	CH	Fat clay ^{K, L, M}	
			PI plots below "A" line	MH	Elastic Silt ^{K, L, M}	
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay ^{K, L, M, P}
			Liquid limit - not dried			Organic silt ^{K, L, M, Q}
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat	

^A Based on the material passing the 3-inch (75-mm) sieve.

^B If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

^C Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

^D Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

$$E \quad Cu = D_{60}/D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

^F If soil contains ³ 15% sand, add "with sand" to group name.

^G If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

^H If fines are organic, add "with organic fines" to group name.

^I If soil contains ³ 15% gravel, add "with gravel" to group name.

^J If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

^K If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

^L If soil contains ³ 30% plus No. 200 predominantly sand, add "sandy" to group name.

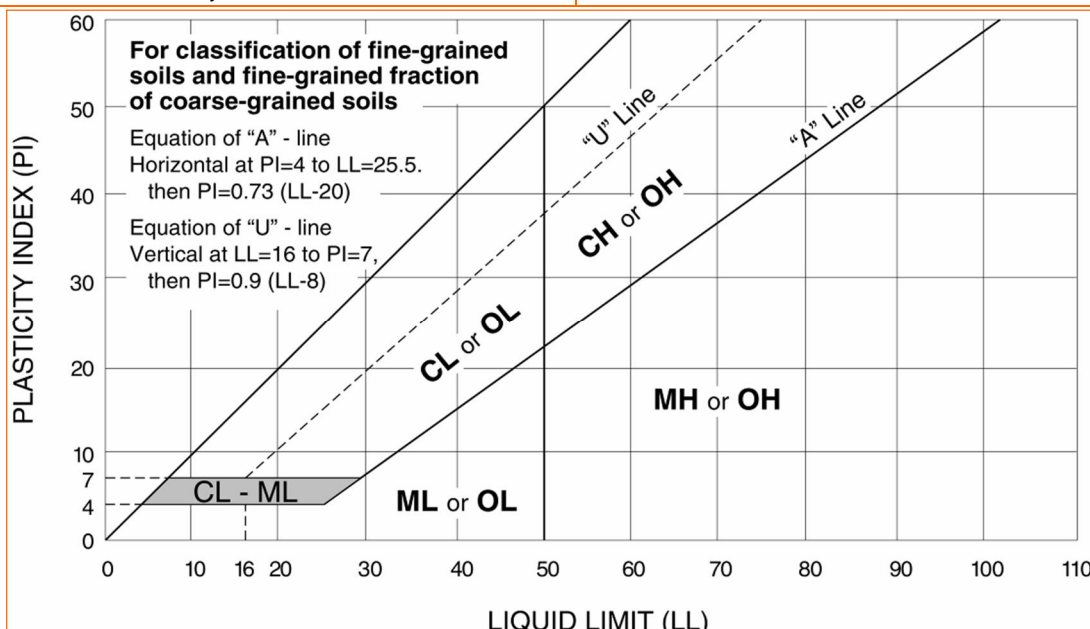
^M If soil contains ³ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

^N $PI \geq 4$ and plots on or above "A" line.

^O $PI < 4$ or plots below "A" line.

^P PI plots on or above "A" line.

^Q PI plots below "A" line.



WEATHERING	
Term	Description
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	Field Identification	Uniaxial Compressive Strength, psi (MPa)
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		Bedding Spacing (May Include Foliation or Banding)	
Description	Spacing	Description	Spacing
Extremely close	< ¾ in (<19 mm)	Laminated	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	Very thin	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	Thin	2 in – 1 ft. (50 – 300 mm)
Moderate	8 in – 2 ft. (200 – 600 mm)	Medium	1 ft. – 3 ft. (300 – 900 mm)
Wide	2 ft. – 6 ft. (600 mm – 2.0 m)	Thick	3 ft. – 10 ft. (900 mm – 3 m)
Very Wide	6 ft. – 20 ft. (2.0 – 6 m)	Massive	> 10 ft. (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) ¹	
Description	RQD Value (%)
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009
Technical Manual for Design and Construction of Road Tunnels – Civil Elements

RECORD OF PROCEEDINGS
Minutes of Bellbrook City Council Regular Meeting
July 12, 2021

PRESENT: TJ Hoke
Ernie Havens
Forrest Greenwood
Elaine Middlestetter
Mayor Mike Schweller

ABSENT: Dr. Van Veldhuizen

ALSO PRESENT: City Manager Melissa Dodd

REGULAR MEETING

Mayor Schweller called the regular meeting to order at 7:00 pm.

ROLL CALL

Mr. Hoke, yes; Mr. Havens, yes; Mr. Greenwood, yes; Mrs. Middlestetter, yes; Mayor Schweller, yes.

Mr. Havens made a motion to excuse Dr. Van Veldhuizen from the meeting. Mr. Greenwood seconded the motion. The Clerk called the roll. Mr. Greenwood, yes; Mr. Havens, yes; Mr. Hoke, yes; Mrs. Middlestetter, yes; Mayor Schweller, yes. The motion passed 5-0.

APPROVAL OF MINUTES

Mayor Schweller asked if anyone had any comments or corrections to the minutes of June 28. Hearing none he declared the minutes approved.

MAYOR'S ANNOUNCEMENTS

Mayor Schweller spoke about the passing of his friend and Deputy Mayor Nick Edwards on June 30, 2021. He sends his thoughts and prayers to Nick's wife, Linda, and family. Throughout his battle with cancer he was always in contact with the City and continued as a great advocate for Bellbrook. Deputy Mayor Edwards was a great Councilman and a stronger Deputy Mayor. He knew his role and executed it flawlessly. His contributions to the City are numerous and those of us who worked with him knew his focus was to support the citizens of Bellbrook and to continue to make it an even better place for our citizens to call home. Nick served the City for 24 years beginning his service on our Planning Board for

RECORD OF PROCEEDINGS

Minutes of Bellbrook City Council Regular Meeting

July 12, 2021

nine years from 1997 to 2006. He left that board to serve on the Board of Zoning Appeals and Property Review Commission for six years from 2007 until 2013. He was first elected to Council in 2013 and reelected in 2017. Nick became Deputy Mayor in January 2020. Nick brought experience from his professional career as a senior vice president at Key Bank. He was also on several major community boards and brought that big board experience to Bellbrook. He was always an independent thinker who always focused on the best result for our citizens. Deputy Mayor Edwards will be greatly missed but not forgotten. His contributions to the City will always be here for our citizens.

Mrs. Middlestetter added that he will be sorely missed. He had incredible insight and a gentle heart.

Mr. Havens suggested Council consider planting a tree in the City in his honor.

Mayor Schweller agreed and added that a memorial brick placed at the museum.

Mr. Greenwood said that he met Nick Edwards after they were elected to City Council in November 2013. He had not known Nick, but they were seated alphabetically so he was next to Nick. It did not take long to learn that Nick was special. He was cloaked with immense knowledge about how things worked and add to the mix was his big heart. It was no surprise to Mr. Greenwood that Nick's work on Council helped everyone. Nick was all-inclusive with all persons no matter who they were. He was always focused on our citizens and questioned if Council's decisions were good for our citizens. He also supported City staff because he knew great service comes from staff that are supported by our citizens and Council. One example of his big heart was his suggestion that an increase in zoning permit fees be postponed for a time due to the effects of the pandemic. He was concerned that some citizens would have to struggle to complete their projects. Plus, after the COVID-19 people could use a break. Being a Council Member takes time away from one's family and Mr. Greenwood thanked Nick's wife Linda and his family and friends for their unwavering support. Nick's memory and example will live on in our hearts and his influence will be a mark on the City of Bellbrook for a long time to come. He closed by saying thanks to Nick for all he has done, and it was an honor to work together.

Mr. Hoke wanted to add that although his time working with Nick was short and mostly virtual over Zoom, he hears from the people he encounters in town all expressing the same sentiment that Nick was genuine and worked hard for this City he truly cared about. His presence will be missed.

RECORD OF PROCEEDINGS
Minutes of Bellbrook City Council Regular Meeting
July 12, 2021

Mayor Schweller referred to a discussion from the last Council meeting where Mr. Havens suggested looking into dispatch service through Greene County. The Mayor researched this and spoke with Brandon Huddleston at Greene County. The Greene County dispatch service is provided by Greene Central which is the service Bellbrook already uses. The Mayor explained that if the fee is based on a per-call basis it seems higher and should possibly be examined more closely. In retrospect the City switched to Greene Central in 2013 when we joined their conglomerate which required a significant capital outlay on their part for the consoles required by the City and Sugarcreek Township. That first contract has been in place from 2013 until it expired in 2020 on September 30. Now seems to be a good time to ensure that we get the best deal for our citizens. Now that the initial large capital expenditure has been concluded at the end of the seven-year deal now might be the time to negotiate some different rates. He added that the next step would be to contact Greene Central. He believes that a better economic program could be achieved.

PUBLIC HEARING OF ORDINANCES - none

INTRODUCTION OF ORDINANCES - none

RESOLUTIONS

Mr. Hoke read **Resolution 2021-T A Resolution Authorizing the City Manager to Adjust the Pay Scales of City Positions not Covered by a Collective Bargaining Agreement.**

Mrs. Dodd explained that this is an annual resolution where the pay scales are adjusted to match the cost-of-living increases that are afforded to the bargaining unit members. Last year the increase was two percent. This year the increase is two- and one-half percent. The City has 16 full-time and 17 part-time employees who will be affected by this increase. The Miami Valley Risk Management Association recently released a wage scale survey showing the average increase was 2.33 percent. This makes the City competitive with what other municipalities are offering. The attached spreadsheet only has this one increase unlike last year when changes were made to some of the steps.

Mr. Hoke made a motion to adopt **Resolution 2021- T A Resolution Authorizing the City Manager to Adjust the Pay Scales of City Positions not Covered by a Collective Bargaining Agreement.** Mrs.

RECORD OF PROCEEDINGS
Minutes of Bellbrook City Council Regular Meeting
July 12, 2021

Middlestetter seconded the motion. The Acting Clerk called the roll. Mr. Hoke, yes; Mrs. Middlestetter, yes; Mr. Havens, yes; Mr. Greenwood, yes; Mayor Schweller, yes. The motion passed 5-0.

Mr. Havens read **Resolution 2021- U A Resolution Authorizing the City Manager to Prepare and Submit an Application to Participate in the Ohio Public Works Commission State Capital Improvement and/or Local Transportation Improvement Programs and to Execute Contracts as Required.**

Mrs. Dodd explained that applications are due into Greene County by July 16 for review and recommendations on which projects they will recommend for funding. Those will move forward to the Ohio Public Works Commission. This is an aggressive ask for \$445,306.00. This includes a twenty percent contingency which is also high. This figure would be a worst-case scenario, but you can back down the request at a later date. The City's engineers at LJB will put together a strong application for the City to gain the best scoring. The good thing about this timing is that you can ask for costs that are within a year of the award so since a substantial amount of the project would not be completed by July 1, 2022, the City could apply again next year if needed. It could end up being a combination of grants and loans. There are not many projects that Bellbrook applies for this funding for so this would be a good project to try. The City already has the federal dollars received from Miami Valley Regional Planning which totals \$342,000. This State grant could reduce the local share down. Answers should be received back in November 2021 and early 2022. The County should inform us soon whether this project has been selected.

Mr. Hoke asked how this grant compares to the one the City received last year for the N. Belleview Drive replacement. Mrs. Dodd answered that last year's grant was through the State's emergency program.

Mr. Havens asked if there was a timeline on the urgency of the replacement of this bridge. Mrs. Dodd answered that the bridge is not being replaced. The project is for the pedestrian improvements along the State route.

Mr. Havens made a motion to adopt **Resolution 2021- U A Resolution Authorizing the City Manager to Prepare and Submit an Application to Participate in the Ohio Public Works Commission State Capital Improvement and/or Local Transportation Improvement Programs and to Execute Contracts as**

RECORD OF PROCEEDINGS
Minutes of Bellbrook City Council Regular Meeting
July 12, 2021

Required. Mr. Greenwood seconded the motion. The Acting Clerk called the roll. Mr. Havens, yes; Mr. Greenwood, yes; Mr. Hoke, yes; Mrs. Middlestetter, yes; Mayor Schweller, yes. The motion passed 5-0.

Mr. Greenwood read **Resolution 2021-V A Resolution Establishing a New Special Revenue Fund Titled “Local Fiscal Recovery Fund”**.

Mrs. Dodd explained that an action of Council is required to establish a new Fund.

Mayor Schweller added that this is the American Rescue Plan Act also referred to as ARPA. Bellbrook’s allocation was reduced when the State added townships into the equation.

Mr. Greenwood made a motion to adopt **Resolution 2021- V A Resolution Establishing a New Special Revenue Fund Titled “Local Fiscal Recovery Fund”**. Mrs. Middlestetter seconded the motion. The Acting Clerk called the roll. Mr. Greenwood, yes; Mrs. Middlestetter, yes; Mr. Hoke, yes; Mr. Havens, yes; Mayor Schweller, yes. The motion passed 5-0.

Mr. Greenwood read **Resolution 2021-W A Resolution by Bellbrook City Council to Request the City of Bellbrook’s Share of American Rescue Plan Act Funds from the Ohio Office of Budget and Management and Authorizes the City Manager to Act as the Authorized Representative on Behalf of the City of Bellbrook**.

The City Manager explained that the State of Ohio has received the funds from the U.S. Treasury. They have been authorized with the budget bill to distribute that money, so the portal was opened last week. This Resolution allows the City Manager to sign off on the distribution on behalf of the City. The City has four years to commit the money and up to six years to spend it.

Mr. Greenwood made a motion to adopt **Resolution 2021-W A Resolution by Bellbrook City Council to Request the City of Bellbrook’s Share of American Rescue Plan Act Funds from the Ohio Office of Budget and Management and Authorizes the City Manager to Act as the Authorized Representative on Behalf of the City of Bellbrook**. The motion was seconded by Mr. Havens. The Acting Clerk called the roll. Mr. Greenwood, yes; Mr. Havens, yes; Mr. Hoke, yes; Mrs. Middlestetter, yes; Mayor Schweller, yes. The motion passed 5-0.

RECORD OF PROCEEDINGS
Minutes of Bellbrook City Council Regular Meeting
July 12, 2021

Mrs. Middlestetter read **Resolution 2021-X A Resolution Directing the Greene County Auditor to Enter the Delinquent Cost of Weed and Grass Mowing on the Tax Duplicate for the Properties Attached Hereto.**

The City Manager explained that this is the annual legislation to attach any weed and grass mowing to the property taxes for any properties which had to be mowed by City staff and were not paid. Typically the City also enacts a resolution for unpaid water bills but there were none this year.

Mrs. Middlestetter made a motion to adopt **Resolution 2021-X A Resolution Directing the Greene County Auditor to Enter the Delinquent Cost of Weed and Grass Mowing on the Tax Duplicate for the Properties Attached Hereto.** Mr. Hoke seconded the motion. The Acting Clerk called the roll. Mrs. Middlestetter, yes; Mr. Hoke, yes; Mr. Havens, yes; Mr. Greenwood, yes; Mayor Schweller, yes. The motion passed 5-0.

Mr. Hoke read **Resolution 2021-Y A Resolution by Bellbrook City Council Authorizing Recommendation to Accept the Fifth Amended Joint Chapter 11 Plan of Reorganization of Purdue Pharma L.P. in the United States Bankruptcy Court of the Southern District of New York Case No. 19-23649.**

Mrs. Dodd referenced the attached memo provided by the Municipal Attorney which summarizes the case and what the resolution accomplishes. A number of states and municipalities are entering into this bankruptcy case against Purdue Pharma, the manufacturer of oxycontin. This drug is considered the center of the opioid addiction crisis. This is a settlement due to Purdue Pharma declaring bankruptcy. The settlement is for approximately \$5,000,000,000 which has been put into a trust with a mission to fund abatement of the opioid crisis. If approved, Purdue Pharma will cease to exist, and a new company will be formed and governed by a charter that will require that it deploy its assets to address the opioid crisis. Affected municipalities have until July 14, 2021, to determine if they are going to be a party. Ohio is sixth in line for a share. Ohio will receive about 4.3 percent or \$215,000,000. The formula takes into account each state's share of prescription opioid sales, overdose deaths, population, and number of persons suffering from pain reliever use disorder. What this means for Bellbrook will depend on how many municipalities choose to participate.

RECORD OF PROCEEDINGS
Minutes of Bellbrook City Council Regular Meeting
July 12, 2021

Mr. Hoke made a motion to adopt **Resolution 2021-Y A Resolution by Bellbrook City Council Authorizing Recommendation to Accept the Fifth Amended Joint Chapter 11 Plan of Reorganization of Purdue Pharma L.P. in the United States Bankruptcy Court of the Southern District of New York Case No. 19-23649.** Mr. Havens seconded the motion. The Acting Clerk called the roll. Mr. Hoke, yes; Mr. Havens, yes; Mr. Greenwood, yes; Mrs. Middlestetter, yes; Mayor Schweller, yes. The motion passed 5-0.

OLD BUSINESS

City Manager Search Update – Mayor Schweller stated that the City continues to receive resumes. Council has met once in executive session to review the first group of submissions. Council will meet at the end of regular business tonight to review more. The plan is to commence interviews Monday evening July 19. Scheduling during the summer travel months is a challenge.

NEW BUSINESS - none

CITY MANAGER REPORT

Mrs. Dodd reported the following:

- Streetscape Plan Update – The City Manager and Service Director met with the lead project manager from Kleingers and received the first draft of the streetscape master plan. They were very impressed with it and were also able to add input. The next step will be the final draft which should be ready near the beginning of September. After that steps for roll-out and input will need to be determined.
- Fire Department Maintains Class 2 ISO Rating – Bellbrook Fire Department received notice that they will maintain their Class 2 ISO rating! This rating is on a scale of 1 being the highest and 10 being the lowest. This puts Bellbrook Fire in the top seven percent of departments in Ohio. Only five departments in Ohio have a Class 1 rating. This is a great honor for Bellbrook Fire to maintain this rating! Congratulations to all of the crew at the Fire Department!

RECORD OF PROCEEDINGS

Minutes of Bellbrook City Council Regular Meeting

July 12, 2021

- November Levy – All of the necessary documents have been filed as of July 7th with the Board of Elections to put the levy on the November ballot. The City Manager created a staff report for the process and steps to create a Ballot Issue Committee and it has been shared with the Mayor.
- Wilmington Dayton Road Closure – The week of July 12 Wilmington Dayton Road will be closed from Centerville Station to Moss Oak from 9am to 3pm each day for some miscellaneous work to be completed on that stretch of road. Emergency traffic will be able to pass through if needed.
- Be Well Bellbrook Event Canceled – The Be Well Bellbrook Health and Wellness component of the Brook Mills race will have to be canceled this year. Without a volunteer group to take over the event, it is best to cancel the event this year. The race and farmers market will still go on!
- Juneteenth Update – The City Manager created a report on the cost associated with adding Juneteenth as a City holiday. Council should make a decision on this for the next update of the Employee Manual.
- Contract Employee for Zoning – Mrs. Dodd reported that she reached out to Greene County Regional Planning about the possibility of contracting a Zoning Assistant through the end of 2021. The lack of a Zoning Administrator has created a large increase in work for the remaining staff who now have to pick up this workload. This has to be the priority when a resident comes to the office or calls.

COMMITTEE REPORTS

Mayor Schweller explained that the committee seats Mr. Edwards held need to be filled. The Mayor offered to step into them. They are the Finance Committee and the Community Affairs Committee. Council agreed with this change. He also commended Service Director Pasley on his plan to complete as much necessary maintenance on and along Wilmington Pike during the times that it was being closed for construction.

Service – Mr. Greenwood reported that the paving crews will be working on the streets scheduled to be repaved this year.

Safety – none

RECORD OF PROCEEDINGS
Minutes of Bellbrook City Council Regular Meeting
July 12, 2021

Finance – Mrs. Dodd reported that the City received a clean audit with no citations. An exit audit conference is being scheduled.

Community Affairs – Mrs. Middlestetter stated that the Committee will try to meet soon to interview the candidates for the openings on the Village Review Board and BZA-PRC.

CLERK’S REPORT

Mayor Schweller explained that the Clerk was at a conference but had left the following information:

Future Agenda Items (dates are subject to change)

- July 26, 6:00 PM Work Session to discuss results of Little Sugarcreek Borings
- July 26 - A Resolution Authorizing the City Manager to Enter into a Lease with Frygib, Inc. for Use of Wellfield Land Located on State Route 725
- October 11 – 6pm Budget Work Session– Administration & Service Departments
- October 25 - 6pm Budget Work Session– Police & Fire Departments
- November 8 – 6pm Budget Work Session– Capital Improvement Plan
- November 22 – Introduction of 2022 Budget Ordinance
- December 13 - Public Hearing of 2022 Budget Ordinance

COMMENTS

Mr. Greenwood congratulated the Fire Department for their rating.

Mr. Havens asked if there was a point of contact for the gas pipeline being run under State Route 725 and Lakeman Road in case there is a problem with a cave in. Mrs. Dodd answered that the City was supplied with a complete list of contact people for the project. He also thanked the Fire Department for maintaining the status.

Mr. Hoke echoed the thanks to the Fire Department. He also reminded the public that there will be a football rally for all the football players in the community from youth through high school. It will take place on Saturday July 17 from 2 until 5 PM. Tickets must be purchased in advance.

RECORD OF PROCEEDINGS
Minutes of Bellbrook City Council Regular Meeting
July 12, 2021

Mrs. Middlestetter also commended the Fire Department adding that this helps keep fire insurance down. She asked about an event advertised along Franklin Street for Police-A-Palooza. Mrs. Dodd answered that it is an event on July 17 from noon until 4 PM at Centerbrook Church. They are planning to have a petting zoo, kids' activities, and a "dunk a cop" tank. All proceeds will go to the Community Support Center.

Mayor Schweller asked if anyone has heard how this storm compared to the one in 2020 that washed away the N Belleview culvert and road. Mrs. Dodd did not have any details at this point.

PUBLIC COMMENT - none

ADJOURNMENT TO EXECUTIVE SESSION

Mrs. Middlestetter made a motion to enter executive session at 7:58 PM. The motion was seconded by Mr. Havens. The Acting Clerk called the roll. Mrs. Middlestetter, yes; Mr. Havens, yes; Mr. Hoke, yes; Mr. Greenwood, yes; Mayor Schweller, yes. The motion passed 5-0.

The Mayor announced that there was no further business at 9:15 PM.

Michael W. Schweller, Mayor

Melissa Dodd, Acting Clerk of Council

2021 City of Bellbrook Goals Update – 7-26-21



Priority	Goal	Status	Projected Completion Date
1	Monitor Pandemic	Ongoing – all operations are back to normal	Unknown
2	Little Sugarcreek Road	STUDY COMPLETE – Presentation to Council tonight. Need to develop plan moving forward	12/31/2021
3	Walkability – Crosswalks & Sidewalks	COMPLETE Preliminary Engineering and Costs Complete for priority areas	
4	Updates to Property Maintenance Code	Work paused due to departure of planning and zoning assistant	12/31/21
5	Downtown Improvements	Streetscape Master Plan is underway – draft submitted at the beginning of July to CM and Service Director, Main & Franklin traffic light is part of goal 3 proposal, truck route yet to be determined	12/31/2021
6	Updates to Zoning Code	Sections have been rewritten and through Planning Board, 18-20(b) (signs) is waiting on Article 14 before it can be passed. On hold until new CM and planning and zoning person are on board.	Ongoing
7	Future levy projections	General fund renewal set for November 2 and all necessary documents sent to board of elections	12/31/2021
8	Fire Department Needs and Future	Discussions and analysis ongoing	12/31/2021
9	Tornado Siren Reassessment	Have received three costs proposals, working with Xenia for them to activate. Chief Bizzarro has the proposals to identify best option.	12/31/2021
10	Community Improvement Corporation	On hold until next CM is on board	12/31/2021
11	Code Enforcement Plan	Yet to be started – need staff dedicated to this in some capacity	12/31/2021

Complete

Reinstitute quarterly community meetings – Have held two so far – City hosted one and township the other. No additional dates have been discussed.

To: Mayor & City Council
From: Melissa Dodd, City Manager
Date: July 26, 2021
Subject: City Manager Update

- **2021 Paving Program** – Milling began the week of July 12 and paving the week after. Knob Hill ended up being omitted from the paving list this year due to some of the other streets measuring slightly more.
 - **Cable Channel Update** – The line move for the cable access channel is awaiting installation from Spectrum. The equipment has been ordered. This will require a supplemental appropriation in a future ordinance for approximately \$20,000 to cover all costs. This is necessary to keep us on the air and eligible to receive our annual cable franchise fees which equate to about \$105,000 per year.
 - **Quarterly Finance Update** – Due to the finance software conversion we are still working on ironing out some of the bugs and therefore I am unable to provide a quarterly finance update for this meeting as usual. I hope to have those all resolved prior to my departure and a finance report compiled for the next meeting.
 - **Planning and Zoning Assistance** –Greene County Regional Planning Executive Committee met regarding contracting with them for assistance. They are also short staffed at this time which does not afford them the capacity to assist us. With my departure and I helping to pick up the slack, this will need to be made a priority to resolve quickly.
 - **City Manager Transition** – I have been compiling a detailed list of ongoing projects which include contact names and pertinent information. This will be left for the next City Manager.
- 