ADDENDUM No. 1

RFP No. 19-02

Construction Engineering for Allen Creek Railroad Berm Opening
Due: January 22, 2019 by 2:00 P.M.

The following changes, additions, and/or deletions shall be made to the Request for Proposal for Construction Engineering Allen Creek Railroad Berm Opening, RFP No. 19-02, on which proposals will be received on/or before the date and time listed above.

The information contained herein shall take precedence over the original documents and all previous addenda (if any), and is appended thereto. **This Addendum includes one hundred and one (101) pages.**

The Proposer is to acknowledge receipt of this Addendum No. 1, including all attachments in its Proposal by so indicating in the proposal that the addendum has been received. Proposals submitted without acknowledgement of receipt of this addendum may be considered non-conforming.

The following forms provided within the RFP Document must be included in submitted proposal:

- **Attachment C - Non-Discrimination Declaration of Compliance**
- **Attachment D - Living Wage Declaration of Compliance**
- **Attachment E - Vendor Conflict of Interest Disclosure Form**

Proposals that fail to provide these completed forms listed above upon proposal opening will be rejected as non-responsive and will not be considered for award.

I. CORRECTIONS/ADDITIONS/DELETIONS

Changes to the RFP documents which are outlined below are referenced to a page or Section in which they appear conspicuously. Offerors are to take note in its review of the documents and include these changes as they may affect work or details in other areas not specifically referenced here.

Section/Page(s)	**Change**
Page 13	Add Item #7 as detailed below

7. The selected consultant shall be expected to provide insurance in accordance with Section VI of the Professional Services Agreement found in Appendix A. As mentioned above, the selected consultant shall be a party to a formal Construction Phase Agreement with Amtrak and shall be expected to provide insurance in accordance with that agreement, which can be found on page 52 of this RFP in

Attachment A. In addition, the selected consultant shall be expected to adhere and provide documentation in accordance with the following required by DTE:

> Prior to entering upon the DTE Property, City shall and shall cause its contractors, it's agents and it's agents contractors to procure and keep in force and effect during the entire term of this Agreement a comprehensive general liability insurance policy including insurance against assumed or contractual liability under this Agreement with respect to all of the work related to the Project and pollution legal liability. The limits of such policy with respect to personal liability and property damage shall be not less than Five Million Dollars ($5,000,000) per occurrence and Two Million ($2,000,000.00) of pollution legal liability. DTE shall be listed as an additional insured on such policies and copies of such policies or certificates thereof shall be delivered to DTE prior to City's entry upon the Property. The insurer under such policy shall agree not to cancel, materially change or fail to renew the coverage provided by such policy, without first giving DTE thirty (30) days advance written notice. The City also agrees that this insurance policy is primary to any potentially applicable insurance carried by or arranged for DTE and its subsidiaries.

Comment: The intent of this change is to clarify the insurance requirements for the selected consultant.

Appendix B Add Appendix B, which includes the Geotechnical Investigation Report and Summary of Pedestrian Bridge and Walkway Stability Evaluation

Comment: The intent of this addition is to provide further project information to prospective consultants.

II. QUESTIONS AND ANSWERS

The following Questions have been received by the City. Responses are being provided in accordance with the terms of the RFP. Respondents are directed to take note in its review of the documents of the following questions and City responses as they affect work or details in other areas not specifically referenced here.

Question 1: Are any of the firms that have been involved in prior related work, restricted from providing a proposal for this job?

Answer 1: Yes. OHM and Bergmann & Associates will not be submitting proposals.

Question 2: Please confirm the construction engineer’s soil erosion inspection role. At the pre-bid meeting it was discussed the City would be responsible for daily inspections, providing certified storm water operators and NPDES inspections and documentation. Items 5.r and 5.s (page 18) identify that as the construction engineer’s responsibility. Can we assume the construction engineer’s responsibility will be for MDOT documentation only?

Answer 2: No. The Consultant is expected to provide a construction inspector that is a certified Storm Water Operator who shall inspect the construction site every 7 days or within 24 hours of a rain event and provide the necessary documentation including MDOT form 1126.

At the Pre-proposal meeting it was mentioned that the City of Ann Arbor is a Local Enforcement Agency for Soil Erosion and Sedimentation Control. City of Ann Arbor Stormwater staff will perform the required spot inspections and documentation review for this project.

Question 3: Please confirm that the City will contract materials testing and fabrication inspections separately and the construction engineer's role is to coordinate and review the testing and reports only?
Answer 3: It is our intent that the Consultant (or sub-Consultant) will be responsible for all of the necessary construction materials testing and fabrication inspection as outlined in task 6 found on page 18 of the RFP.

Question 4: Will the City provide a meeting space for the community workshops free of charge and assist with staffing?
Answer 4: The City of Ann Arbor will work with the Consultant to find a suitable meeting space. It is expected that the Consultant Engineer will lead the meetings.

Question 5: If local flyers are the construction engineer's role, how and to whom are they to be distributed?
Answer 5: The City of Ann Arbor will work with the Consultant to identify the necessary project stakeholders and will assist in the distribution of the flyers.

Question 6: If a project specific website is the construction engineer's role, can we assume that this will be a separate project page on the City's website and the construction engineer's role is to provide information and photos for the City's website manager to post?
Answer 6: The Consultant may elect to use the City's website and will be given permission to post the necessary updates and photos.

Question 7: Will the sign-in sheet for this meeting be made available?
Answer 7: Yes, it is included in this Addendum.

Question 8: If a consultant has a general engineering services contract with MDOT Office of Rail, would the city consider this a conflict of interest?
Answer 8: No.

III. PRE-PROPOSAL MEETING NOTES AND SIGN-IN SHEET

The Pre-Proposal Meeting Notes and sign-in sheet are attached.

Respondents are responsible for any conclusions that they may draw from the information contained in the Addendum.

APPENDIX B: GEOTECHNICAL INVESTIGATION REPORT AND SUMMARY OF PEDESTRIAN BRIDGE AND WALKWAY STABILITY EVALUATION

Geotechnical Investigation Report
City of Ann Arbor
Allen Creek Railroad Berm Opening
Engineering and Assistance
Rev. 1

Prepared for

Bergmann Associates
7050 W. Saginaw Highway, Suite 200
Lansing, MI 48917

October 2017

Prepared by

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cti

Protecting, Enhancing, and Restoring Our Environment

October 25, 2017

Mr. Jeremy Hedden, PE
Project Manager
Bergmann Associates
7050 W. Saginaw Highway, Suite 200
Lansing, MI 48917

RE: Geotechnical Investigation
Allen Creek Railroad Berm Opening
Ann Arbor, Michigan
CTI Project No. 3172040002

Dear Mr. Hedden:

As requested, CTI and Associates, Inc. (CTI) has completed a geotechnical investigation for the proposed development at Allen Creek Railroad Berm in Ann Arbor, Michigan. The enclosed report presents the results of our findings and an engineering interpretation of these with respect to the soil related phases of the project, including preliminary recommendations for excavation, foundation design, backfilling, and groundwater control.

The native subgrade soils generally consist of sandy gravel or silty clay. The observations and analysis resulting from our investigation indicate that the subject sites are considered suitable for the proposed storm culvert and pedestrian undercrossing utilizing conventional design methods. However, organics, areas of fill, and medium dense sand and gravel were encountered, which may require some improvement depending on the actual storm culvert and pedestrian undercrossing configuration.

We appreciate the opportunity to be of service to you on this project. If you have any questions regarding this report or if we can be of further assistance, such as providing field monitoring and quality control inspection services during construction, please contact our office.

Sincerely,

CTI and Associates, Inc.

ASpears

Amber Spears, E.I.T.
Staff Engineer

Kevin Foye, Ph. D., P.E.
Senior Engineer

CITY OF ANN ARBOR

ALLEN CREEK RAILROAD BERM OPENING

GEOTECHNICAL INVESTIGATION REPORT

OCTOBER 2017

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CITY OF ANN ARBOR

ALLEN CREEK RAILROAD BERM OPENING

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1. INTRODUCTION

1.1 General

Upon authorization from Bergmann Associates (Bergmann), CTI and Associates, Inc. (CTI) conducted a geotechnical investigation of three areas (designated as DTE Gas Site, Allen Creek Railroad Berm, and 201 Depot St. Parking Lot) located at or near the Allen Creek Railroad Berm (Site) in the City of Ann Arbor, Michigan. The following report contains a description of the geotechnical investigation performed in April 2017 and is divided into the following sections.

- Section 2 – Site and Project Characteristics
- Section 3 – Investigation Procedures
- Section 4 – General Subsurface Conditions
- Section 5 – Analysis and Recommendations

1.2 Purpose and Scope

The purpose of this investigation was to determine the general subsurface conditions at three areas by drilling test borings and to provide preliminary design and construction recommendations. As part of the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant, an assessment of existing conditions was necessary for future development. The evaluations and recommendations discussed in this report are based on the soil conditions encountered in the test borings performed at the specific boring locations, and on the date indicated on the boring logs. The soil conditions may vary at locations other than the actual soil boring locations. These variations may not become evident until the time of construction.

CTI's authorized scope of services included a geotechnical study of the Site and did not include an environmental assessment for determining the presence or absence of hazardous or toxic materials in the soil or groundwater at, below, or around the Site. However, during the study, CTI engineers noted the following significant information:

- Some soil samples exhibited unusual color.
- The project site was identified as a former MichCon manufactured gas plant – that is currently owned by DTE Gas.

- Verbal communications with a representative from TRC, a company who serves as a consultant to DTE, identified environmental concerns, including possible soil contamination.

Any statement contained within this report or presented on the soil boring logs regarding possible contamination, odors, colors or unusual items are strictly for informational purposes only. If any further recognized environmental concerns are identified for this Site, the evaluations and/or recommendations presented in this report may require amendment.

2. SITE AND PROJECT CHARACTERISTICS

2.1 Site Conditions

Figure 1 presents the three areas within the scope of this project: vacant grasslands, a railroad berm, and a parking lot. As shown in Figure 1, the DTE Gas Site consists of vacant grasslands within 200 feet of Allen Creek. Allen Creek Railroad Berm is currently owned by MDOT and operated by Amtrak as an active railroad with daily passenger service. 201 Depot St. Parking Lot is a parking lot adjacent to a multi-business facility. An abandoned trestle bridgeand a protected[1] tree are located on this site. These areas are bounded to the west and east by Broadway St. and N. Main St. (Bus. US 23B), and to the north and south by Allen Creek and Depot St., respectively.

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[1] The protected tree is dedicated to someone (name unknown). It is located northwest of B-5, in the vicinity of the four parking spaces just west of the trestle bridge.

Figure 1. Project Area including DTE Gas Site, Allen Creek Railroad Berm, and 201 Depot St. Parking Lot

2.2 Project Description

In the vicinity of the railroad berm near the mouth of Allen Creek, just west of Ann Arbor Amtrak Station, the overland drainage flow pattern is perpendicular to the berm. It is understood that the City of Ann Arbor proposed to lower the floodplain in this area to mitigate the flooding threat to nearby homes and businesses.

Based on the information provided to CTI, we understand the proposed project will include the construction of a culvert (flow invert elevation 762.42±) below the MDOT railway to accommodate the passage of flood-waters and to allow pedestrians to cross the railway safely via an underground tunnel (pedestrian surface elevation 764±).

It was originally proposed to temporarily remove and re-align the railway (construct a "shoo-fly") to permit continuous train passage during the construction activities. It is currently proposed to eliminate the shoo-fly and construct a new culvert structure during a short term closure (12-16 hours) and restore the rail tracks. Pathways and retaining walls will also be constructed as part of the overall work, but would be constructed outside of the track closure time, and would be completed with live train traffic. It is currently proposed to use soil data to assist with the design of the culvert foundations, pathways and retaining walls.

3. INVESTIGATION PROCEDURES

3.1 Field Investigation

The field investigation consisted of performing 5 soil borings between April 10, 2017 and April 11, 2017. A summary of the boring locations has been included in Appendix A. The division of the boring locations between the three areas is presented in Table 1.

Table 1. Field Investigation Summary

Location	Railroad Berm	DTE Site	Parking Lot
No. of Borings	1	3	1
Depth of Borings (ft.)	60	20	50

The borings were backfilled using bentonite slurry, bentonite pellets, and soil cuttings. However, Borings B-2 through B-5 were not backfilled using soil cuttings, as the soil cuttings were placed in drums and transported to the DTE Gas Site parking lot. The number and general locations of the borings were selected by Bergmann in consultation with DTE. Miss Dig and private utility locators provided buried utility clearance information for each location. Some locations were adjusted laterally in the field by 10 to 15 feet so that the borings were drilled closer to the proposed culvert location identified in the field by OHM surveyors. The proposed boring locations were marked in the field by CTI. Ground surface elevations at the boring locations were provided by OHM and are included in the boring logs presented in Appendix B and Appendix A.

The drilling operations were performed under the direction of CTI personnel by Stearns Drilling, Inc. (Stearns). The soil borings were advanced using hollow-stem augers. Soil samples were obtained at intervals of 2½ feet by the Standard Penetration Test Method (ASTM D1586), whereby a 2-inch outside diameter split-barrel sampler is driven into the soil with a 140-pound weight falling freely through a distance of 30 inches. For borings located on concrete pavement, the first soil sample was collected beyond the full depth of the pavement.

The sampler is generally driven three successive 6-inch increments, with the number of blows for each increment being recorded. The combined number of blows required to advance the sampler the second and third 6-inch increments is termed the Standard Penetration Resistance, N. The soil samples obtained with the split-barrel sampler were sealed in glass jar containers and transported to CTI's laboratory for further classification and testing.

Soil and groundwater conditions observed in the test borings were evaluated and are presented on the Borings Logs included in Appendix B. To aid in understanding the data presented on the boring logs, "General Notes for Soil Classification," describing nomenclature used in soil descriptions, are included in Appendix C.

3.2 Laboratory Testing

The laboratory testing program was directed towards determining the general soil classification and physical properties of the soil pertinent to excavation, foundation pre-design, and site preparation. All laboratory testing was performed in general accordance with applicable ASTM test method standards. The laboratory testing included –

- Visual soil classification of every sample (ASTM D2488)
- Moisture content tests on selected samples (ASTM D2216)
- Atterberg limits testing on representative samples (ASTM D4318)
- Sieve Analysis of selected samples (ASTM D6913)

The soil samples were visually classified in general accordance with the Unified Soil Classification System (USCS). The estimated USCS group symbol is shown in parentheses following the written description of the various natural strata on the test boring logs. The results of all laboratory tests are indicated on the boring logs at the depths the samples were obtained and/or on the "Summary of Laboratory Test Results" included in Appendix D

4. GENERAL SUBSURFACE CONDITIONS

The following subsections present generalized soil and groundwater conditions encountered at the Site based on the available test borings. For the purposes of this report, we will only describe the properties of the near-surface materials and the gravel and clay layers. For a more detailed description of the subsurface conditions encountered at the site, please refer to the individual soil boring logs and the Summary of Boring Locations provided in Appendix B and Appendix A, respectively.

4.1 Soil Conditions

4.1.1 Major Materials Encountered

Many different materials were encountered during the subsurface investigation. While there is variation in composition and engineering properties between individual samples, the material encountered can be divided into the following major categories.

Topsoil – Approximately 6 to 12 inches of topsoil was encountered at all borings performed in the grass. At these borings, trace organics were encountered at deeper depths.

Fill – Below the topsoil, a layer of fill was typically encountered with thickness ranging from 4.5 feet to up to 29.5 feet. Types of fill included clean sand, silty, and gravelly sand. In one instance, fill was encountered below topsoil and black fibrous soil (possibly peat) and silty sand in Boring B-4 of the DTE Gas Site. A representative of TRC, a consultant to DTE, provided information that a 30-foot-wide cap was placed on the DTE Gas Site adjacent to the bank of Allen Creek to prevent dense non-aqueous phase liquid (DNAPL) from getting into Allen Creek. Fill encountered was often wet.

Organics – Organics were encountered in surficial material and/or within deeper layers of the subsurface, often in trace amounts.

Sand- A layer of sand was encountered at a depth of 15 feet throughout the DTE Gas Site. The thickness was 5 feet, to the end of the boring depth. The sand was medium dense, with an N-value ranging from 14 to 18. Types of sand included gravelly sand. Sand encountered was wet.

Gravel – A layer of gravel was encountered at varying depths throughout the Site, with thickness ranging from 4.5 feet to 15.5 feet. The gravel was medium dense to very dense, with an N-value ranging from 10 to 74. Types of gravel included sandy gravel (GP) and clean gravel (GP) with occasional sand layers and trace to some amounts of silt, sand, gravel, and cobbles. Cobbles were not retrieved in samples but likely encountered at locations where the split spoon could not penetrate the full 18”. Gravel encountered was wet.

Clay – A layer of clay was encountered at depths greater than 30 feet throughout the Site, with thickness ranging from 16.5 feet to 25 feet. The silty clay was hard in consistency, with an N-value ranging from 50 to 91. The clay encountered was silty clay (CL-ML) with frequent silt partings and trace to some amounts of silt, sand, gravel, and cobbles. Clay encountered was moist.

Laboratory testing on selected samples revealed additional properties of the silty clay layer. Moisture content values are consistently 7%. Atterberg limits confirmed that the silty clay has a low plasticity.

The above subsurface description is of a generalized nature, and is intended to highlight the major stratification features and material characteristics. The individual test boring logs should be reviewed for specific information. The stratification depths shown on the test boring logs represent the soil conditions at the actual boring locations only. Variations may occur between and/or beyond the boring locations. The nature and extent of any variations may not become evident until the time of construction. If significant variations in the soil conditions are discovered during construction, it should be immediately brought to the attention of CTI.

Table 2. Summary of Soil Data from Boring Logs

Category	Depth to top of layer (ft.)	Thickness range (ft.)	q_p* (tsf)	Consistency Range
Fill	0.5-1	4.5-29.5	-	-**
Sand	15	5	-	Medium Dense
Gravel	5-30.5	4.5-15.5	-	Medium Dense-Dense
Clay	33.5– 35	16.5– 25	4.5+	Hard

* q_p - Pocket Penetrometer reading for cohesive soils.

** Consistency/Relative Density of fill is not provided due to the variable nature of fill.

4.2 Groundwater Conditions

At most of the boring locations, the groundwater was detected at depth of 6 feet or shallower (between el. 762.9 ft. to 763.9 ft.). One exception, Boring B-1, encountered groundwater at 15 feet (el. 760.8), with samples below this depth encountered in a wet or moist condition. However, the short-term groundwater level observations from the borings are not necessarily indicative of the static, long-term groundwater conditions. The presence of Allen Creek (NWL approx. el. 762.5 ft) suggests that the short-term groundwater level observation and long-term groundwater condition are similar.

The short-term piezometric levels have been summarized in Table 3 based on the conditions encountered within the test borings.

Table 3. Summary of Groundwater Conditions at Site

Boring	Water level (ft./el. ft.)*	Water level (ft./el. ft.)**	Cave In Depth (ft./el. ft.)**
B-1	15/760.8	13/762.8	-
B-2	4.8/762.9	4.8/762.9	5.9/761.8
B-3	5/763.2	4/764.2	7.5/760.7
B-4	5/763.9	5/763.9	5/763.9
B-5	6/763.2	5/764.2	-

* Where observed and recorded during drilling

** Where observed and recorded after drilling

The groundwater conditions discussed herein and indicated on the soil boring logs represent those encountered at the time of the field investigation. The groundwater levels, including perched groundwater accumulations, should be expected to fluctuate seasonally, based on variations in precipitation, evaporation, surface run-off and other factors not evident at the time of our investigation. The actual groundwater levels at the time of construction may vary from those provided herein.

The above soil and groundwater conditions represent a generalized summary of the subsurface conditions and material characteristics. The individual Boring Logs and Boring Location Plan should be reviewed for specific information and details relating to specific areas of the site.

5. PRELIMINARY ANALYSIS AND DESIGN RECOMMENDATIONS

At the time this report was prepared, the overall project was in the planning and design stage. Therefore, flow invert and pedestrian surface elevations for the storm and pedestrian culvert, respectively, pathways, the outflow channel, and retaining walls have been defined. The following recommendations were developed based on the previously assumed/described project characteristics and subsurface conditions. As the design progresses and if the culvert locations and configurations are modified, the Architect and Owner should be aware that additional borings and/or test pit excavations may be required within the culvert footprints to verify the soil conditions and to determine if changes are required to the excavation, foundation design, backfilling and groundwater control recommendations presented herein.

5.1 Suitability of Existing Subgrade

In general, the three areas at or near the Site can be made suitable for the proposed storm and pedestrian culverts. However, contaminated areas within the DTE Gas Site are unsuitable. DTE Gas should be consulted for possible restriction on the use of the site, especially with respect to excavation and construction activities. Additionally, at multiple boring locations during the field investigation, indications of poor subgrade conditions were observed. These indications included:

- Highly variable quality of uncontrolled fill
- presence of organics in the subgrade

In general, the subgrade was highly variable with depth and type of uncontrolled fill as shown in Appendix B. Uncontrolled fill can be typical of previously developed land, and is permissible when designing structures that are likely to induce negligible differential settlement. The scope of this project will include structures, such as a storm culvert and pedestrian culvert, that will be constructed entirely below existing grade, which will tend to minimize total settlement. However, due to the variable subgrade, these structures could generate significant differential settlement under poor conditions. Low blow counts in the uncontrolled fill for all areas were encountered. Trace amounts of organics were encountered in most borings, primarily within the surficial or fill layers. Therefore, these layers were deemed unsuitable for expected final depths of foundations without some improvement. The lateral extent of poor subgrade conditions at any of the boring locations is unknown. Replacement of areas of poor subgrade conditions beyond boring locations may be necessary in unexplored areas to limit pavement, structural, or other types of distress in the area of the storm culvert, pedestrian culvert, and pedestrian pathway.

5.2 Site Preparation

At the start of earthwork operations, all existing vegetation, surficial topsoil, and any other deleterious materials should be removed in their entirety from the proposed culvert footprints on the north and south sides of the Allen Creek Railroad Berm. The presence and thickness of topsoil and/or unsuitable soils may vary across the site. The topsoil should be properly stockpiled for use in landscaping and to avoid contamination with any soils to be used as engineered fill and soil to be disposed. The depth of unsuitable soil to be removed should be determined by a qualified geotechnical engineer at the time of stripping and rough grading.

For the culvert foundations, footpath areas, and pavements, the following options for subgrade preparation are possible. Where uncontrolled fill or greater than trace amounts of organic-containing soils are not present, the subgrade soils should be prepared in accordance to “Alternative A,” presented below. In the areas where uncontrolled fill and organic soils are present, several alternatives for subgrade preparation present themselves, each associated with a different level of risk concerning the performance of on-grade structures.

5.2.1 Alternative A – Proofrolling

Proofrolling is a subgrade preparation method where the surficial topsoil, pavement and other deleterious materials are stripped, but little to no additional undercutting is performed. Proofrolling is the most economical subgrade preparation alternative. Proofrolling should only be used in areas where appropriate access and absence of the groundwater table permit its use. However, where uncontrolled fill or greater than trace amounts of organic-containing soils are present, preparing the subgrade soils by proofrolling alone has the greatest risk with regard to poor performance of on-grade structures.

In this alternative, after rough grade has been achieved in cut areas and prior to fill placement in fill areas, the exposed subgrade should be thoroughly proofrolled. Proofrolling should be performed with a heavily loaded front-end loader, tandem-axle dump truck or other suitable rubber-tired vehicles. The purpose of proofrolling operations is to locate areas of excessively loose, soft or weak subgrade soils which may be present at the time of construction. Soils that are observed to rut or deflect excessively during proofrolling should be stabilized by conventional methods such as disking, drying, and re-compacting.

As stated previously, there is an elevated risk of poor performance where on-grade structures are supported over uncontrolled fill and/or organic-containing soils. This subgrade preparation alternative generally has the lowest initial cost, but could have increased long-term costs depending on future settlement of the subgrade.

Additional stabilization of any below grade structures’ subgrade soils is anticipated to be necessary. We recommend a layer of crushed stone be placed below the culvert slabs and pathway pavement to provide a working platform for construction and to provide additional protection of the subgrade soils. Depending on the conditions encountered during excavation, some measure of undercutting may also be necessary.

Where soil stabilization is required, any required geotextile fabric and/or crushed aggregate should be placed at an elevation below the proposed pavement.

5.2.2 Alternative B – Partial-depth Undercut of Existing Fill

If it is not feasible to dry and re-compact the unsuitable subgrade soils that have uncontrolled fill or trace amounts of organic-containing soils due to unfavorable weather conditions, scheduling, etc., it may be necessary to remove such soils and replace them with engineered fill. The thickness of the undercut will depend on the severity of the unstable soils encountered at specific locations. If significant subgrade instability is observed, or the unstable soils are in the vicinity of the groundwater table, a layer of self-compacting crushed aggregate may be necessary to stabilize the subgrade before placement of the selected engineered fill material. The use of a woven geotextile material below the crushed aggregate layer could also be considered to provide additional subgrade stability.

In general, the more unsuitable soils that are removed and replaced with controlled fill, the lower the risk of subgrade settlement and the resulting poor performance of slabs. Therefore, another subgrade preparation alternative that should provide improved performance over proofrolling alone is performing a partial-depth undercut of the existing uncontrolled fill or organic-containing soils and re-establishing the design subgrade elevation by placing engineered fill. If significant settlement of the organic-containing soils occurs, it could result in cracking and distress of the culvert slabs and pathway pavement.

With this alternative, the unsuitable soils should be removed to a predetermined depth. Following the undercutting operations, the resulting subgrade soils should be stabilized. After any necessary subgrade stabilization measures, the site should be raised to the design subgrade elevation with engineered fill. The engineered fill should be placed and compacted as described in Section 5.3 of this report.

This subgrade preparation alternative will provide a predetermined thickness of controlled fill beneath the on-grade structures. This layer of controlled fill will likely provide a more uniform subgrade support of slabs than proofrolling alone. CTI suggests a minimum undercut of 18 inches in the culvert slab areas considered below the design subgrade elevation where unsuitable soils are present. However, site conditions at the time of construction may require undercutting to greater depths than the suggested minimum undercut depths.

Partial-depth removal of the uncontrolled fill and organic-containing soils and replacement with controlled, engineered fill should reduce the risk and degree of differential settlement-related problems that may affect below grade structures. However, it should be understood that this alternative does not eliminate the risk of slab distress associated with the settlement of the uncontrolled fill or organic-containing soils that may remain in place.

5.2.3 Alternative C – Full-depth Undercut of Existing Organic-containing Soils

This alternative involves completely removing any existing uncontrolled fill and/or organic-containing soils from below the building pad and pavement areas. This alternative minimizes the risk of poor performance of on-grade structures related to settlement of the existing unsuitable soils by removing them in their entirety.

Following the removal of the uncontrolled fill or organic-containing soils, the resulting subgrade soils should be proofrolled as outlined in a previous section. After completion of the proofrolling operations and any necessary subgrade stabilization measures, the site should be raised to the design subgrade elevation with engineered fill. The engineered fill should be placed and compacted as described in Section 5.3 of this report.

This alternative has the highest initial cost of each of the subgrade preparation alternatives presented herein, but likely has the lowest long-term maintenance/repair costs. As the final design is developed with regard to culvert slabs and pathway pavement, the Owner must elect the subgrade preparation alternative that meets their performance and budget requirements.

5.3 Fill Materials and Compaction

Once the site has been evaluated, proofrolled and/or stabilized, the inspected area should not be allowed to remain exposed to wet conditions more than one day or subjected to construction traffic, otherwise a re-evaluation should be made. The site earthwork operations should be carried out during a period of dry weather, if possible. This should minimize potential subgrade problems, although they may not be eliminated. The severity of subgrade instability will depend to a high degree on the weather conditions prevailing during construction.

After subgrade preparation and observation have been completed, engineered fill placement may begin. Any fill placed below the proposed foundation, culvert slabs, or pathway pavement areas should be an approved material that is free of topsoil, organics, frozen soil or any other unsuitable material.

If clay soils or granular soils containing greater than 12 percent clay are used as fill, with an exception to a specific zone of the retention wall backfill, close moisture content control will be required to achieve the recommended degree of compaction. Cohesive fill materials should be low to medium in plasticity, with a liquid limit less than 40 and plasticity index less than 20. It should be noted that wet cohesive soils are difficult to compact and that the specified compaction may not be achieved. Wet cohesive soils may require drying or mixing with dry soil to facilitate compaction. If water must be added to dry soil, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying.

The engineered fill should be placed in uniform horizontal layers not exceeding 8 to 12 inches in loose thickness for clean granular soils and 4 to 6 inches in loose thickness for clay soils (or clayey granular soils exhibiting cohesive characteristics), depending on the type and size of compaction equipment used. The lift thickness for sands that have an appreciable amount of fines should be decreased accordingly. The engineered fill should be compacted to achieve a density of not less than 95 percent of the maximum dry density as determined by the Modified Proctor Compaction Test (ASTM D 1557). Also, the upper 12 inches of the subgrade soils should be compacted, prior to any fill placement, to achieve a density of not less than 95 percent of the maximum dry density as determined by the Modified Proctor test. The as-compacted moisture content of the engineered fill should be within 2 to 3 percent of the optimum moisture content for the soil, as determined by the Modified Proctor test. The placement and testing of engineered fill should be observed and properly documented in the field by CTI.

We recommend that the contract specifications include provisions for moisture conditioning of any on-site soils that are to be used as engineered fill. Some of the native soils may require moisture conditioning to allow for proper compaction. The success of aeration and drying of clay soils will be dependent on the time of year, the prevailing weather conditions and the contractor’s effort. During cold and/or wet periods of the year, the saturated or disturbed clay soils will be more difficult to dry. In this case, the contractor may have to use drier on-site soils or imported sand.

If site grading or other construction activity is planned during cold weather, it is recommended that proper winter construction practices are followed. All snow and ice should be removed from cut and fill areas prior to grading. Frozen materials should not be used as engineered fill and no fill, footings, slabs or pavement should be placed on soils that are frozen or contain frozen material.

5.4 Preliminary Foundation Recommendations

The following foundation recommendations are preliminary in nature and based on the loading assumptions presented in Section 2.2 of this report. Once the plans for the proposed development progress, the subsequent design analysis should incorporate the topographic information (existing ground surface at the boring locations in relation to the flow invert and pedestrian surface elevation) and the actual structural loads. Due to the relatively neutral change in subgrade loading due to the proposed below-grade storm culvert and construction, we anticipate that the foundation design will be controlled primarily by considerations of stable foundation working surface conditions. Uneven compression of the foundation soils during and after construction could result in significant differential settlement. Foundation preparations for the storm culvert should consider the subgrade preparation recommendations presented above. Maximum reduction of differential settlement potential can be achieved through the use of deep foundations.

5.4.1 Deep Foundations

This foundation system will transfer the foundation loads to competent soils underlying the areas of medium dense sand and medium dense to dense gravel encountered. Individual drilled pier foundations bearing on the hard clay soils may be proportioned for a maximum net allowable bearing pressure of 3,500 psf. Based on limited field testing, the maximum average undrained shear strength is 2,250 psf for hard clay from depths 33.5 ft. to 60 ft. (between el. 740.8 ft. and 715.8 ft). Additional load carrying capacity will be available in side shear. Appropriate factors of safety should be used for design. We recommend a minimum factor of safety of 2.0 be applied to side shear.

Cobbles are suspected to be within the gravel layers encountered within the test borings. Cobbles and boulders may be encountered during the larger diameter drilled pier excavation. The contractor should come to the site prepared to break up and/or remove cobbles and boulders if they are encountered.

A positive head of concrete should be kept in the casing prior to pulling the casing, to reduce the risk of soil and groundwater outside the casing from contaminating the concrete in the shaft and causing the shaft to "neck". After the drilled pier has been completed to near the proper elevation with an appropriate head of concrete, the temporary casing can be withdrawn during simultaneous concrete placement. The drilled pier concrete must be placed in such a way that the reinforcing steel is not shifted laterally or vertically.

To reduce lateral movement of the drilled pier, the contractor must place the pier concrete in intimate contact with undisturbed natural soil. Any voids or enlargements in the drilled pier excavation should be filled with concrete at the time of drilled pier concrete placement.

The potential for concrete arching may be reduced and a workable material may be provided by using a concrete mix designed for a slump of 5 to 7 inches. For concrete placed by tremie methods, the concrete mix should be designed for a slump of 7 to 9 inches.

5.5 Pathway Pavements

The subgrade soils for support of the pathway pavement (pavement) sections should be prepared as indicated in Section 5.1 of this report. As discussed previously, we recommend the subgrade be subjected to a comprehensive proofrolling and evaluation program to determine the overall suitability at the time of construction. The Owner must be willing to accept an elevated risk of slab and/or pavement distress if the pavement is grade supported and the existing uncontrolled fill or organic-containing soils are not entirely removed from the pavement areas. The areas requiring subgrade improvement should be determined in the field by CTI by proper inspection and evaluation at the time of construction. Provisions should be established in the construction documents for this purpose.

The long-term performance of the pavement will typically be a function of the quality of the subgrade soil at the time of construction along with the quality, thickness and strength of the overall pavement section. The most critical portion of the subgrade is the 3 feet immediately beneath the pavement section, which provides the primary strength needed for pavement section support. Uncontrolled fill materials present within the upper 2 to 3 feet of the pavement subgrade can be detrimental if the design does not account for this substandard soil condition, especially during the spring freeze-thaw cycles.

The pavement system should be properly drained to reduce the potential for weakening the subgrade. Provisions should be made to prevent surface run-off water from accumulating within the aggregate base course of the pavement. The pavement and underlying subgrade should be suitably crowned or sloped to promote effective surface drainage and prevent water ponding. Due to the relatively low permeability of the soils encountered at this site, finger drains should be installed at all catch basin locations to provide drainage for surface water that may become trapped in the pavement aggregate base section. Perimeter drainage systems will also be necessary.

It should be recognized that all pavements require regular maintenance and occasional repairs to keep them in a serviceable condition. Of particular value, is timely sealing of joints and cracks, which if left un-repaired, can serve to permit water to enter the pavement section and cause rapid deterioration of the pavement during freeze-thaw cycles. The need for such routine maintenance and repair is not necessarily indicative of premature pavement failure. However, if appropriate maintenance and repairs are not performed on a timely basis, the serviceable life of the pavement can be reduced significantly.

Actual pavement section thickness should be provided by the design civil engineer based on the selected subgrade preparation method, traffic loads and volume and the owners design life requirements. All pavement materials and procedures should conform to standard MDOT or appropriate local municipal agency requirements.

6. GENERAL CONSTRUCTION PROCEDURES/RECOMMENDATIONS

6.1 General

Experience indicates that variations in soil conditions are encountered during construction. In order to permit correlation between the soil boring data and the actual soil conditions encountered during construction, it is recommended that a continuous inspection and review of the soil related phases of construction work be carried out. We recommend the site preparation activities, engineered fill placement and foundation construction be observed by a qualified engineering technician. The technician should perform the appropriate type and number of field tests needed to verify compliance with construction specifications and that the foundation bearing material is suitable.

The silty and clayey soils encountered at the boring locations could be potentially troublesome for some earthwork operations, depending on the prevailing moisture content. These soils have relatively poor drainage characteristics and are susceptible to ponding, subsequent softening and pumping due to construction traffic. During a wet season or periods of heavy precipitation, the subgrade soils with high moisture contents may become unstable and provide limited support for some rubber-tired construction equipment. If pumping of the subgrade occurs due to construction traffic, an evaluation of the site and construction procedures should be made by a geotechnical engineer.

6.2 Foundation and Utility Excavations

In general, all excavations should be safely sheeted, shored, sloped or braced in accordance with OSHA guidelines. Construction traffic, stockpiles of soil and construction materials should be kept away from the edges of the excavations a lateral distance at least 1.5 times the depth of the excavation.

Utility excavations are generally expected to consist of open-cut methods. In this regard, the utility trench sidewalls should be adequately braced or sloped back to prevent sloughing and caving. In any case, appropriate measures will be required to maintain the stability of excavation sidewalls. The required measures will depend on the depth and width of excavations and groundwater conditions at specific locations. The excavation support system for utilities could consist of internally braced sheeting, trench boxes or sliding trench shields. If material is stored or equipment is operated near an excavation, stronger shoring must be used to resist the extra pressure due to the superimposed loads.

The angle of the excavation side slopes should be decided based on the soil type and unconfined compressive strength of the excavated soil per MIOSHA requirements. For excavations greater than 5 feet and less than 20 feet in depth, MIOSHA has different sloping requirements for a variety of soil types.

Table 4 provides a summary of the requirements for informational purposes only. Prior to designing or constructing a stable and safe excavation, the contractor must refer to MIOSHA standards.

Table 4. Maximum Allowable Angle of Repose for the Side of an Excavation

Soil Type	**Maximum Allowable Excavation Side Slope**		**Maximum Angle of Repose (Degrees)**
	Horizontal	**Vertical**	
Clay with minimum unconfined compressive strength of 2.5 tsf	1	2	63
Clay with minimum unconfined compressive strength of 1.5 tsf	2	3	56
Clay with minimum unconfined compressive strength of 1.0 tsf; Dry granular soils; Dry sand and clay mixtures	1	1	45
Granular soil with wet clay or silt seams; Clay with a minimum unconfined compressive strength of 1.0 tsf that contains running sand seams	1½	1	34
Saturated granular soil; Clay with an unconfined compressive strength less than 1.0 tsf	2	1	26
Running/sloughing soil (sand or clay)	3	1	18

The contractor is solely responsible for designing and constructing stable and safe temporary excavations and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor should be aware that slope height, slope inclination and excavation depth should not exceed the specified local, state and federal regulations.

All foundation excavations should be inspected by a qualified person to ensure that any excessively loose, soft or otherwise undesirable materials are removed and that the foundations will bear on a satisfactory base. If loose, soft or disturbed soils are found in the footing excavations and it is not practical to lower the footings or mechanically improve the bearing soils, the proposed footing elevation may be reestablished by backfilling with lean concrete or crushed aggregate after the undesirable material has been removed. The thickness of the undercutting, if required, will depend upon the actual conditions encountered and the degree of disturbance observed.

Soils exposed in the bases of all satisfactory foundation excavations should be protected against any detrimental change in conditions such as disturbances from rain and freezing. Surface run-off water should be drained away from the excavations and not allowed to pond. If possible, all footing concrete should be placed the same day the excavation is made. If this is not possible, the footing excavations should be adequately protected.

6.3 Groundwater Control

Based on the observed groundwater conditions in the test borings, groundwater seepage would be encountered within general excavations throughout the project due the high short-term water level in close proximity to Allen Creek. Proper groundwater control measures should be maintained during all earthwork activities in order to limit the disturbance of the subgrade soils. These measures should include a provision of temporary drainage ditches to discharge any perched water outside the construction area.

For excavations to depths at or above the Allen Creek NWL (approx.. el. 762.5) it appears that groundwater accumulations should be controllable by conventional pumping methods from standard sump pits extending into the native clay soils.

For deeper excavations, a more significant dewatering effort may be required. An evaluation of the need for these dewatering efforts should be made once the design progresses.

The most appropriate method of groundwater control will depend on many factors including the actual design grades, locations/depths of excavations and the specific soil conditions. Any groundwater related problems should be evaluated in the field by a qualified geotechnical engineer so that the best remedial measures can be determined.

If variations in the reported soil conditions are encountered, CTI should be contacted immediately. In such a case, it may be necessary for CTI to reevaluate the recommendations of this report. Such a reevaluation may be possible from on-site observations or may require additional investigations. If any such variations are revealed, they may result in increased construction costs. A contingency should be provided in the project budget to accommodate such variations.

Note: This geotechnical investigation report is intended for the sole use of Bergmann and The City of Ann Arbor. The scope of services performed during this investigation may not be *appropriate to satisfy the needs of other users, and any use or re-use of this document or of the findings, conclusions or recommendations presented herein is at the sole risk of said user.*

CITY OF ANN ARBOR
ALLEN CREEK RAILROAD BERM OPENING
GEOTECHNICAL INVESTIGATION REPORT

Appendix A – Summary of Boring Locations

Summary of Boring Locations

Date of Boring	Site	Boring	Northing (ft)	Easting (ft)	Elevation (ft)	Depth of Boring (ft)	OHM Survey Points
4/10/2017	Railroad Berm	B-1	288251.038	13291421.07	775.776	60	SB#10013
4/10/2017	DTE Gas	B-2	288336.377	13291436.92	767.739	20	SB#5101
4/11/2017	DTE Gas	B-3	288375.771	13291438.13	768.229	20	SB#5100
4/11/2017	DTE Gas	B-4	288415.213	13291438.86	768.905	20	SB#5109
4/11/2017	Parking Lot	B-5	288221.252	13291310.7	769.219	50	SB#4161

CITY OF ANN ARBOR
ALLEN CREEK RAILROAD BERM OPENING
GEOTECHNICAL INVESTIGATION REPORT

Appendix B – Boring Logs

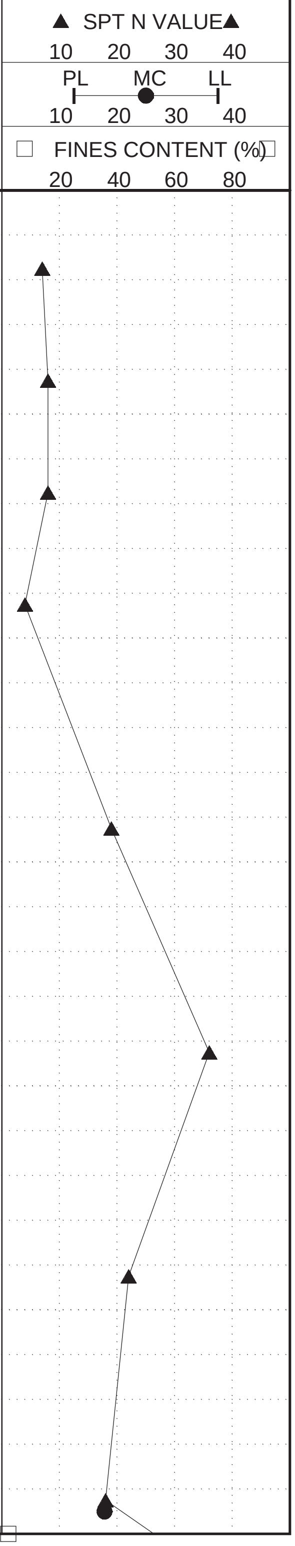
CTI and Associates, Inc.

BORING NUMBER: B-1

PAGE 1 OF 2

CLIENT Bergmann Associates
PROJECT NAME Allen Creek Railroad Berm Opening (Geo)
PROJECT NUMBER 3172040002
PROJECT LOCATION Ann Arbor, MI
DATE STARTED 4/10/17 **COMPLETED** 4/10/17
GROUND ELEVATION 775.776 ft +/-
DRILLING CONTRACTOR Stearns Drilling
GROUND WATER LEVELS:
DRILLING METHOD 4-1/4-inch HSA
▽ **DURING DRILLING** 15.00 ft / Elev 760.78 ft
LOGGED BY A. Spears **CHECKED BY**
▼ **AFTER DRILLING** 13.00 ft / Elev 762.78 ft
NOTES backfilled w/slurry to 13', soil cuttings + hole plugging clay thereafter
COLLAPSE DEPTH ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
775	0		1' of TOPSOIL					
			774.8					
			SILT FILL- black, with organics, some clay and gravel, an occasional brown medium to fine sand layer, moist	SS 1	89	5-4-3 (7)		
770	5			SS 2	89	2-4-4 (8)		
			768.3	SS 3	56	3-5-3 (8)		
			SAND FILL- brown, medium to fine, with gravel, trace silt and clay, moist to wet					
765	10			SS 4	72	3-2-2 (4)		
		▼						
760	15	▽		SS 5	78	5-8-11 (19)		
	20		755.8	SS 6	61	8-16-20 (36)		
755			SAND FILL- brown, medium to fine, trace silt, clay, and gravel, wet					
750	25			SS 7	39	3-10-12 (22)		
	30			SS 8	89	4-8-10 (18)		18



(Continued Next Page)

CTI and Associates, Inc.

BORING NUMBER: B-1

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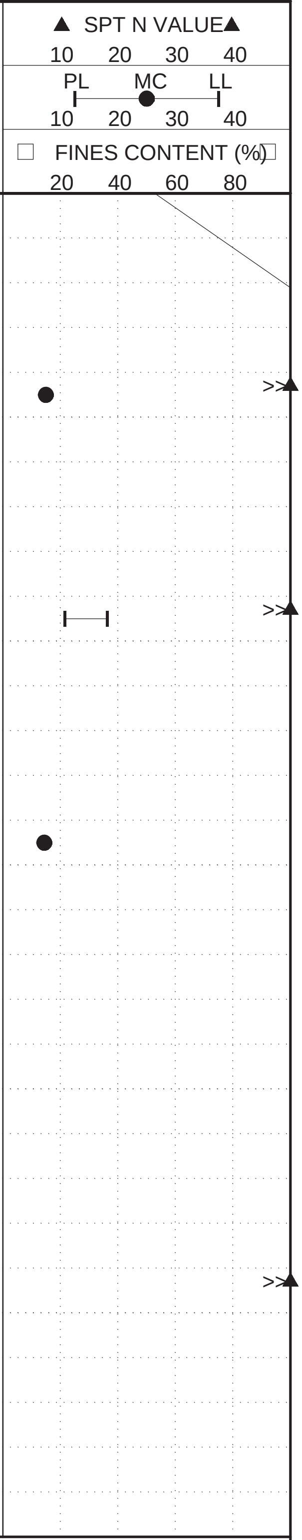
CLIENT Bergmann Associates

PROJECT NAME Allen Creek Railroad Berm Opening (Geo)

PROJECT NUMBER 3172040002

PROJECT LOCATION Ann Arbor, MI

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
745	30	745.3 GRAVEL (GP)- gray, coarse to fine, with medium to fine sand, trace silt and clay, very dense, wet					
	35		SS 9	39	22-44-30 (74)		7
740		740.8 SILTY CLAY (CL-ML)- gray, with gravel, some sand, frequent silt partings, hard, dry					
735	40		SS 10	67	14-41-50 (91)	4.5+	
730	45		SS 11	39	58-50	4.5+	7
725	50		SS 12	78	35-50	4.5+	
720	55		SS 13	100	23-41-50 (91)	4.5+	
	60	715.8	SS 14	19	48-50	4.5+	



Bottom of borehole at 60.0 feet. 7' north of nearest rail.
Raining and Lightening temporarily haulted drilling.

CTI and Associates, Inc.

BORING NUMBER: B-2

PAGE 1 OF 1

CLIENT Bergmann Associates

PROJECT NAME Allen Creek Railroad Berm Opening (Geo)

PROJECT NUMBER 3172040002

PROJECT LOCATION Ann Arbor, MI

DATE STARTED 4/10/17 **COMPLETED** 4/10/17

GROUND ELEVATION 767.739 ft +/-

DRILLING CONTRACTOR Stearns Drilling

GROUND WATER LEVELS:

DRILLING METHOD 4-1/4-inch HSA

▽ **DURING DRILLING** 4.80 ft / Elev 762.94 ft

LOGGED BY A. Spears **CHECKED BY**

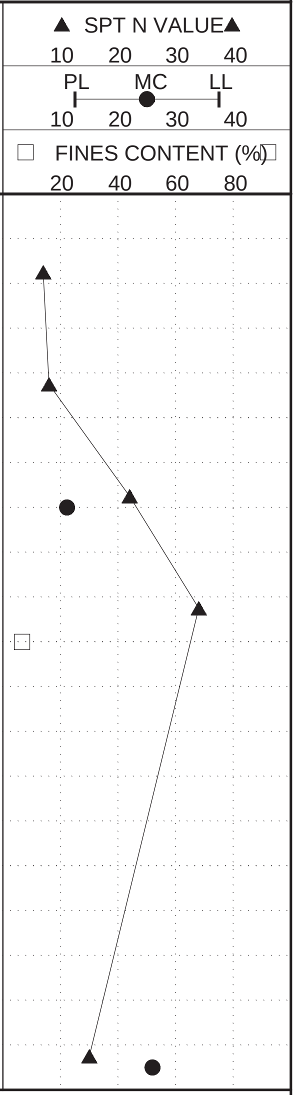
▼ **AFTER DRILLING** 4.80 ft / Elev 762.94 ft

NOTES backfilled w/hole plugging clay

▼ **COLLAPSE DEPTH** 5.90 ft / Elev 761.84 ft

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
767.2	0	6" of TOPSOIL					
762.7	5	SILT FILL- dark brown, some organics, sand, and gravel, moist	SS 1	67	3-4-3 (7)		
			SS 2	50	2-2-6 (8)		
752.7	15	SANDY GRAVEL (GP)- brown, trace silt and clay, dense to very dense, wet	SS 3	83	7-12-10 (22)		11
			SS 4	72	4-19-15 (34)		
			SS 5	0	48-50		
747.7	20	GRAVELLY SAND (SP)-brown, trace silt and clay, medium dense, wet	SS 6	100	3-7-8 (15)		26

Bottom of borehole at 20.0 feet. Soil cuttings were placed in drums.



CTI and Associates, Inc.

BORING NUMBER: B-3

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CLIENT Bergmann Associates

PROJECT NAME Allen Creek Railroad Berm Opening (Geo)

PROJECT NUMBER 3172040002

PROJECT LOCATION Ann Arbor, MI

DATE STARTED 4/11/17 **COMPLETED** 4/11/17

GROUND ELEVATION 768.229 ft +/-

DRILLING CONTRACTOR Stearns Drilling

GROUND WATER LEVELS:

DRILLING METHOD 4-1/4-inch HSA

▽ **DURING DRILLING** 5.00 ft / Elev 763.23 ft

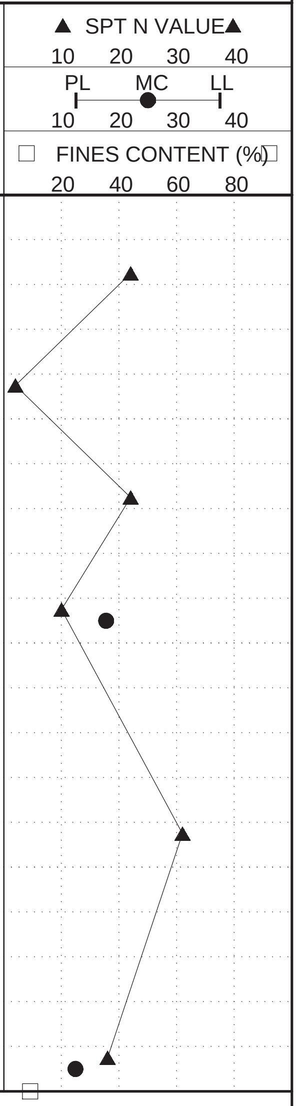
LOGGED BY A. Spears **CHECKED BY**

▼ **AFTER DRILLING** 4.00 ft / Elev 764.23 ft

NOTES backfilled w/hole plugging clay

▼ **COLLAPSE DEPTH** 7.50 ft / Elev 760.73 ft

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
	0		6" of TOPSOIL 767.7					
			SILT FILL- dark brown, some organics, sand, and gravel, trace asphalt, moist to wet	SS 1	67	5-6-16 (22)		
765			▼					
	5		▽ 763.2	SS 2	100	1-1-1 (2)		
			GRAVEL (GP)- brown, with silt and sand, medium dense, wet	SS 3	33	4-6-16 (22)		
			▼					
760								
	10			SS 4	89	3-3-7 (10)		18
755								
	15		753.2	SS 5	83	16-19-12 (31)		
			SAND (SP)- brown, medium to fine, some gravel, medium dense, wet					
750								
	20		748.2	SS 6	39	5-8-10 (18)		12



Bottom of borehole at 20.0 feet. Soil cuttings were placed in drums.

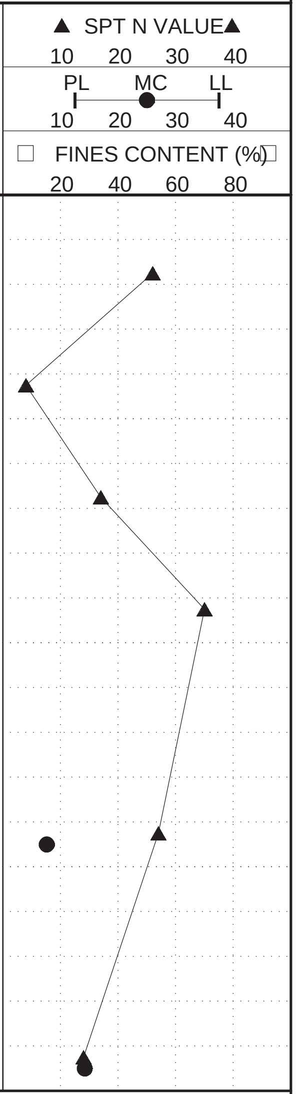
CTI and Associates, Inc.

BORING NUMBER: B-4

PAGE 1 OF 1

CLIENT Bergmann Associates
PROJECT NAME Allen Creek Railroad Berm Opening (Geo)
PROJECT NUMBER 3172040002
PROJECT LOCATION Ann Arbor, MI
DATE STARTED 4/11/17 **COMPLETED** 4/11/17
GROUND ELEVATION 768.905 ft +/-
DRILLING CONTRACTOR Stearns Drilling
GROUND WATER LEVELS:
DRILLING METHOD 4-1/4-inch HSA
▽ **DURING DRILLING** 5.00 ft / Elev 763.91 ft
LOGGED BY A. Spears **CHECKED BY**
▼ **AFTER DRILLING** 5.00 ft / Elev 763.91 ft
NOTES backfilled w/slurry to 5', hole plugging clay thereafter
▼ **COLLAPSE DEPTH** 5.00 ft / Elev 763.91 ft

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION		SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
	0	6" of TOPSOIL	768.4					
		SILT FILL- dark brown, some brick debris, organics, sand, and gravel, moist	766.4	SS 1	100	6-20-6 (26)		
765	5	CONTAMINATED FILL- black fibrous soil (possibly peat) to silty sand, some gravel, trace silt and clay, wet ▼		SS 2	94	2-1-3 (4)		
				SS 3	61	14-4-13 (17)		
760	10		758.9	SS 4	56	11-17-18 (35)		
755	15	SANDY GRAVEL (GP)- brown, trace silt and clay, dense, wet	753.9	SS 5	61	17-13-14 (27)		8
750	20	GRAVELLY SAND (SP)- brown, trace silt and clay, medium dense, wet	748.9	SS 6	61	4-5-9 (14)		14



Bottom of borehole at 20.0 feet. Moved soil boring from staked location, within limits private utility locator boundaries; trees limited overhead access. Soil cuttings were placed in drums. Soil contamination in 5' and 10' samples. Decontaminated equipment after drilling to final depth.

BORING NUMBER: B-5

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CLIENT Bergmann Associates

PROJECT NAME Allen Creek Railroad Berm Opening (Geo)

PROJECT NUMBER 3172040002

PROJECT LOCATION Ann Arbor, MI

DATE STARTED 4/11/17 **COMPLETED** 4/11/17

GROUND ELEVATION 769.219 ft +/-

DRILLING CONTRACTOR Stearns Drilling

GROUND WATER LEVELS:

DRILLING METHOD 4-1/4-inch HSA

▽ **DURING DRILLING** 6.00 ft / Elev 763.22 ft

LOGGED BY A. Spears **CHECKED BY**

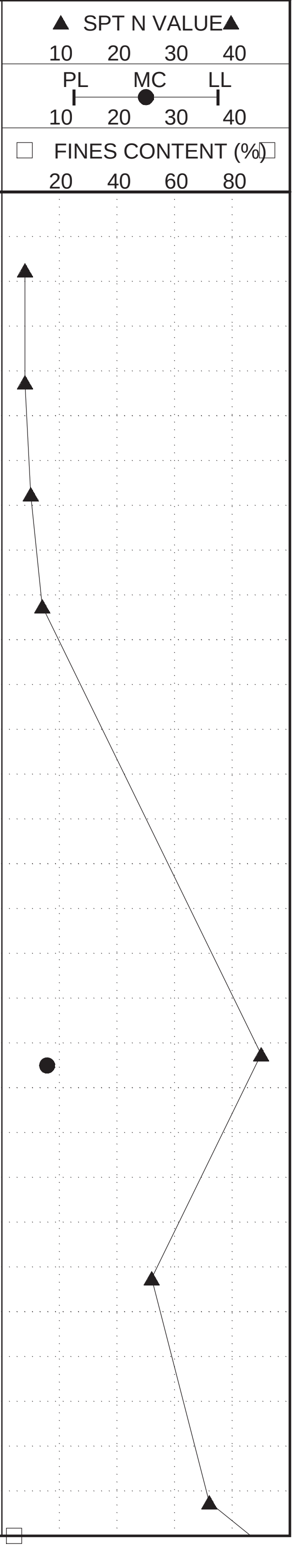
▼ **AFTER DRILLING** 5.00 ft / Elev 764.22 ft

NOTES backfilled w/slurry to 5', hole plugging clay thereafter

COLLAPSE DEPTH ---

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
	0	6" of TOPSOIL					
768.7		SILT FILL- dark brown, some black staining, trace clay, sand, and gravel, moist	SS 1	100	2-2-2 (4)		
765.2		CLAY FILL- brown, silty clay, some sand, trace gravel, moist ▼	SS 2	100	2-2-2 (4)		
764.2	5	SAND FIll- brown, medium to fine, with gravel, trace silt and clay, wet ▽					
			SS 3	72	2-3-2 (5)		
	10		SS 4	100	2-2-5 (7)		
	15		SS 5	28	50		
750.7	20	GRAVEL (GP)- brown, coarse to fine, with silt, with an occassional clean coarse to fine gravel layer, trace sand, dense, wet	SS 6	94	13-22-23 (45)		8
745.7	25	GRAVEL (GP)- clean, coarse to fine, with silt, with an occassional brown medium to fine sand layer, trace silt, dense, wet	SS 7	94	6-10-16 (26)		
	30		SS 8	100	9-19-17 (36)		

Elevation scale: 765, 760, 755, 750, 745, 740



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CTI and Associates, Inc.

BORING NUMBER: B-5

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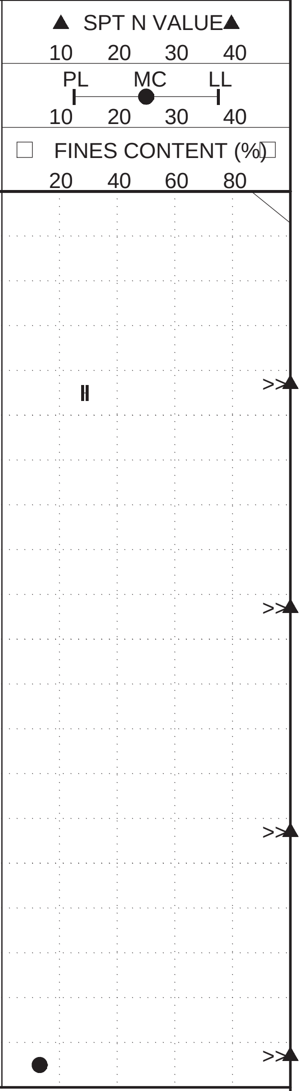
CLIENT Bergmann Associates

PROJECT NAME Allen Creek Railroad Berm Opening (Geo)

PROJECT NUMBER 3172040002

PROJECT LOCATION Ann Arbor, MI

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
	30	GRAVEL (GP)- clean, coarse to fine, with silt, with an occassional brown medium to fine sand layer, trace silt, dense, wet *(continued)*					
		735.7					
735	35	SILTY CLAY (CL-ML)- grayish brown, some gravel, trace sand, frequent silt partings, hard, moist	SS 9	83	45-34-50 (84)		
730	40		SS 10	78	23-35-39 (74)	4.5+	
725	45		SS 11	83	15-30-38 (68)	4.5+	
720	50	719.2	SS 12	83	16-28-43 (71)	4.5+	7



Bottom of borehole at 50.0 feet. Soil cuttings were placed in drums.

CITY OF ANN ARBOR

ALLEN CREEK RAILROAD BERM OPENING

GEOTECHNICAL INVESTIGATION REPORT

Appendix C – General Notes for Soil Classification

GENERAL NOTES FOR SOIL CLASSIFICATION

STANDARD PENETRATION TEST: Driving a 2” outside diameter, 1-3/8” inside diameter sampler a distance of 18 inches into undisturbed soil with a 140 pound hammer free falling a distance of 30 inches. The sampler is driven three successive 6-inch increments. The number of blows required for the last 12 inches of penetration is termed the Standard Penetration Resistance (N).

GROUNDWATER: Observations are made at the times indicated on logs. Porosity of soil strata, weather conditions and site topography may cause changes in the water levels.

SOIL CLASSIFICATION PROCEDURE: Classification on the logs is generally made by visual inspection. For fine-grained soils (silt, clay and combinations thereof), the classification is primarily based upon plasticity. For coarse-grained soils (sand and gravel), the classification is based upon particle size distribution. Minor soil constituents are reported as “trace” (0-5%), “some” (5-12%) and “with” (12-29%). Where the minor constituents are in excess of 29%, an adjective is used preceding the major constituent name (i.e. for sands containing 35% silt, the soil is classified as silty sand).

PARTICLE SIZE DISTRIBUTION

Boulders	-	Greater than 12 inches average diameter
Cobbles	-	3 inches to 12 inches
Gravel –		
Coarse	-	¾ inches to 3 inches
Fine	-	No. 4 (4.75mm) to ¾ inches
Sand –		
Coarse	-	No. 10 (2.00mm) to No. 4 (4.75mm)
Medium	-	No. 40 (0.425mm) to No. 10 (2.00mm)
Fine	-	No. 200 (0.075mm) to No. 40 (0.425mm)
Silt and Clay	-	Less than 0.075mm, Classification based upon plasticity. Generally silt particles size ranges from 0.005mm to 0.075mm and clay particle size is less than 0.005mm.

CONSISTENCY OF FINE GRAINED SOILS IN TERMS OF UNCONFINED COMPRESSIVE STRENGTH AND N-VALUES

Consistency	Unconfined Compressive Strength (Tons per square foot)	Approximate range of N
Very Soft	Less than 0.25	0 - 2
Soft	0.25 to 0.5	3 - 4
Medium Stiff	0.5 to 1.0	5 - 8
Stiff	1.0 to 2.0	9 - 15
Very Stiff	2.0 to 4.0	16 - 30
Hard	over 4.0	over 31

RELATIVE DENSITY OF COARSE GRAINED SOILS ACCORDING TO N-VALUES

Density Classification	Relative Density, %	Approximate Range of N
Very Loose	0 – 15	0 – 4
Loose	16 – 35	5 – 10
Medium Dense	36 - 65	11 - 30
Dense	66 - 85	31 – 50
Very Dense	86 – 100	over 50

Relative density of cohesionless soils is based upon an evaluation of the Standard Penetration Resistance (N), modified as required for overburden pressure.

CITY OF ANN ARBOR

ALLEN CREEK RAILROAD BERM OPENING

GEOTECHNICAL INVESTIGATION REPORT

Appendix D – Laboratory Test Results

1. Laboratory Test Summary Table
2. Particle Size Gradation Analysis
3. Atterberg Limits

CTI and Associates, Inc.

SUMMARY OF LABORATORY RESULTS

PAGE 1 OF 1

CLIENT Bergmann Associates

PROJECT NAME Allen Creek Railroad Berm Opening (Geo)

PROJECT NUMBER 3172040002

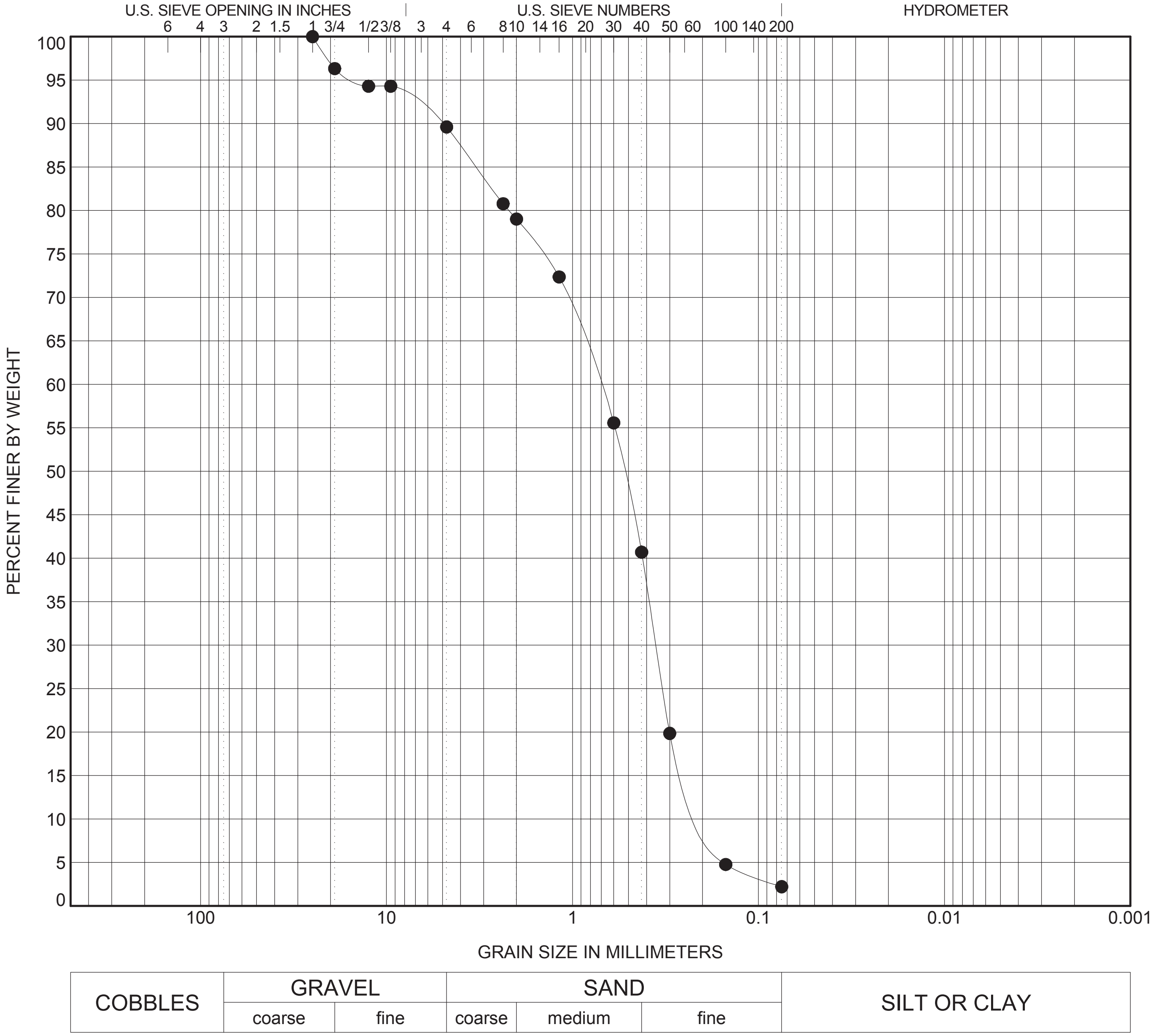
PROJECT LOCATION Ann Arbor, MI

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Classification	%<#200 Sieve	Water Content (%)	Natural Density (pcf)	Loss-on-Ignition (%)	Hand Penetrometer (tsf)	Unc. Compressive Strength (psf)
B-1	30.0					2	18				
B-1	35.0						7				
B-1	40.0	18	11	7							
B-1	45.0						7				
B-2	7.5						11				
B-2	10.0					7					
B-2	20.0						26				
B-3	10.0						18				
B-3	20.0					9	12				
B-4	15.0						8				
B-4	20.0						14				
B-5	20.0						8				
B-5	30.0					4					
B-5	35.0	15	14	1							
B-5	50.0						7				

CTI and Associates, Inc.

GRAIN SIZE DISTRIBUTION

CLIENT Bergmann Associates
PROJECT NAME Allen Creek Railroad Berm Opening (Geo)
PROJECT NUMBER 3172040002
PROJECT LOCATION Ann Arbor, MI



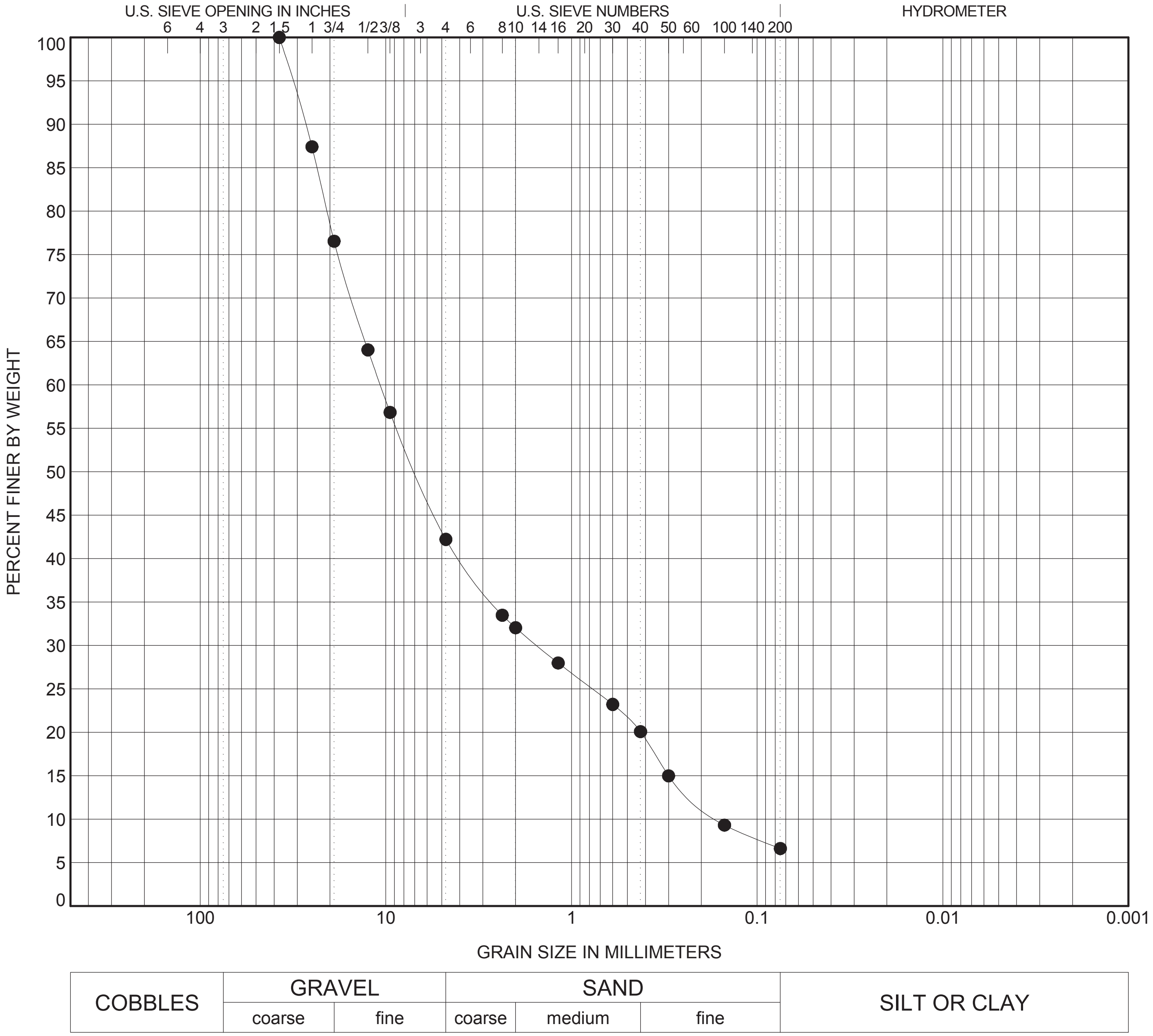
BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● **B-1**	**30.0**	**POORLY GRADED SAND(SP)**				**0.92**	**3.76**

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **B-1**	**30.0**	**25**	**0.717**	**0.355**	**0.191**	**10.4**	**87.4**	**2.2**	

CTI and Associates, Inc.

GRAIN SIZE DISTRIBUTION

CLIENT Bergmann Associates
PROJECT NAME Allen Creek Railroad Berm Opening (Geo)
PROJECT NUMBER 3172040002
PROJECT LOCATION Ann Arbor, MI



BOREHOLE		DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-2**	**10.0**	**POORLY GRADED SANDY GRAVEL (GP)**				**1.35**	**65.73**

BOREHOLE		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-2**	**10.0**	**37.5**	**10.72**	**1.535**	**0.163**	**57.8**	**35.6**	**6.6**	

CTI and Associates, Inc.

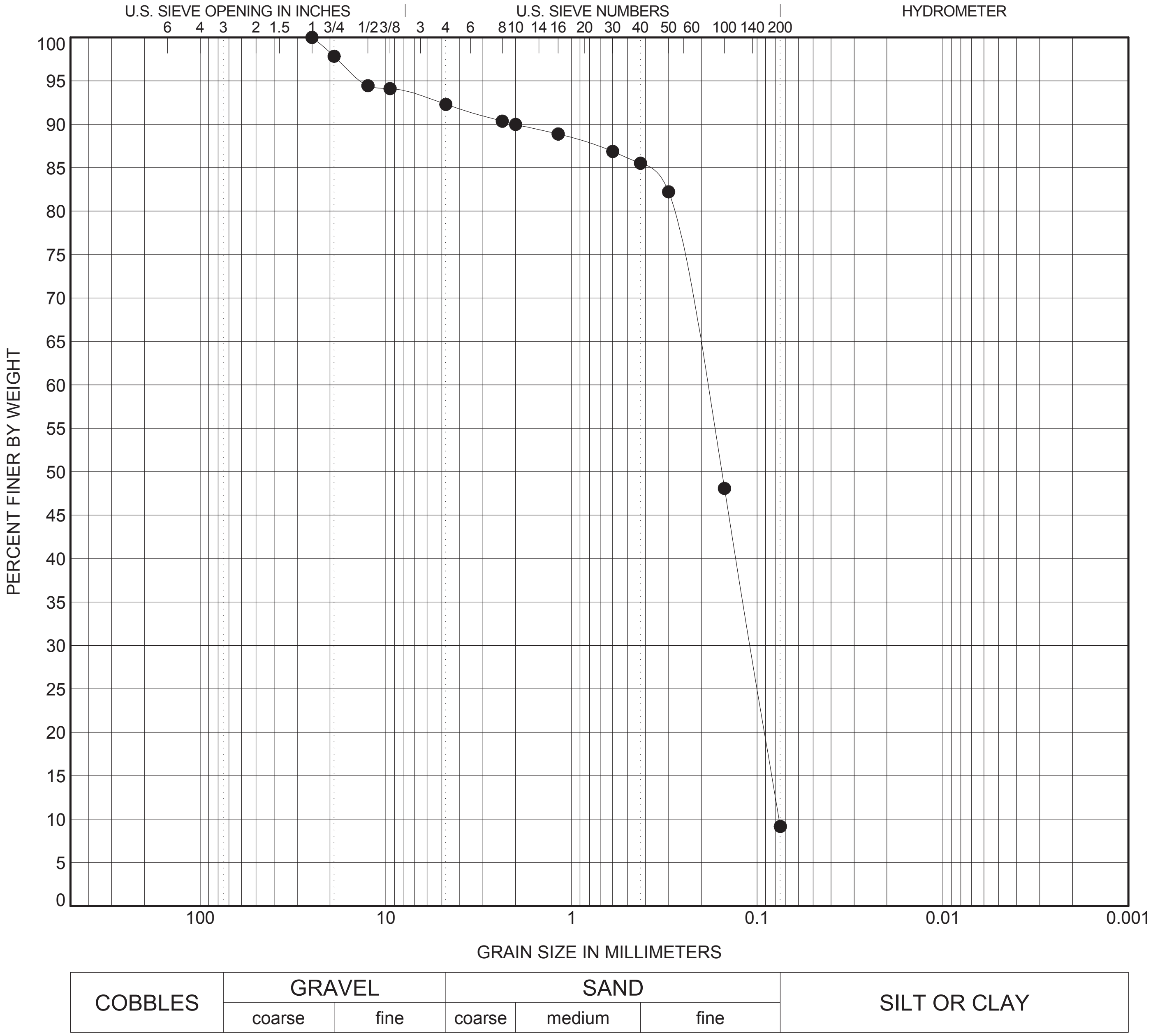
GRAIN SIZE DISTRIBUTION

CLIENT Bergmann Associates

PROJECT NAME Allen Creek Railroad Berm Opening (Geo)

PROJECT NUMBER 3172040002

PROJECT LOCATION Ann Arbor, MI



BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● **B-3**	**20.0**	**POORLY GRADED SAND (SP)**				**0.81**	**2.51**

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **B-3**	**20.0**	**25**	**0.191**	**0.109**	**0.076**	**7.7**	**83.1**	**9.2**	

CTI and Associates, Inc.

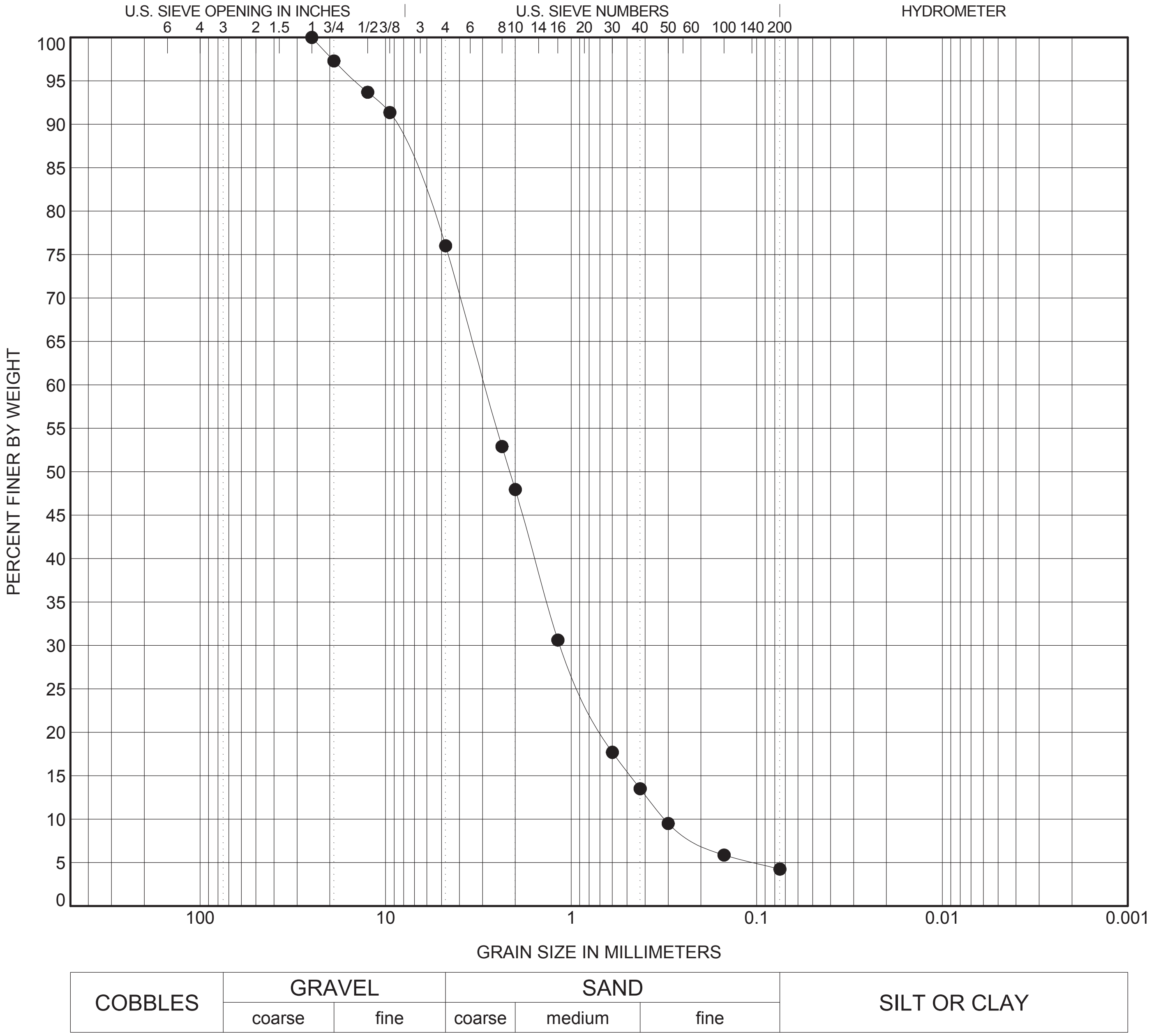
GRAIN SIZE DISTRIBUTION

CLIENT Bergmann Associates

PROJECT NAME Allen Creek Railroad Berm Opening (Geo)

PROJECT NUMBER 3172040002

PROJECT LOCATION Ann Arbor, MI



BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● **B-5**	**30.0**	**WELL-GRADED SAND with GRAVEL(SW)**				**1.42**	**9.34**

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **B-5**	**30.0**	**25**	**2.925**	**1.142**	**0.313**	**24.0**	**71.8**	**4.2**	

CTI and Associates, Inc.

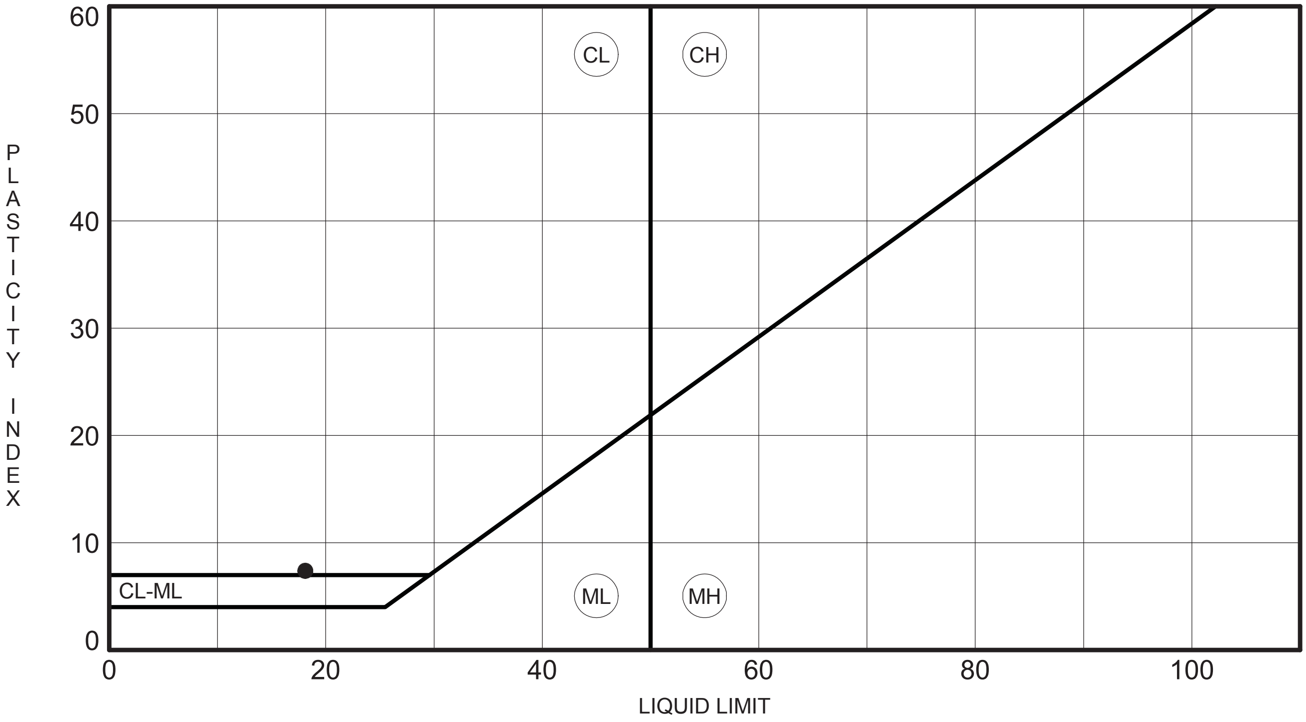
ATTERBERG LIMITS' RESULTS

CLIENT Bergmann Associates

PROJECT NAME Allen Creek Railroad Berm Opening (Geo)

PROJECT NUMBER 3172040002

PROJECT LOCATION Ann Arbor, MI



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-1**	**40.0**	**18**	**11**	**7**		SILTY CLAY (CL-ML)

CTI and Associates, Inc.

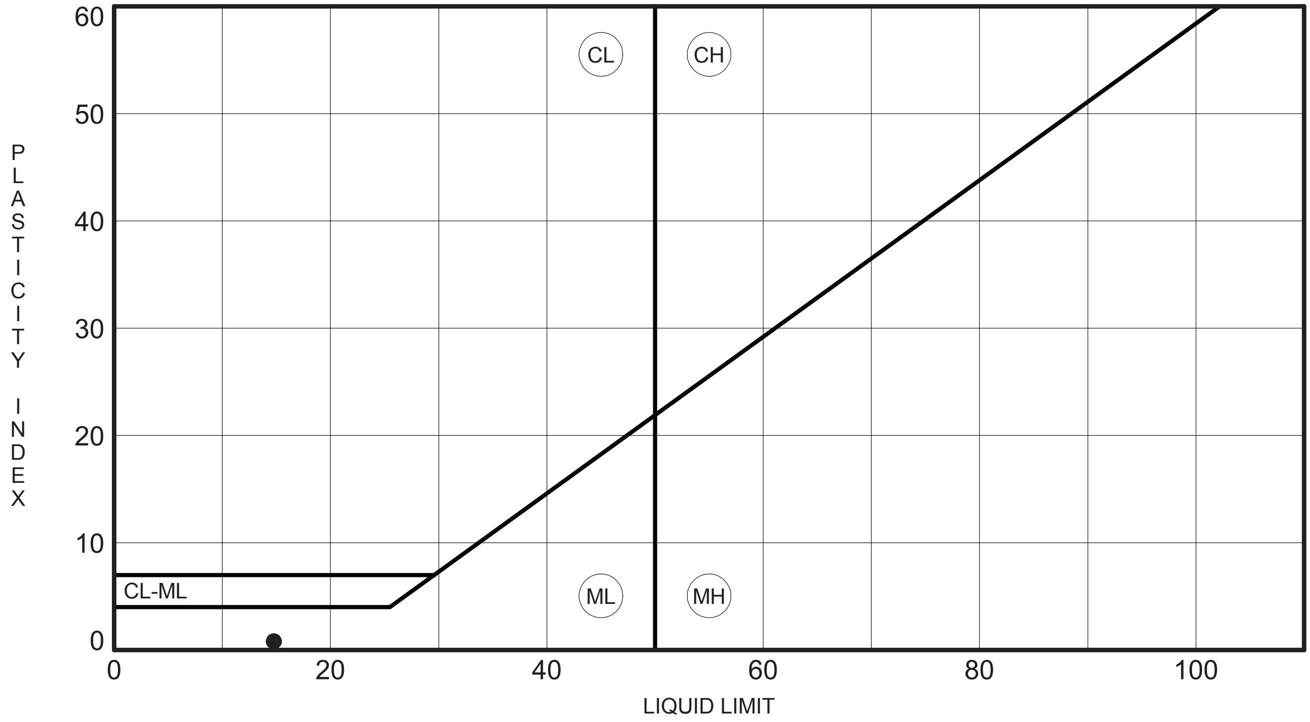
ATTERBERG LIMITS' RESULTS

CLIENT Bergmann Associates

PROJECT NAME Allen Creek Railroad Berm Opening (Geo)

PROJECT NUMBER 3172040002

PROJECT LOCATION Ann Arbor, MI



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-5**	**35.0**	**15**	**14**	**1**		SILTY CLAY (CL-ML)

Protecting, Enhancing, and Restoring Our Environment

December 22, 2017

Mr. Jeremy Hedden, P.E.
Project Manager
Bergmann Associates
7050 W. Saginaw Highway, Suite 200
Lansing, MI 48917

re: **Summary of Pedestrian Bridge and Walkway Stability Evaluation**
Allen Creek Berm Opening
Ann Arbor, MI 48105
CTI Project No. 1178070029

Dear Mr. Hedden,

The following paragraphs are a summary of CTI's preliminary assessment of the slope stability of the proposed retaining walls and the proposed foundation systems at the above-mentioned site. Our assessment was performed using 1) existing information about the subsurface conditions at the site and 2) the results of an additional boring performed to the north of the existing outlet near the location of the proposed pedestrian bridge on December 1, 2017 . The scope for the analyses and additional soil boring were outlined in CTI's proposal dated October 11, 2017.

CTI assessed the following cases:

1. Global Slope Stability at the critical cross section of the below-grade pedestrian path
2. Global Slope Stability at the critical cross section at the location of the proposed pedestrian bridge
3. Stability evaluation of the proposed pedestrian bridge foundation system including settlement, bearing capacity, and the existing sheet pile and tie back system

The design documents provided to CTI by Bergman Associates were not final and thus some details were missing. In addition, the additional proposed soil boring has not been performed yet. Therefore, CTI has made multiple assumptions regarding different site conditions and design parameters. The assumptions made are described in the paragraphs below. Should any of these assumptions be considered inaccurate or inadequate, CTI shall be notified so that any necessary adjustments to the recommendations presented in this report be made.

ADDITIONAL SOIL BORING

An additional soil boring was performed on the north side of the existing outlet on December 1, 2017. The purpose of the soil boring was to confirm the soil profile encountered in other soil borings performed as part of an earlier investigation and to identify any areas of concern. The soil boring revealed that the subgrade materials consisted mostly of sands with various amounts of silt and gravel. This profile is similar to that seen in other soil borings. The soil boring log is included in Attachment 5.

CASE 1

The global stability of the retaining wall, and retained embankment soil at station 6+50.00 was analyzed. A maximum load acting on the railroad was assumed to result from a Cooper E-80 locomotive. The maximum concentrated load of 80,000 lbs was taken to be distributed over a 10 ft x 10 ft area, accounting for the effects of load distribution to the bottom of the profile slices used in the analysis. The analysis also considers the effects of the flood-level groundwater level. The analysis conservatively ignored the presence of wall B and the concrete floor of the pedestrian path, both of which contribute greatly to the stability of the slope. The calculated factor of safety against global slope failure was 1.71, which is acceptable. The details of the analysis and cross section analyzed are provided in Attachment 1. Note that these analyses consider the global slope stability of the embankment near the proposed retaining walls and does not consider the internal stability of the retaining wall itself. The structural proportioning and depth of embedment of the proposed retaining walls must be engineered separately to ensure that the selected design is able to support the lateral earth pressures imposed on the retaining wall.

CASE 2

The global stability at the location of the proposed pedestrian bridge was analyzed considering that potential slip surfaces would extend outside the existing seawall and proposed bridge abutment. The cross section at the location where the bridge abutment is closest to the sheet pile wall was considered to be the most critical cross section. A dead load consisting of the bridge abutment load of 38,200 lbs was assumed. In addition, a live load of 360 psf was considered to be acting on the entire area of the bridge. This results in a total abutment load of 164,200 lbs. The factor of safety calculated was 1.45. The details of the analysis and cross section are provided in Attachment 2.

CASE 3

The stability of the pedestrian bridge foundation system was analyzed with respect settlement, influence on the existing seawall, bearing capacity, sliding, and overturning. The proposed foundation system consists of shallow foundations as presented in the drawing set provided to CTI.

SETTLEMENT

The settlement of the foundation system under the loads from the pedestrian bridge was calculated and found to be less than 0.5 inches. Note that this calculation was setup to consider the settlement that would be experienced by the bridge and not the settlement that would be experienced by the abutment as a result of the abutment backfill. The engineering rationale for this approach is that the bridge will be positioned and leveled atop the abutments following the placement and initial settlement of the abutments. Total settlement potential of the abutments during construction is not expected to exceed 1 inch. The details of this calculation are presented in Attachment 3.

STABILITY OF THE SHEET PILE WALL

In addition, the potential effect of the abutments on the sheet pile wall system was examined under the increased load from the construction of the pedestrian bridge and its foundation system. It was determined that the bridge foundation is outside the active zone of the sheet pile wall and thus will not have any direct effects on the stability of the wall. The analysis was based on the following assumptions:

- The edge of the bridge foundation is at a minimum horizontal distance of 5 feet from the sheet pile wall.
- The bridge foundation bears at elevation 763 ft, 6 inches below the existing tie backs.
- The top of the sheet pile wall is at elevation 767.5 and the wall is 20 feet deep.
- The stream bed is at elevation 758.5’

Figure 1 below, shows the active zone and proposed location of the bridge foundation.

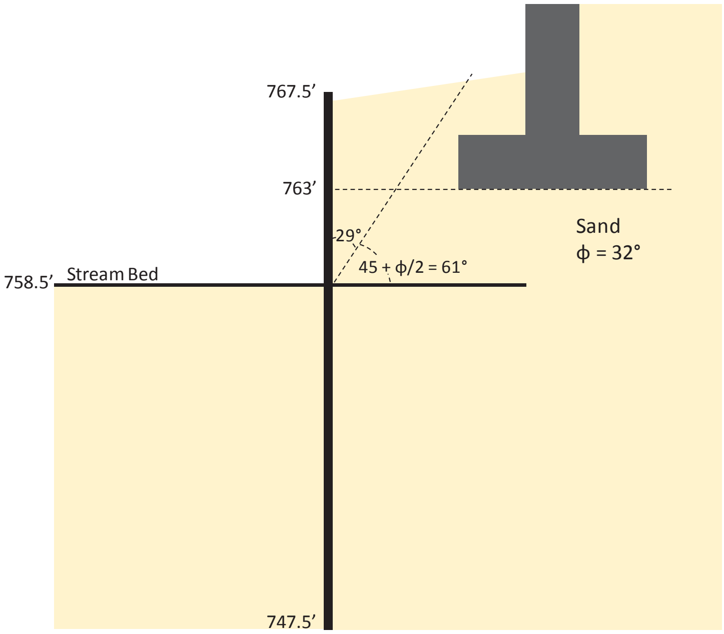


Figure 1. Active zone of sheet pile wall (not to scale).

FOUNDATION STABILITY

The bearing capacity of the soils on site was calculated using Terzaghi's method (Codutto 2001) using the cross section shown in Figure 1 above. The foundation was modeled as an 8-ft wide square foundation with a bridge load of 164,200 lbs distributed over a 8-ft x 20-ft area. The load of the bridge approach embankment was also considered. The bearing capacity calculation assumed a minimum of 2 foot of soil backfill above the abutment footing. The factor of safety calculated against bearing capacity failure was 8.8; larger than 3.0 which is typically recommended in similar scenarios.

Since the height of soil fill on either side of the foundation is different, a check for the factor of safety against overturning and sliding was made. The factor of safety against overturning was 3.0 and the factor of safety against sliding was 6.4. Both factors of safety are acceptable. The details of the calculation are presented in Attachment 4.

CONCLUSION

In conclusion, the assessment performed by CTI of the various components and aspects of the Pedestrian walkway and bridge suggest that the proposed design is acceptable. It should be noted that if any of the assumptions presented in this report or its attachments are found to be inaccurate or inappropriate, CTI must be contacted to evaluate the need for revising its recommendations.

Please contact me by phone (313-486-0730) or email (kfoye@cticompanies.com) with any questions regarding this report. CTI is grateful for the opportunity to provide geotechnical engineering services to Bergmann Associates.

Regards,

CTI and Associates, Inc.

Kevin Foye, Ph.D., P.E.
Senior Engineer

Mohammad Kabalan, P.E.
Project Engineer

Attachments:

1. Global Slope Stability at the critical cross section of the below-grade pedestrian path
2. Global Slope Stability at the critical cross section at the location of the proposed pedestrian bridge
3. Settlement Analysis of the soils under the pedestrian bridge foundation
4. Stability evaluation of the proposed pedestrian bridge foundation
5. Additional Soil Boring Log

Attachments

Attachment 1

Slope Stability at the critical cross section of the below-grade pedestrian path

SLOPE STABILITY ANALYSIS REPORT FORM

Project Name:	Allen Creek Railroad berm opening-Geotechnical Investigation						
Project Number:	1178070029		**Client:**	Bergmann Associates			
Analysis Short Name:	Slope Stability-Retaining Wall		**Filename:**	AA Rail Berm Retaining Wall 20171218 AS FINAL			
Revision:	2	**Originated :**	AS	**Checked:**	MK	**Approved:**	KF
Date:	12/18/17	**Date:**	10/19/17	**Date:**	12/15/2017	**Date:**	12/18/2017

Purpose of Analysis:	To determine the slope stability for the deepest retaining wall (Retaining Wall A) along the pedestrian path, within the railroad (RR) existing (ex.) right-of-way (ROW)		
☒ Drained ☐ Undrained	☒ Static ☐ Seismic	☒ Pore Pressure	☒ Optimized Surface
Additional Details:	Distance from Retaining Wall A to RR CL is 27.52’ Height of RR CL is EL 778’ Top of Retaining Wall A is EL 777.5’ Bottom of Retaining Wall A is EL760.5’ Top of Grade Behind Wall is EL 777.5’ Water Table is EL 762.78’ (maximum) Pathway section view 6+50.00 was used for this analysis		

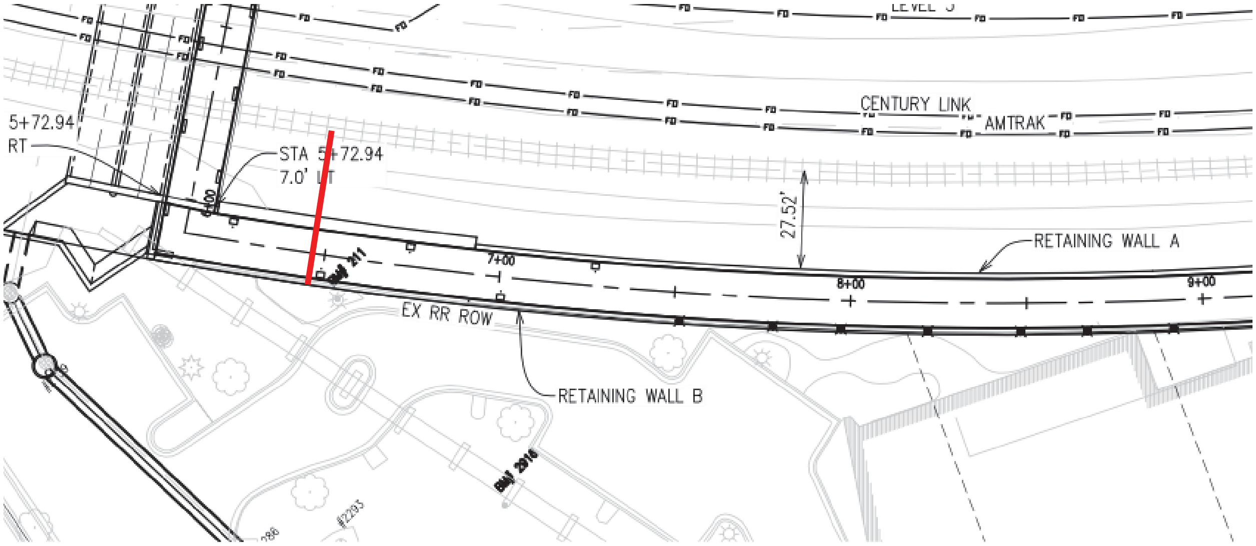
Design Foundation Case:	The retaining wall represents a foundation to the pedestrian path.
Type of Structure/Importance:	The RR embankment and pedestrian path retaining walls are structures used for the transportation of pedestrians and passengers, therefore it is a typical-occupancy structure.
Design Loads/Load Combinations:	The largest likely axle load for the RR is from the Copper E80 locomotive at 80,000 lbs. It will be distributed over a 10 ft. by 10 ft. area at the top of the berm, creating a pressure load of 800 lbs/ft.

Material	Name	Color in Profile	Unit Wt(s) (pcf)	Strength ϕ (deg.)	Strength C (psf)
1	Concrete	Gray	150	0	170000 (1180.56 psi)
2	Silt Fill	Dark Brown	110	32	750
3	Sand Fill	Yellow	120	34	0
4	Gravel	Teal	120	32	0
5	Silty Clay	Dark Gray	110	0	4500
6					
7					
8					

Source of Geometry:	Bergmann and Associates (2017). *New Culvert Crossings Under Railroad AD, Pedestrian Bridge and Associated Drawings*. Ann Arbor, MI

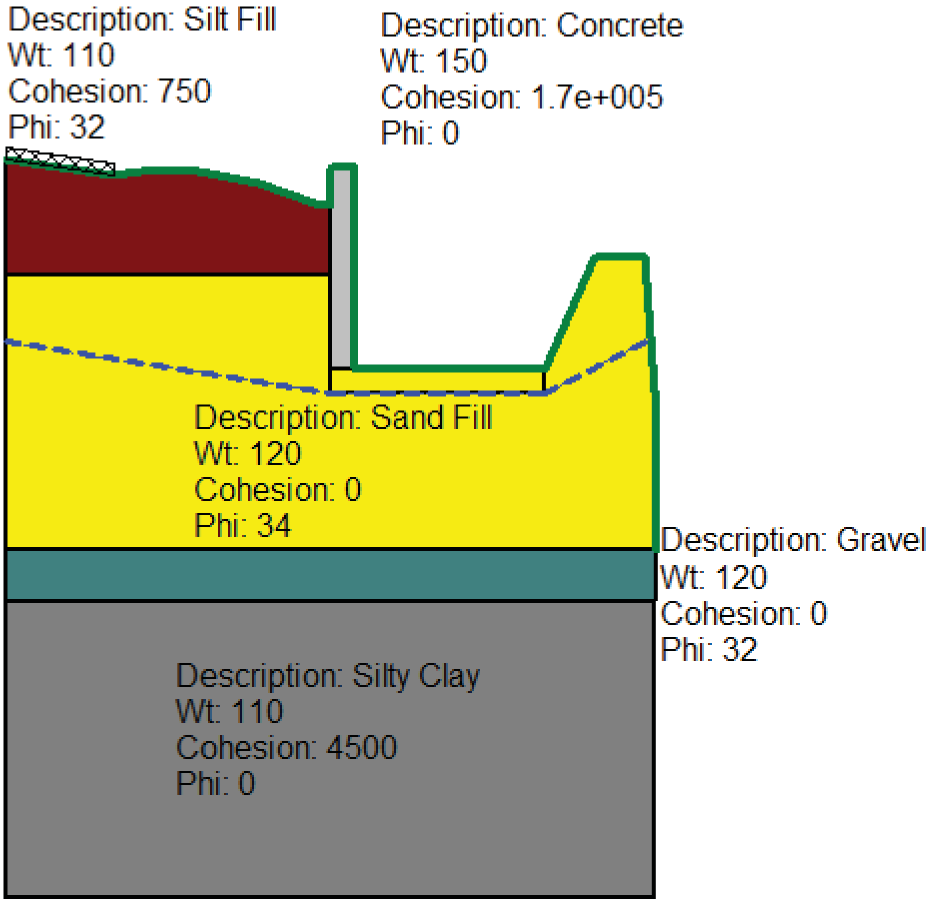
References:	CTI and Associates, Inc. (2017) *Geotechnical Investigation, Allen Creek Rail Berm*. Ann Arbor, MI. Coduto, D.P. (1999) *Geotechnical Engineering: Principles and Practices*, 2nd Ed., Prentice-Hall Inc., New Jersey. Wisconsin Department of Transportation. (2017) *WisDOT Bridge Manual*. 08 Dec. 2017. < http://wisconsindot.gov/dtsdManuals/strct/manuals/bridge/ch38.pdf>
☐ Preconstruction ☒ Construction ☐ Interim ☐ Final ☐ Existing ☐ Back-Analysis	
Construction Phase Represented:	Retaining Wall A is constructed prior to the construction of the pedestrian path and Retaining Wall B.
Other Geometry Notes:	

Cross-Section Trace (plan):

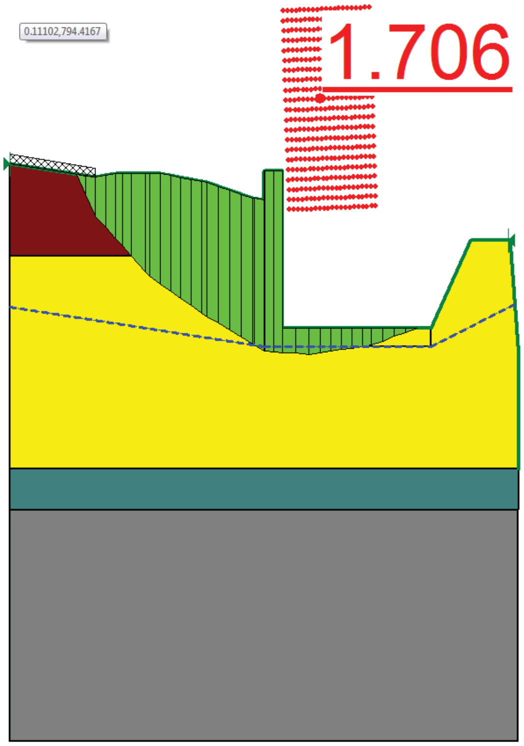


RETAINING WALL PLAN

Cross-Section:



Critical Slip Surface:



Factor of Safety:	1.71	☒ Acceptable ☐ Not Acceptable ☐ Follow-up ☐ Superseded
Comments:	A hypothetical case where Retaining Wall A is constructed prior to the construction of the spread footing is most critical. The Factor of Safety increases to numbers that are greater than 7 when the spread footing is constructed, the most critical failures are primarily within the silt fill layer and do not go through the wall. Construction of Retaining Wall B was not included in this analysis. The construction of wall B is expected to contribute towards the stability of the slope and would increase the factor of safety from that calculated in our analysis.	

Attachment 2

Slope Stability at the critical cross section at the location of the proposed pedestrian bridge

SLOPE STABILITY ANALYSIS REPORT FORM

Project Name:	Allen Creek Railroad berm opening-Geotechnical Investigation						
Project Number:	1178070029	**Client:**	Bergmann Associates				
Analysis Short Name:	Slope Stability-Pedestrian Bridge	**Filename:**					
Revision:	2	**Originated:**	AS	**Checked:**	MK	**Approved:**	KF
Date:	12/20/17	**Date:**	11/03/17	**Date:**	12/20/2017	**Date:**	12/20/2017

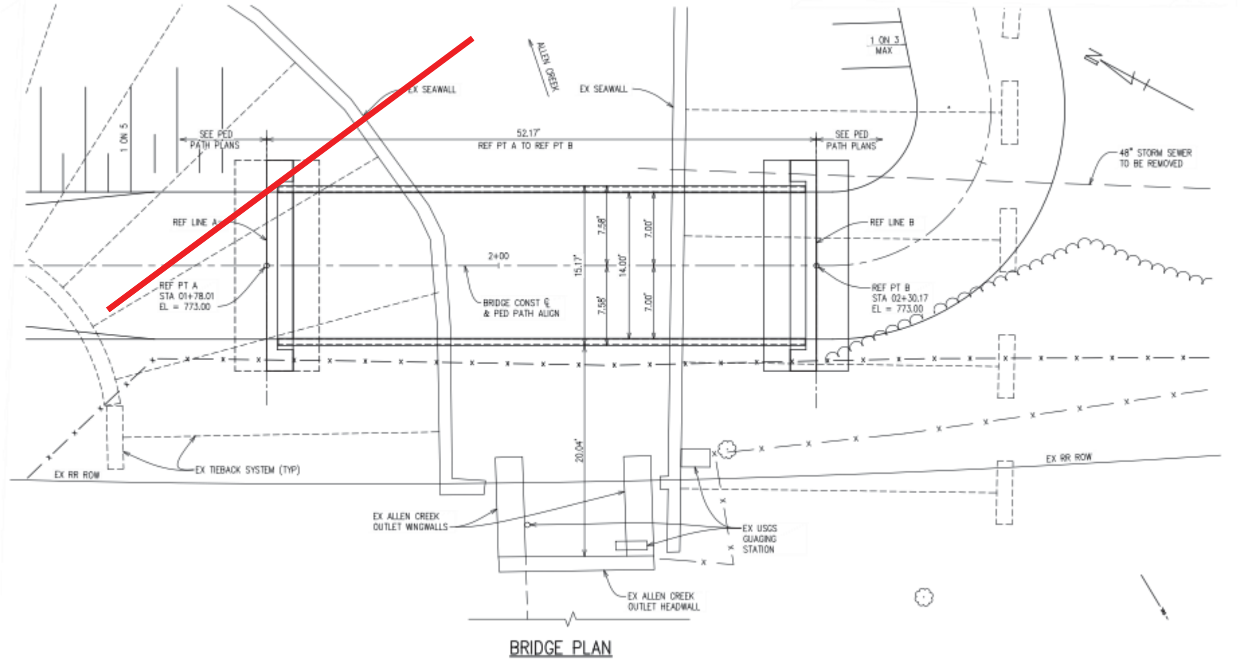
Purpose of Analysis:	To determine the global slope stability for the pedestrian bridge and seawall with tieback system during the 100-yr storm, using Huron River flood levels.		
☒ Drained ☐ Undrained	☒ Static ☐ Seismic	☒ Pore Pressure	☒ Optimized Surface
Additional Details:	• Distance from front edge of abutment (proposed) to back of Seawall is 5’ (assumed minimum) • Top of Seawall (1974 proposed plans) is EL 767.5’ • Height of Seawall along Huron River at the location of the pedestrian bridge is 20’ • Top of Ground Surface behind Seawall (1974 proposed plans) is EL 767.0’ • Water Table: Huron River 100-YR H.W. EL is 766.1 • Stream bed assumed at EL 758.6’ (lowest elevation, assumed) • This analysis considered the global stability of the cross section. The stability of the tieback system was not included in this analysis. • The seawall is assumed to be constructed using PZ 27 steel sheet pilings. However, the seawall represented in the analysis is a concrete wall with strength properties that are less than that of the pilings. • The tieback system was neglected in this analysis.		

Design Foundation Case:	The abutment represents a foundation to the pedestrian bridge.
Type of Structure/Importance:	The pedestrian bridge will be used for the transportation of pedestrians; therefore, it has a typical occupancy importance for the protection of human life.
Design Loads/Load Combinations:	The largest likely bridge concentrated live load for the abutment is 126,000 lbs., based on a 50 ft. x 14 ft. bridge and a 360 psf. distributed live load. The largest likely bridge load for the abutment is from the heaviest crane pick of an 80 ft. x 14 ft. Continental Connector Bridge, H-section, at 38,200 lbs. The maximum total load is thus 164,200 lbs. It will be distributed over an 8 ft. x 20 ft. area spread footing, creating a pressure load of 1026.25 lbs/ft.

Material	Name	Color in Profile	Unit Wt(s) (pcf)	Strength ϕ (deg.)	Strength C (psf)
1	Concrete	Gray	150	0	170000 (1180.56 psi)
2	Silt Fill	Dark Brown	110	32	750
3	Compacted Fill	Yellow	120	34	0
4	Gravel	Teal	120	32	0
5	Sand	Yellow	120	34	0
6					
7					
8					

Source of Geometry:	Bergmann and Associates (2017). *New Culvert Crossings Under Railroad AD, Pedestrian Bridge and Associated Drawings*. Ann Arbor, MI McNamee, Porter, and Seeley Consulting Engineers (1974). *Washtenaw County Drain Commission Allen's Creek Drain Outlet Repair*. Ann Arbor, MI
References:	Contech Construction Products, Inc. (2010) *"Project: Bridge Design Build, Wixom, MI"*. CTI and Associates, Inc. (2017) *Geotechnical Investigation, Allen Creek Rail Berm*. Ann Arbor, MI. Coduto, D.P. (1999) *Geotechnical Engineering: Principles and Practices*, 2nd Ed., Prentice-Hall Inc., New Jersey.
☐ Preconstruction ☐ Construction ☐ Interim ☒ Final ☐ Existing ☐ Back-Analysis	
Construction Phase Represented:	
Other Geometry Notes:	An additional scenario was created to determine if the seawall contributed any structural support to the slope. This was completed by removing the seawall and placing silt fill on a slope approximately 1H:1V to the stream bed.

Cross-Section Trace (plan):



Cross-Section:

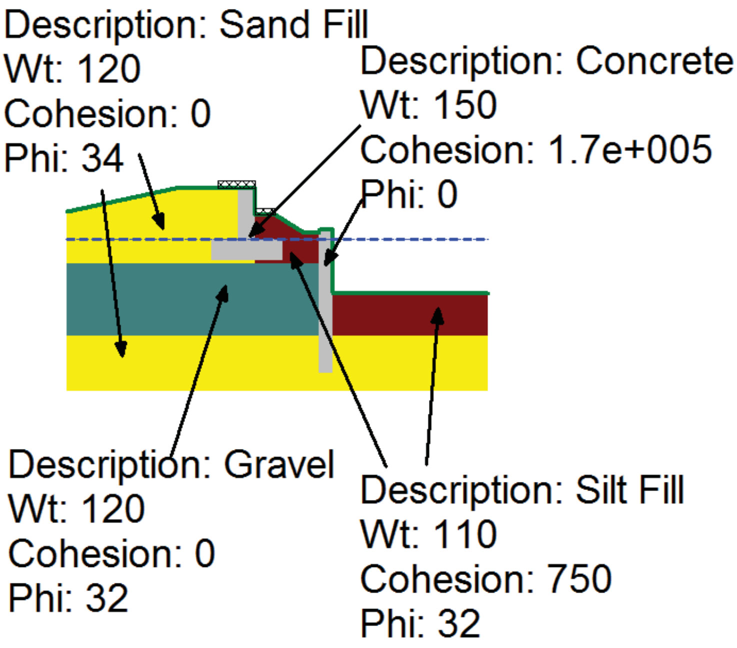


Figure 1. Case A

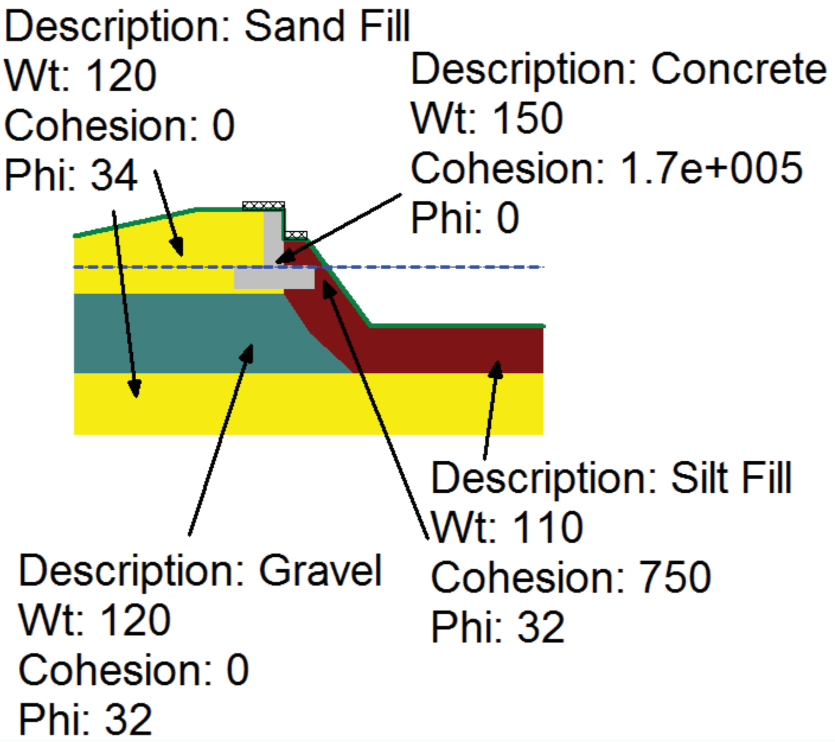


Figure 2. Case B

Critical Slip Surface:

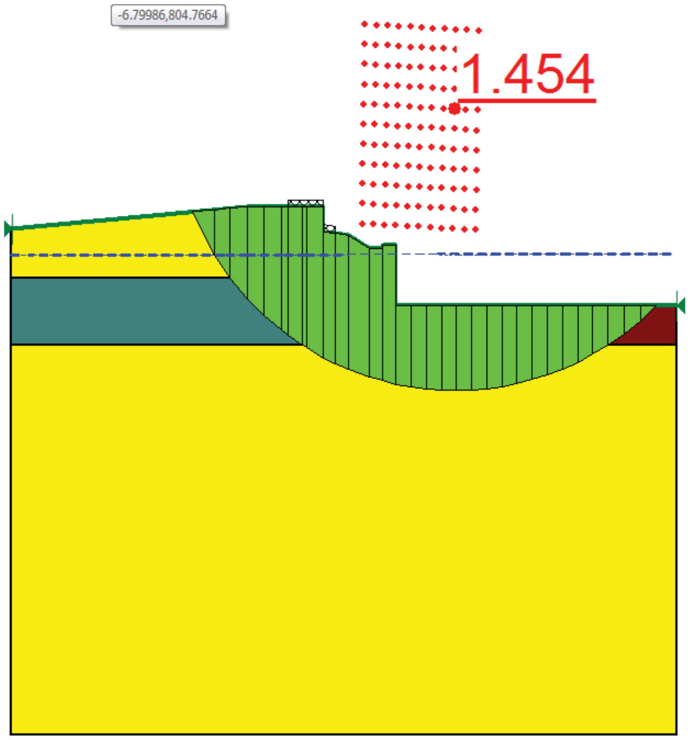


Figure 3. Slip Surface for Case A

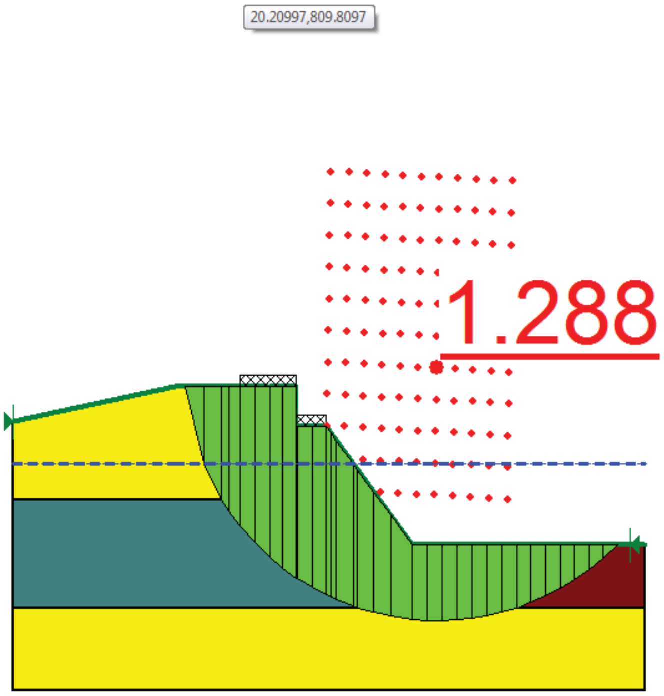


Figure 4. Slip Surface for Case B

Factor of Safety:	1.45	☒ Acceptable ☐ Not Acceptable ☐ Follow-up ☐ Superseded
Comments:	The cross-section depicts the footing located at its closest proposed distance from the seawall (5 ft) (Case A). Case B eliminates the seawall to investigate the effect of the seawall on the global stability of the footing and slope. These cases demonstrate that the global stability of the cross section is adequate.	

Attachment 3

Settlement Analysis of the soils under the pedestrian bridge foundation

ROUTINE FOUNDATION ANALYSIS REPORT FORM

Project Name:	Allen Creek Railroad Berm Opening – Additional Scope						
Project Number:	1178070029		**Client:**	Bergmann Associates			
Analysis Short Name:	Foundation Settlement			**Filename:**	20171220_Settlement_MK		
Revision:	2	**Originated:**	MK	**Checked:**	KF	**Approved:**	KF
Date:	12/20/17	**Date:**	11/13/17	**Date:**	11/15/17	**Date:**	12/20/17

Purpose of Analysis:	Determine total settlement potential due to load from pedestrian bridge		
☒ Drained ☐ Undrained	☒ Static ☐ Seismic	☒ Pore Pressure ☐ OCR	☐ Eccentricity
Geometry of Foundation:	Shallow Foundation for Pedestrian Bridge over a sand subgrade		
Additional Details:	8 ft wide foundation		

Design Foundation Case:	Final Conditions after installing prefabricated bridge
Type of Structure/Importance:	Pedestrian Bridge – typical occupancy
Design Loads/Load Combinations:	164,200 lb load on each abutment distributed over a 8ft x 20ft area

Layer	Material Type	Depth to top of layer (ft)	N Value	Equivalent modulus of elasticity (tsf)	Influence Factor
1	Sandy	7	24	7	0.1875
2	Sandy	9.5	12	7	0.3208

Source of Subsurface Profile:	Soil borings from phase 2 investigation
☐ Preconstruction ☐ Construction ☐ Interim ☒ Final ☐ Existing ☐ Back-Analysis	
Other Geometry Notes:	Soil properties based on additional soil boring

Settlement:	0.2 in	☒ Acceptable ☐ Not Acceptable ☐ Follow-up ☐ Superseded
Angular Distortion:	N/A	☐ Acceptable ☐ Not Acceptable ☐ Follow-up ☐ Superseded
Factor of Safety:	N/A	☐ Acceptable ☐ Not Acceptable ☐ Follow-up ☐ Superseded
Comments:		

Attachment 4

Stability evaluation of the proposed pedestrian bridge foundation

Project Name: Allen Creek Railroad Berm Opening – Additional Scope
Client: Bergmann Associates
Project Number: 1178070029
Project Manager: Kevin Foye, Ph.D., P.E.
Project Location: Ann Arbor, MI
QA Manager: Kevin Foye, Ph.D., P.E.

Calculation Sheet Information

Calculation Medium: ☒ Electronic
☐ Hard-copy Number of pages (excluding cover sheet):

Title of Calculation: Foundation Stability Analysis
Calculation Originator: Mohammad Kabalan, P.E.
Calculation Contributors:
Calculation Checker: Kevin Foye, Ph.D., P.E.

Calculation Objective

Determine acceptability of proposed pedestrian bridge abutment design considering the following potential failure modes:

1. Bearing Capacity
2. overturning
3. Sliding

Assumptions/Open Items

1. The load acting on the bridge abutment is 166,000 lbs distributed over a minimum foundation area of 8 ft x 10 ft
2. A minimum of 2 foot of soil is placed as backfill above the abutment footing (on the downslope side)
3. A maximum of 11 feet of soil is placed above the bottom of the footing as backfill behind the abutment wall on the upslope side
4. The water level is at the 100-year flood elevation

Design Criteria/Design Basis (with Reference to Source of Data)

The minimum required factors of safety are

1. 3.0 for bearing capacity
2. 1.5 for overturning
3. 1.5 for sliding

Results/Conclusions

The factors of safety calculated are acceptable.

1. The factor of safety against bearing capacity failure is 8.8
2. The factor of safety against overturning is 3.0
3. The factor of safety against sliding is 6.4

References/Source Documents

Drawing set provided by Bergmann Associates on November 22, 2017.
Coduto (2001), *Foundation Design Principles and Practices,* Second Edition, Prentice Hall, Upper Saddle River, NJ

Revision Records

Checker comments provided on: ☐ Hard-copy ☒ Electronic File

No.	**Revision Identifier (Number or Letter)**	**Version Type**		**Originator Initials**	**Date**	**Checker Initials**	**Date**
		Draft	**Final**				
1	Rev. 0	☐	☒	MK	11/13/17	KF	11/15/17
2	Rev. 1	☐	☒	MK	12/11/17	KF	12/20/17
3		☐	☐				
4		☐	☐				
		☐	☐				
		☐	☐				
		☐	☐				

Approval

☒ The Detail Check has been completed. Any significant issues not resolved between the Checker and Originator have been resolved by the Approver.

Originator Signature

12/11/17
Date

Checker Signature

12/15/17
Date

Approved Signature

12/20/17
Date

CTI and Associates
Bearing Capactiy Calculation

Allen Creek Railroad Berm Opening
Project #: 1178070029

Input Parameters

γ:	130	pcf	γw:	62.4	pcf
Φ':	32	deg	gamma eff	67.6	pcf
Ka:	0.307				
Kp:	3.255				
K0:	0.470				
Bottom Elev	763	ft	D_high	11	ft
Top Elevation	773	ft	Water_Level_high	4	ft
Thickness	3	ft	Load	1026.25	psf
Foundation Width	8	ft	D_low	5.5	ft
B1	2.75	ft			

Overturning

D	10	ft		
Wc	6225	lb		
Ws	2502.5	lb		
P	1026.25	lb		
s_z	676	psf		
s_h	831.7	psf	Assuming water at 100-yr flood level	
Mom_arm	3.3	ft		
active moment	13862	ft-lb		
Resisting moment	41479	ft-lb	0	Kp factor
FS	**3.0**			

Bearing Capacity

s'_z	465.4	psf		
Nq	28.5			
N_gamma	28			
q_ult	19320.86	psf		
Pv_equivalent_d	3.3	ft		
Pv_equivalent	9753.75	lb		
e	1.42	ft	B/6	1.33
qmax	2188.838	psf		
FS	**8.8**			

Sliding

Resisting force	26801.39	lb
Driving Force	4158.5	lb
FS	**6.4**	

Attachment 5

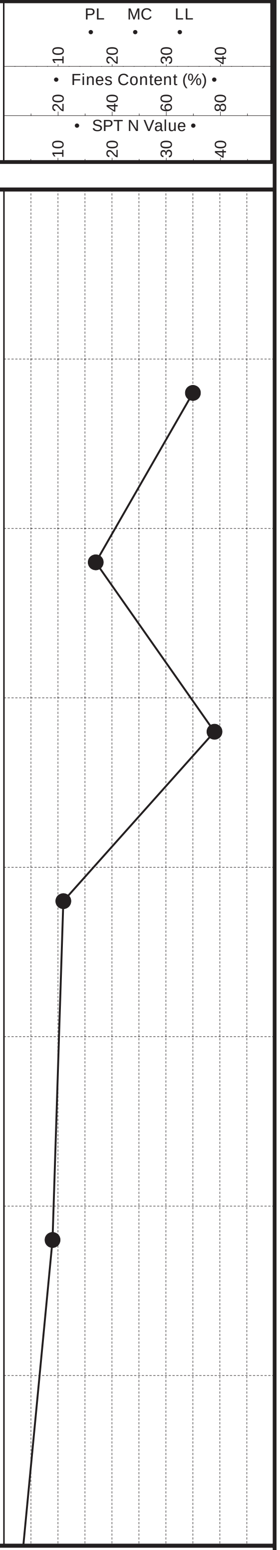
Additional Soil Boring Log and Lab Testing Summary

Project Number: 1178070029
Project Name: Allen Creek Rail Berm
Project Location: Ann Arbor, MI
Client Name: Bergmann Associates

Date Started: 12/1/17 Completed: 12/1/17
Time Started: 11:30 am Completed: 11:30 am
Logged By: M. Partenio Checked By:

Boring No: B-1
Offset: 48' N & 41' W of seawall
Drilling Firm: GeoServ
Driller Name: Bob Hansen
Drilling Method: Direct Push
Drill Rig Model: Geoprobe 6620DT
Auger Size:
Weather: Sunny, 45°F

DEPTH (ft)	DESCRIPTION OF STRATA	LEGEND	SAMPLE	RECOVERY (in)	UCS (tsf) *hand penetrometer	MOISTURE (%)
0	4" TOPSOIL					
	SANDY CLAY (CL) - brown, trace silt and gravel, moist		SS-1	18		
5	SAND (SP) - brown, fine to medium, some silt, trace gravel and organics, medium dense, moist		SS-2	18		
	SAND (SW) - brown, fine to coarse, some silt, trace gravel, dense, wet		SS-3	10		
10	SAND (SW) - brown, fine to coarse, trace gravel and fines, medium dense, wet		SS-4	26		
15			SS-5	21		
20						



Groundwater During Drilling: 7.5'
Groundwater After Drilling: None
Cave-in Depth: None
End of Boring: 30 ft

Notes: Boring terminated at 30' due to geoprobe refusal. Backfilled with cuttings and bentonite chips.

Project Number: 1178070029
Project Name: Allen Creek Rail Berm
Project Location: Ann Arbor, MI
Client Name: Bergmann Associates

Date Started: 12/1/17 Completed: 12/1/17
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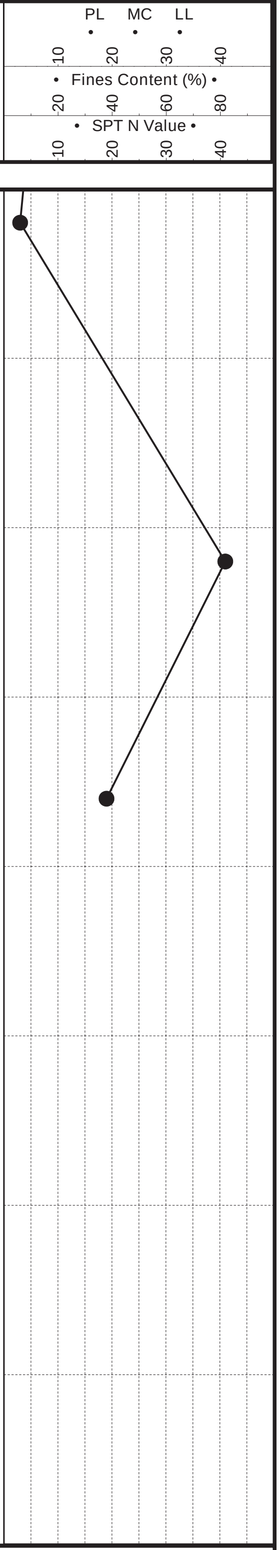
Drilling Method: Direct Push
Drill Rig Model: Geoprobe 6620DT
Auger Size:
Weather: Sunny, 45°F

DEPTH (ft)	DESCRIPTION OF STRATA	LEGEND	SAMPLE	RECOVERY (in)	UCS (tsf) *hand penetrometer	MOISTURE (%)
20		⁘	SS-6	24		
25	SAND (SW) - brown, fine to medium, trace gravel, dense, wet	⁘	SS-7	13		
	SAND (SP) - brown, fine to medium, medium dense, wet	⁘	SS-8	9		
30	End of Boring					
35						
40						



Groundwater During Drilling: 7.5'
Groundwater After Drilling: None
Cave-in Depth: None
End of Boring: 30 ft

Notes: Boring terminated at 30' due to geoprobe refusal. Backfilled with cuttings and bentonite chips.

28001 Cabot Drive, Suite 250
Novi, MI 48377
Phone: (248) 486-5100
Fax: (248) 486-5050

Material Test Report

Project No.: 1178070029
ReportNo: MAT:FH17-W04453-S01

Client: Bergmann Associates **CC:**

Project:

,

This report shall not be reproduced (in part or whole) without the written constent of:

AASHTO ACCREDITATION PROGRAM

Reviewed By: Mike Partenio

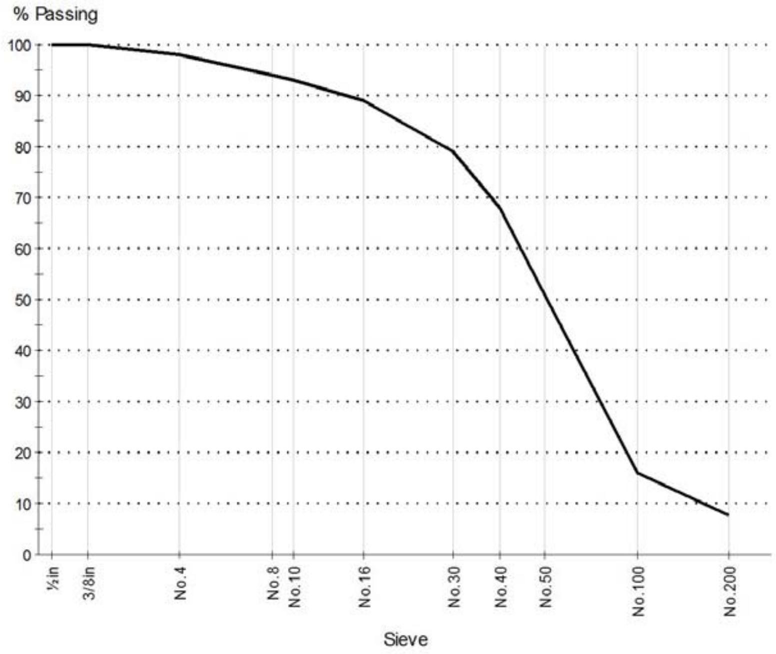
Sample Details

Sample ID	FH17-W04453-S01
Location	B-1 SS-4, SS-5, SS-6
Date Sampled	12/6/2017
Source	Geotechnical Drilling Samples
Material	Granular
Specification	No Specification
Sampling Method	Split Spoon

Sample Description:

Brown Fine to Medium Silty Sand, Trace Gravel

Particle Size Distribution



COBBLES	GRAVEL		SAND			FINES (7.6%)	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
(0.0%)	(0.0%)	(2.0%)	(5.0%)	(25.0%)	(60.4%)		

Grading: ASTM C 136, ASTM C 117

Drying by: Oven
Date Tested: 12/9/2017
Tested By: Sheila Bowers

Sieve Size	% Passing	Limits
½in	100	
3/8in	100	
No.4	98	
No.8	94	
No.10	93	
No.16	89	
No.30	79	
No.40	68	
No.50	51	
No.100	16	
No.200	7.6	

D85: 0.9003 **D60:** 0.3607 **D50:** 0.2941
D30: 0.1979 **D15:** 0.1381 **D10:** 0.0914
Cu: 3.95 **Cc:** 1.19

CITY OF ANN ARBOR, MICHIGAN

Engineering
301 E. Huron Street, P.O. Box 8647
P.O. Box 8647, Ann Arbor, Michigan 48107-8647
Phone: (734) 794-6410 Fax: (734) 994-1744
Web: www.a2gov.org

Printed on recycled paper

RFP #19-02 - Construction Engineering for Allen Creek Railroad Berm Opening Project

Pre-Proposal Meeting Minutes

MEETING DATE AND TIME

January 7, 2019 at 10:30 AM

ATTENDEES

Anne Warrow	City of Ann Arbor	301 E. Huron St P.O. Box 8647 Ann Arbor, MI 48107	734-794-6410 X 43639 Awarrow@a3gov.org
Tesha Humphriss	City of Ann Arbor	301 E. Huron St P.O. Box 8647 Ann Arbor, MI 48107	734-794-6410 X 43672 Thumphriss@a2gov.org
Jerry Hancock	City of Ann Arbor	301 E. Huron St P.O. Box 8647 Ann Arbor, MI 48107	734-794-6430 X 43709 jhancock@a2gov.org
Jeremy Heddon	Bergmann & Associates	7050 Saginaw Lansing, MI 48917	517-827-8684 jheddon@bergmanpc.com
Greg Kaevinsky	OHM	34000 Plymouth Road Livonia, MI 48180	greg.kaevinsky@ohmadvisors.com
Nick Berzka'ms	Quandel	2723 S. State St Suite 150 Ann Arbor, MI 48104	734-704-4908 734-255-0486 nberzkams@quandel.com
John Becht	FTCH	39500 Mackenzie Dr Novi, MI 48377	248-762-0354 Jebecht@ftch.com

Citad Rajala	Benesch	10484 Citation Drive Suite 200 Brighton, MI 48116	810-588-4096 248-925-7436 crajula@benesch.com
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Tony Tyler	Stantec	3754 Ranchero Drive Ann Arbor, MI 48108	734-214-2547 734-845-6155 tony.tyler@stantec.com
Darmario Brown	DLZ	607 E. Shelby Detroit, MI 48226	248-727-7089 Dbrown@glz.com

PROJECT DESCRIPTION

The City of Ann Arbor is requesting proposals from professional civil engineering firms to provide construction engineering, survey and project management for the Allen Creek Railroad Berm Opening Project.

ITEMS DISCUSSED

1. All attendees were asked to sign the Meeting Sign-In Sheet, which is attached to these minutes. Minutes of this meeting and list of attendees will be provided via formal Addendum and posted on BidNet. In addition, responses to questions brought up today or written questions submitted by email will also be provided via formal Addendum. This addendum is expected around January 15th.

2. Schedule

Activity/Event	**Anticipated Date**
Pre-proposal Meeting	January 7, 2019, 10:30 a.m.
Written Question Deadline	January 11, 2019, 4:00 p.m.
Addenda Published (if needed)	Week of January 14, 2019
Proposal Due Date	January 22, 2019, 2:00 p.m. (Local Time)
Tentative Interviews (if needed)	Week of February 4, 2019
Selection/Negotiations	February 2019
Expected City Council Authorizations	March 2019

3. Brief overview of the Scope

a) BACKGROUND

The railroad berm near the mouth of Allen Creek in the vicinity of Depot Street and Main Street, just west of the Ann Arbor Amtrak Station, is oriented perpendicular to the overland drainage flow pattern and causes the floodplain depth in this area of the City to be as deep as 10 feet during heavy storm events. Upstream of the influence of this berm, flood depths are more typically in the 3 to 5 foot range.

In December of 2013, the City and its consultant, OHM Advisors, completed a feasibility study to determine if it was possible to create openings in the railroad berm to accommodate passage of floodwaters, as well as to allow pedestrians to cross safely under the railroad to get to the park facilities to the north. The feasibility study indicated that it would be possible to lower the floodplain elevation in the area by as much as 6.5 feet as well as accommodate non-motorized access under the railroad.

There is a known trespassing hazard near the project. The lack of a convenient and reasonable pedestrian access linking the downtown area to the B2B Trail leads to the dangerous and illegal trespassing behavior. The project will provide safe and legal access to the B2B trail from the population center and eliminate this hazard. The project aims at creating a new pedestrian connection linking downtown Ann Arbor and its neighborhoods with the Border to Border (B2B)/Iron Belle Trail through the railroad berm in the vicinity of the Allen Creek.

On June 27, 2016, the Michigan State Police-Emergency Management Division (MSP-EM) provided City Staff with a FEMA Hazard Mitigation Assistance Grant agreement for the first phase of a two phase project to create openings in the railroad berm. Phase one consisted of the engineering design, development of construction plans, and preparation of the phase two hazard mitigation grant application.

On January 3, 2017, City Council authorized a Professional Services Agreement with Bergmann Associates, Architects, Engineers, Landscape Architects & Surveyors, D.P.C. (Bergmann) to assist staff in developing and preparing the construction plans and specifications.

The construction plans and specifications were submitted to the National Railroad Passenger Corporation (Amtrak) for review and approval. Amtrak has provided a letter of no exceptions.

A construction phase FEMA Hazard Mitigation Grant application was prepared and submitted. In November of 2018, Michigan State Police-Emergency Management Division (MSP-EM) notified the City Staff that the City has received a Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant for the construction of the stormwater portion of the Allen Creek Berm Opening Project.

The City has been awarded a Transportation Alternatives Program (TAP) Grant to fund a portion of the non-motorized elements of the Allen Creek Berm Opening Project. In addition, the City has also received a Michigan Department of Natural Resources Trust Fund Grant to fund a portion of the non-motorized elements of the Allen Creek Berm Opening Project.

b) DESCRIPTION

Three separate culverts will be installed beneath the railroad tracks, as part of this project. The lower culverts (twin 12 feet span x 7 feet rise) would be used to convey floodwater to the north side of the railroad tracks and discharge into the Huron River. A higher culvert (14 feet span x 12 feet rise) would be used to accommodate pedestrians.

The three culverts would be (4)-sided concrete pre-cast sections set on pile-supported footings. As the pedestrian/bicycle pathway needs to be protected against inundation during extreme flow events, a flood protection wall will be constructed along the pathway and will be set to one foot above the 1% flood elevation.

A 48” storm sewer will be installed from Depot Street (just west of 4th Avenue) up to the new constructed hydraulic weir at the inlet of the new twin box culverts to convey flood water to the Huron River.

This project includes the construction of approximately 1,275 feet of non-motorized path, which includes a 54-foot prefabricated truss bridge that spans over the Allen Creek outfall. The pedestrian access provided by this project will be lighted using solar energy and serve as the initial phase of the Allen Creek Treeline Urban Trail (ACT)

Fencing will be installed along both sides of the railroad right-of-way, extending from the Ann Arbor RR overpass to the Amtrak train station. This barrier is required by the railroad owner and is intended to prevent the public from trespassing which is both dangerous and against the law.

4. The following points of interest were discussed:

a) Due to the federal regulations regard Conflicts of Interest, Bergmann & Associates and OHM will not be responding to this RFP.

b) All on-site personnel will be required to complete the railroad safety program. This will be the responsibility of the consultant to ensure that all of their employees

(and/or sub-consultants) meet this requirement. Visit the Amtrak website for more information.
https://amtrakcontractor.com/

c) In addition to the insurance requirements outlined in Attachment A and Appendix A, there may be additional insurance requirement for stipulated by DTE. Please see Addendum #1 for clarification.

d) Draft Plans and specifications will be available, upon request for review.

e) FEMA considers our project two separate projects from a funding perspective, a pedestrian project and a stormwater project. As a result, all invoices shall be split and submitted as two separate invoices, one for stormwater and one for pedestrian. Construction bid items are separated in FieldManager with two separate categories to track stormwater and pedestrian items separately.

f) Per railroad regulations, materials removed from the railroad right-of-way within our project limits shall be removed and returned to the railroad right-of-way. Sheet 11 of the plans depicts the location where the railroad spoils shall be transported to.

g) Soils on the DTE parcel are presumed to be hazardous and shall be handled and disposed of in accordance with the project specifications.

5. The following questions were answered:

a) Where is the existing storm sewer system? There is existing storm sewer pipe that runs from Depot Street, through 115 Depot, through 201 Depot, that ultimately discharges to the Allen Creek. A majority of this storm sewer will be removed, as shown on sheet 22 of the plans.

b) Is a track outage of the railroad required? Yes, a track outage of the railroad is required. The City has received approval for a 24-hour track outage. During this 24-hour track outage the contactor will need to construct approximately 60 linear feet of all three box culverts (2 storm and one pedestrian) crossings.

c) What is the estimated construction start and end date? The City is aiming for a May 2019 letting with a 4 month construction period, likely starting in June 2019, and ending in October 2019. Ideally the work will be performed while the Huron River is at seasonal low elevation, typically the river is its highest in May and decreases throughout the summer. The specific schedule will be up to the contractor, and it is anticipated the railroad shut down will occur in August or September.

d) What is the engineer's opinion of probable construction costs? The current engineer's opinion of probable construction cost is $4,854,500. Of this, it is estimated the hydraulic portion is $2,596,500 and the pedestrian portion is $2,258,000.

e) Is there a geotechnical report for this project? Yes, it will be included in Addendum #1.

f) Who is the main contact for the City? Tesha Humphriss is a new project management with the City and will be the main point of contact for the construction phase of this project. Anne Warrow has lead the design phase, and will still be around to assist during construction. Tesha's contact information is located on the attached sign in sheet.

g) What is the approximate change in elevation between the top of track and bottom of culvert? The excavation at the railroad tracks to the invert of the culvert bedding is approximately 20 to 25 feet.

h) Is dewatering necessary? Dewatering is anticipated, but is dependent on the water level of the river.

i) Is materials testing to be provided as part of this RFP? Yes, construction materials testing for this project is part of the scope of work to be provided by the construction engineering firm. Materials testing services shall include testing for soils, concrete, and asphalt as outlined in the RFP.

j) Will the existing retaining wall remain? No, it will be removed, as shown on sheet 22 of the plans.

k) Are all easements secured? No, the City is still working with the 2 adjacent property owners and hope to have them in hand soon.

l) What permits will be required?
    i. MDEQ - Water Resources Division Permit was issued on 1/24/2018, for this project.
    ii. A drain use permit from the Washtenaw County Water Resources Commissioner will be required. The WCWRC has reviewed the plans and specifications for work impacting the Allen Creek Drain, but the contractor shall submit a permit application and provide the necessary insurance documentation.
    iii. A SESC Permit will be issued by the City of Ann Arbor for work on project site, but the contractor shall submit the permit application and provide the necessary insurance documentation.
    iv. A SESC Permit will be required from the WCWRC for spoils spreading at the E. Delhi railroad right-of-way, which is located in Scio Township. The contractor shall submit an application for this permit and provide the necessary insurance documentation.
    v. Temporary Driveway Permit will be required from the Washtenaw County Road Commission (WCRC) at the E. Delhi Road railroad crossing. The contractor shall apply for this permit and provide the necessary insurance documentation.
    vi. Hauling Permit will be required from the WCRC for transporting the project site spoils to the E. Delhi railroad right-of-way. The contractor shall apply for this permit and provide the necessary insurance documentation.

m) What impacts to private utilities? North of the tracks are several fiber optic lines, the plans detail some relocation prior to construction but some will need to be coordinated during construction.

n) What traffic control will be required during construction? The City has arranged staging areas on DTEs property and has a goal of keeping one lane of Depot Street open in each direction throughout the duration of the project, with the exception of construction of the manhole in Depot Street, which will require a closure. More detail can be found in the maintaining traffic Special Provision.

o) What is the anticipated delivery route for the proposed pipe? It is anticipated the contractor will coordinate most of their deliveries from the north, however a few pieces will have to be delivered on Depot Street, which will have temporary impact on traffic.