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Date: 2021-11-30

Planning Department
Superior Charter Township
3040 North Prospect
Ypsilanti, MI 48198
Phone: +1 734 482 6099
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planning@superior-twp.org

RE: Area Plan Amendment - Hyundai Safety Testing and Investigation Laboratory
Hyundai America Technical Center, Inc.
6800 Geddes Rd. Superior Charter Township, MI 48198
IBI Group Project #: 134894

Dear Planning Department:

IBI Group is pleased to submit the attached petition for Area Plan Amendment for Hyundai pursuant of Superior Charter Township, Washtenaw County, Michigan Zoning Ordinance No. 174 Article 10.

Our package submitted includes: cover letter, area plan petition form, cover sheet, general site plan, general notes, existing conditions plan, site plan, utility plan, concept landscape plan, concept building elevations, geotechnical report (Appendix A), boundary survey (Appendix B), steam and wetland delineation report (Appendix C), threatened and endangered species memo (Appendix D), tree survey memo (Appendix E), and topographic survey (Appendix F).

Thank you for the opportunity and please contact us with any requests.

Sincerely,

David C. Kassab
Project Manager
Office: +1 248 936 8000 ext. 51016
Cell: +1 586 747 9125
david.kassab@ibigroup.com

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Appendix A

Geotechnical Report

PRELIMINARY GEOTECHNICAL EVALUATION REPORT

HATCI R&D CENTER | CRASH BUILDING & TEST TRACK
SUPERIOR TOWNSHIP, MICHIGAN

SME Project Number: 087829.00
November 11, 2021

SME

The Kramer Building
43980 Plymouth Oaks Blvd.
Plymouth, MI 48170-2584

T (734) 454-9900

www.sme-usa.com

November 11, 2021

Mr. David Kassab, PMP
IBI Group
25200 Telegraph Road Suite 300
Southfield, Michigan 48033

Via E-mail: david.kassab@ibigroup.com (PDF file)

RE: Preliminary Geotechnical Evaluation Report
HATCI R&D Center | Crash Building & Test Track
6800 Geddes Road
Superior Township, Michigan 48198
SME Project No. 087829.00

Dear Mr. Kassab:

We have completed the preliminary geotechnical evaluation for the HATCI R&D Center | Crash Building and Test Track project located in Superior Township, Michigan. This report presents the results of our observations and analyses, and our geotechnical engineering recommendations based on the information disclosed by the borings.

We appreciate the opportunity to be of service. If you have questions or require additional information, please contact me.

Sincerely,

SME

Jeremy S. Wahlstrom, PE
Project Manager / Project Engineer

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IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL ENGINEERING REPORT
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1. INTRODUCTION

This report presents the results of the preliminary geotechnical evaluation performed by SME for the HATCI R&D Center | Crash Building and Test Track project. We performed this evaluation in general accordance with the scope of services outlined in SME Proposal No. P03040.21, dated September 27, 2021. Our services for this evaluation were authorized by IBI Group, Inc. To assist with our evaluation and preparation of this report, SME reviewed an, "Area Plan," drawing set (11 Sheets) dated October 27, 2021, prepared by IBI.

The project is in active planning stages and details about the planned structures (e.g., design elevations, specific locations, loads, and settlement tolerances) have not been finalized. Accordingly, the recommendations of this report should be considered preliminary for the purposes of addressing the feasibility of developing the site, and the geotechnical considerations affecting the design, construction and cost of site development. SME shall prepare a final geotechnical evaluation report after reviewing finalized design information, conducting additional site evaluations (if required), and performing engineering analyses based on the geotechnical conditions encountered at the site.

1.1 SITE CONDITIONS

The project site consists of the southern portion of the Hyundai-Kia America Technical Center, Inc. (HATCI) property located at 6800 Geddes Road in Superior Township, Michigan. The site area is generally covered with wild grass vegetation and contains densely wooded areas. The Snidecare Drain is located along the northwestern perimeter of the site and flows from northeast to southwest towards the Huron River (located about ½-mile away). The approximate location of the site is depicted on the Boring Location Diagram (Figure No.1), included in Appendix A. An aerial image depicting recent site conditions along with the soil borings performed for this project is provided below.

IMAGE 1 – SITE AERIAL DATED MARCH 19, 2021

SME reviewed publicly available documents as part of our evaluation, including aerial photographs and topographic maps dating back to the 1900's. Based on our review, the site appears to have been utilized as agricultural farmland prior to construction of the current HATCI development in the mid-2000's. Relatively small structures (likely single-family houses and barns associated with the agricultural usage) were previously located along Leforge Road along the eastern site perimeter. We are not aware of any additional previous site development or usage (e.g., structures, utilities, etc.).

Based on topographic data illustrated on the provided drawing, we understand the site grades from east to west, with ground surface elevations generally ranging from about 800 to 810 feet along Leforge Road to about 780 feet along the Snidecar Drain. However, intermittent hills are located throughout the site (including within the planned building footprints and pavement areas) where the ground surface elevations peak at about 820 to 825 feet. These hills are reportedly related to previous soil stockpiling from the original building construction.

1.2 PROJECT DESCRIPTION

The project consists of two new research buildings along with associated infrastructure (e.g., pavements, utilities, retaining walls, stormwater basins, etc.). The approximate locations of the planned development features are shown on the Boring Location Diagram (Figure No. 1) included in Appendix A.

The buildings will be single-story, slab-on-grade structures with footprint areas of about 60,000 and 30,000 square-feet (for the northern and southern buildings, respectively). Based on our experience with similar types of projects, we anticipate structural loads will include maximum column loads of about 300 kips and maximum wall loads of 5 kips per lineal foot. The northern building will have finished floor elevation of 805 feet. The finished floor elevation of the southern building has not been determined at this time. Existing grade levels within the planned building footprints currently range from about 798 to 822 feet (for the northern building) and from about 792 to 817 feet (for the southern building). Accordingly, we anticipate relatively aggressive earthwork will be required to established subgrade levels within the planned development areas, including cuts and fills of up to about 15 to 20 feet in some areas.

The new access drives and parking lots are anticipated to consist of asphalt pavement with concrete curb-and-gutter. Based on the anticipated site grading requirements, permanent retaining walls may be required in select areas. A stormwater detention pond is planned for the northwest portion of the site (near the Snidecar Drain). The pond has a footprint area of about 40,000 square-feet.

2. EVALUATION PROCEDURES

2.1 FIELD EXPLORATION

SME completed seventeen borings (designated B201 through B207 and P201 through P210) at the site over the period of October 5 through 7, 2021. The borings were advanced to depths of 10 to 35 feet each. A total of 315 lineal feet of drilling was performed for this evaluation. The approximate as-drilled boring locations are shown on Figure No. 1.

SME determined the planned number, depth, and locations of the borings and staked the planned boring locations in the field using a GPS unit. SME estimated the existing surface elevations at the as-drilled boring locations to the nearest 1-foot using available topographic data shown on the provided drawing.

The borings were advanced with an ATV track-mounted, rotary drill rig using continuous-flight augers. The borings included soil sampling based upon the Split-Barrel Sampling procedure. Portions of the recovered split-barrel samples were sealed in glass jars. The Shelby tubes were sealed with tape in the field.

Groundwater level observations in the boreholes were recorded during drilling and immediately after completion of drilling. The boreholes were backfilled with auger cuttings after completion and collection of groundwater readings. Therefore, long-term groundwater observations are not available from the borings.

Soil samples recovered from the field exploration were returned to the SME laboratory for further observation and testing.

2.2 LABORATORY TESTING

The laboratory testing program consisted of visual soil classification on recovered samples in general accordance with ASTM D-2488. We also performed the following laboratory tests:

- Moisture content and dry density
- Hand penetrometer and/or Torvane shear strength
- Unconfined compression strength of cohesive soil samples
- Loss-on-ignition
- Atterberg Limits determination
- Loss-by-wash
- Consolidation

Based on the laboratory testing, we assigned a group symbol to the various soil strata encountered based on the Unified Soil Classification System (USCS).

Upon completion of the laboratory testing, we prepared boring logs including the soil descriptions, penetration resistances, pertinent field observations, the results of the laboratory testing, and the existing ground surface elevations. The boring logs are included in Appendix A. Explanations of symbols and terms used on the boring logs are provided on the Boring Log Terminology sheet included in Appendix A.

Soil samples are normally retained in our laboratory for 60 days and are then disposed, unless instructed otherwise.

3. SUBSURFACE CONDITIONS

3.1 SOIL CONDITIONS

The soil conditions encountered at the boring locations generally consisted of surficial topsoil overlying existing fill (at previously mentioned mounded areas) underlain by natural cohesive clays and clayey silts extending to the explored depths of the borings. Interbedded layers of granular sands and sandy silts were frequently present within the overall cohesive soil profile. We provide a summary of the materials encountered at the boring locations, beginning at the existing ground surface and proceeding downward, below.

STRATUM 1 – SURFICIAL MATERIALS

The surficial topsoil at the boring locations ranged from 4 inches to 2 feet in thickness. However, the topsoil was generally about 6 to 8 inches thick.

STRATUM 2 – EXISTING FILL

Existing fill was encountered underlying the surficial topsoil at seven of the boring locations. The existing fill consisted of sand and clay soils with intermixed topsoil deposits and was encountered extending to depths of 3 to 16 feet at the boring locations, corresponding to an elevation range from about 801.5 to 818 feet (where encountered).

The sand fill consisted of silty and clayey sands and was encountered in very loose to medium dense conditions, with SPT N_{60}-values ranging from 4 to 12 blows-per-foot (bpf) of penetration. The clay fill exhibited medium to hard consistencies, with shear strengths ranging from 0.8 to greater than 4.5 kips-per-square-foot (ksf) and had moisture contents ranging from 13 to 26 percent.

We performed four loss-on-ignition (LOI) tests on SPT samples obtained within the existing fill suspected of containing elevated levels of organic material. The LOI tests indicated organic contents of about 2.2 to 4.3 percent (refer to table below).

TABLE 1: LOI RESULTS

BORING NO.	SAMPLE INTERVAL (feet)	SOIL DESCRIPTION	ORGANIC CONTENT (%)	MOISTURE CONTENT (%)
B203	3.5 – 5.0	Fill- Lean Clay w/Sand- Brown & Dark Brown (CL)	2.5	22
B204	1.0 – 2.5	Fill- F/M Clayey Sand- Brown (SC)	2.2	19
P205	3.5 – 5.0	Fill- Sandy Lean Clay- Freq. Topsoil Layers- Brown & Dark Brown (CL)	2.9	22
	6.0 – 7.5		4.3	20

STRATUM 3 – NATURAL SOILS

Natural soils were encountered underlying the surficial materials and existing fill and extended to the explored depths. The natural soils generally consisted of cohesive clay and clayey silt layers containing interbedded layers of granular sand and silt deposits.

The natural cohesive clays and clayey silts exhibited stiff to hard consistencies, with shear strengths ranging from 1.5 to greater than 4.5 kips-per-square foot (ksf) and had moisture contents ranging from 9 to 27 percent. We performed two Atterberg Limits determination tests on SPT samples obtained within the natural cohesive soils. Based on the results of these tests, the natural cohesive soils exhibited a plastic limit of 18 percent with liquid limits of 33 and 34 percent. Based on the in-situ moisture contents with respect the plastic and liquid limit ranges, the natural cohesive soils were generally encountered in a semi-solid condition.

The natural sands contained variable amounts of fines and were classified as “SP”, “SP-SM”, “SM”, and “SM/SC” in accordance with USCS. The natural sands were encountered in very loose to very dense conditions, with SPT N_{60}-values ranging from about 4 to 71 bpf. The natural silts and sandy silts were encountered in a medium dense to extremely dense condition, SPT N_{60}-values ranging from about 12 to greater than 100 bpf.

GENERAL NOTES

Consider thickness measurements of surficial materials (e.g., topsoil, etc.) reported on the boring logs approximate since mixing of the surficial materials with the underlying subgrade can occur while advancing the augers, and it is difficult to measure the thickness of surface materials in small-diameter boreholes. Therefore, if more accurate surficial material thickness measurements are required, we recommend performing additional evaluations such as hand augers.

It is sometimes difficult to distinguish between fill and natural soils based on samples and cuttings from small-diameter boreholes, especially when portions of the fill do not contain man-made materials, debris, topsoil or organic layers, and when the fill appears similar in composition to the local natural soils. Therefore, consider the delineation of fill described above and on the appended boring logs approximate only. A more comprehensive evaluation of the extent and composition of the existing fill could be made by reviewing former site topography plans and by observing test pit excavations.

The soil profile described above and included on the boring logs are generalized descriptions of the conditions encountered. The stratification depths described above and shown on the logs are intended to indicate a zone of transition from one soil type to another. They are not intended to show exact depths of change from one soil type to another. The soil descriptions are based on visual classification of the soils encountered. Soil conditions may vary between or away from the borings. Please refer to the boring logs for the soil conditions at the specific locations.

3.2 GROUNDWATER CONDITIONS

Groundwater was encountered during drilling and groundwater measurement were obtained upon completion of drilling. A summary of groundwater measurements obtained for this project is provided in the following table.

TABLE 2: GROUNDWATER MEASUREMENTS

BORING NO.	GROUNDWATER DEPTH (feet)		GROUNDWATER ELEVATION (feet)	
	DURING DRILLING	COMPLETION OF DRILLING	DURING DRILLING	COMPLETION OF DRILLING
B201	N/E*	N/E*	N/E*	N/E*
B202	4.0	5.0	798.0	797.0
B203	N/E*	N/E*	N/E*	N/E*
B204	3.0	16.0	810.0	797.0
B205	N/E*	N/E*	N/E*	N/E*
B206	4.0	18.0	813.0	799.0
B207	N/E*	N/E*	N/E*	N/E*
P201	N/E*	N/E*	N/E*	N/E*
P202	5.5	6.0	802.5	802.0
P203	4.5	7.0	803.5	801.0
P204	1.5	13.0	810.5	799.0
P205	16.0	16.0	811.0	811.0
P206	N/E*	N/E*	N/E*	N/E*
P207	N/E*	N/E*	N/E*	N/E*

BORING NO.	GROUNDWATER DEPTH (feet)		GROUNDWATER ELEVATION (feet)	
	DURING DRILLING	COMPLETION OF DRILLING	DURING DRILLING	COMPLETION OF DRILLING
P208	3.0	5.0	809.0	807.0
P209	8.0	15.0	809.0	802.0
P210	N/E*	N/E*	N/E*	N/E*

*Groundwater Not Encountered

The encountered groundwater is considered perched above or within the relatively impermeable cohesive soils and is anticipated to be influenced by the water level in the adjacent Snidecar Drain, sloping site grades, and variable soil conditions (i.e., interbedded sand/clay soil stratum). In cohesive soils (i.e., clays and clayey silts), a long time may be required for the groundwater level in the borehole to reach an equilibrium position. The use of groundwater observation wells (piezometers) can be necessary to more accurately determine the hydrostatic groundwater level within soil profiles containing clays.

Expect hydrostatic groundwater levels/elevations to fluctuate throughout the year, based on variations in precipitation, evaporation, run-off, and other factors. The groundwater conditions indicated by the borings represent conditions at the time the readings were taken. The groundwater levels at the time of construction may vary from those conditions noted on the boring logs.

4. ANALYSIS AND RECOMMENDATIONS

4.1 SITE PREPARATION AND EARTHWORK

4.1.1 EXISTING FILL CONSIDERATIONS

Existing fill was encountered at seven of the boring locations extending to depths of 3 to 16 feet below current site grades, corresponding to an elevation range from about 801.5 to 818 feet (where encountered). The depths and elevations at the individual boring locations are provided in the following table.

TABLE 3: EXISTING FILL

BORING NO.	GROUND SURFACE ELEVATION (feet)	EXISTING FILL BOTTOM DEPTH (feet)	EXISTING FILL BOTTOM ELEVATION (feet)
B201	798	N/E*	N/E*
B202	802	N/E*	N/E*
B203	822	16.0	806
B204	813	6.0	807
B205	808	N/E*	N/E*
B206	817	5.0	812
B207	792	N/E*	N/E*
P201	800	N/E*	N/E*
P202	808	N/E*	N/E*

BORING NO.	GROUND SURFACE ELEVATION (feet)	EXISTING FILL BOTTOM DEPTH (feet)	EXISTING FILL BOTTOM ELEVATION (feet)
P203	808	6.5	801.5
P204	812	3.0	809
P205	827	9.0	818
P206	812	N/E*	N/E*
P207	803	N/E*	N/E*
P208	812	3.0	809
P209	817	N/E*	N/E*
P210	801	N/E*	N/E*

*Existing Fill Not Encountered

The existing fill generally consisted of sand and clay soils with intermixed topsoil deposits and had organic contents ranging from 2.2 to 4.3 percent (based on the results of 4 LOI tests). We consider the measured organics contents to be relatively low as most are below 4.0 percent. Based on the relatively consistent elevation range of the bottom of the existing fill, the presence of topsoil deposits within the existing fill, and the reported previous grading operations, it appears the elevated "hills" located within the current project area generally consist of stockpiled soils, likely from site stripping (i.e., topsoil removal) as well as from site balancing during original site development. Based on the range of SPT N_{60}-values within the existing fill (e.g. boring B203 where N_{60}-values vary from 7 to 25 bpf in a relatively close elevation range), it appears the fill was placed under variable compaction efforts and may not have been controlled in the field or placed as engineered fill.

The planned northern building has a finished floor elevation of 805 feet. Accordingly, we anticipate the existing fill will be removed from within the planned building footprint via grading cuts of up to about 20 to 25 feet in some areas. We also expect the fill at boring B206 will be removed from within the proposed southern building as B206 is at much higher grade (bottom of fill elevation 812 feet). Based on final pavement levels, the existing fill may be present under some pavement areas.

We consider the existing fill to be undocumented since we do not have information on the origin of the fill, including data on placement and compaction. Due to the variabilities associated with undocumented existing fill, we recommend the existing fill be removed (i.e., undercut) beneath proposed foundations and replaced with engineered fill as needed to re-establish the design foundation bearing elevation.

The existing fill can be considered for support of grade slabs and pavements, provided the subgrade is properly evaluated and prepared as described below and the Owner accepts the associated risks of poor performance. The increased risks associated with supporting grade slabs and pavements over the existing fill at this site could include greater than typical post-construction settlement, resulting in differential movements and associated cracking of the slabs. These risks can be reduced, but not eliminated, by evaluating the existing fill materials and preparing the subgrades as discussed in this report. In general, we anticipate the risks of poor slab performance to be relatively low if prepared as recommended. If the Owner is not willing to accept the risk of poor performance discussed below, the existing fill must be undercut beneath the entire footprint of the respective buildings and replaced with engineered fill.

Assuming the existing fill will remain in-place for support of floor slabs (depending upon final grading), further evaluation of the existing fill during construction must be conducted by SME. Further evaluation includes observing the condition of the existing fill in hand-auger borings or shallow test pits, testing the existing fill several feet below the subgrade surface using a cone penetrometer, observing the condition of the existing fill in the sides of the foundation excavations, and observing the response of the surface of the existing fill when subjected to a proofroll. Suspect existing fill materials observed during the evaluation and testing need be further evaluated by performing additional hand-auger borings and/or test pits and the contractor need to be prepared to assist SME, as needed. Existing fill to remain in-place must be of sufficient strength and free of deleterious materials such as excessive debris and organics. Unsuitable existing fill unable to be improved in-place shall be removed (i.e., undercut) and replaced with engineered fill placed and compacted per the requirements outlined in Section 4.1.5 of this report.

The recommendations provided in the following report sections are based on the assumption existing fill will be undercut beneath foundations, SME will be retained to provide construction materials services, the Owner accepts the risks of poor performance of the floor slab, and suitable existing fill will remain in-place and be used to support floor slabs. Please contact SME if our assumptions are incorrect so we can update our report as necessary.

Our evaluation of the existing fill is currently limited to the number of soil borings performed for this evaluation and sampling conducted within the borings (i.e., 2-inch diameter SPT samples obtained at intermittent depths). Based on the relatively large areas of the former stockpiles, it is possible the existing fill may contain greater amounts of buried topsoil or non-soil materials (e.g., construction materials, debris, etc.). Further evaluation of the existing fill may be warranted (e.g., test pit excavations). Please contact SME if addition evaluation of the existing fill is desired.

4.1.2 SITE SUBGRADE PREPARATION

If present, remove any existing buried structural elements (e.g., foundations, floor slabs, and other below-grade structural components) associated with previous site usage from within the development area. Reroute any existing utilities from the planned building footprint and remove any abandoned utilities from the development area. Extend excavations for removal of buried structural elements and utilities to suitable existing fill or natural soils and backfill the resulting excavations with engineered fill meeting the requirements of Section 4.1.5 of this report.

Drainage tile systems are sometimes present in farm fields that exhibit poor subgrade drainage characteristics. Farm drain tile systems can contain significant amounts of collected water. If these tile systems are encountered in excavations, significant amounts of water can be discharged. If portions of these drain tiles are interrupted, significant back-ups of stormwater can occur that can have an adverse effect on site drainage and on the construction process. If present, it may be necessary to entirely remove the formerly installed drain tile in conjunction with establishing an overall site drainage program. We recommend the potential location and elevations of the existing drain tile systems (if present) be further evaluated, and measures to collect this water be incorporated into the permanent subsurface drainage measures for the site.

After stripping and removal of unsuitable materials and during cuts to design subgrade levels, groundwater seepage could be encountered. The borings indicate groundwater levels as shallow as 1.5 feet below existing grade and present within the upper 5 feet at seven of the borings. The earthwork contractor needs to be prepared to provide large sump pumps to remove excess surface water from recent precipitation and/or perched groundwater sources. Additionally, we recommend shaping the site grades to promote gravity sheet-drainage to limit disturbance from excess moisture/groundwater.

The subgrade soils are sensitive to disturbance when exposed to water. If the subgrade is exposed to water, it may be necessary to improve the disturbed subgrade or remove and replace the soils with engineered fill, crushed aggregate or crushed concrete. Placement of crushed aggregate or crushed concrete, possibly with a geotextile for separation, is a traditional treatment to protect subgrades.

In the case of more severe subgrade disturbance, particularly if the construction will occur during the winter and early spring months, chemical stabilization of the subgrade could be considered. SME can provide additional information about chemical stabilization using lime or cement, if desired.

Once design subgrade levels are established, the exposed subgrade needs to be uniformly compacted using large construction equipment, as the fill and natural soil conditions near the surface varied in condition/consistency. Take care during compaction not to damage nearby existing utilities. As predominantly silty and clayey soil conditions are expected, we recommend using large, sheepsfoot vibratory rollers for the compaction operations. We recommend at least several passes be made with the compaction equipment. In some areas, moisture conditioning and/or undercutting may be necessary to enhance the effectiveness of the compaction operation.

After compaction, we recommend the exposed subgrade be proofrolled in the presence of SME. Proofroll using a fully-loaded, tandem-axle dump truck or other similar pneumatic-tire construction equipment. Improve areas of unsuitable (e.g., loose) subgrade revealed during proofrolling by compacting in-place, if feasible. Soils unable to be suitably improved in-place must be removed (undercut) and replaced with engineered fill.

After the exposed subgrade is evaluated (as described above) and improved as necessary, engineered fill may be placed on the exposed subgrade to establish final design subgrade levels. Refer to Section 4.1.5 of this report for materials and compaction requirements for engineered fill.

4.1.3 SUBGRADE SETTLEMENT

Soil settlement will occur under applied loading from 1) the weight of the engineered fill placed to achieve design grade levels, 2) the building structure loads transferred to the soil beneath foundations, and 3) the weight of the floor slab and stored materials. We anticipate the total soil settlement will occur due to a combination of “short-term” elastic compression and “long-term” consolidation after application of loading.

Elastic compression occurs over a relatively short period of time and is related to the elastic properties of the soil. In granular soils (e.g., gravels, sands, sandy silts, etc.) the elastic modulus is directly related to the density of the material. Accordingly, denser granular soils will have a relatively higher elastic modulus and undergo less settlement from an applied load than will looser materials. In cohesive soils, the elastic component of the total settlement, sometimes referred to as immediate settlement, is generally much less than the consolidation settlement.

Consolidation settlement occurs over a relatively long period of time and refers to the volumetric change in saturated cohesive soils (e.g., clays, clayey silts, etc.) as moisture is forced out of a soil matrix under applied loading. Consolidation settlement occurs in two stages – primary and secondary – and is related to the in-situ moisture content and previous loading history of the soil. Primary consolidation refers to the phase in which pore water pressure, which initially carries the entire stress increase from the applied load, dissipates with time as the pore water drains from the soil and the pressure increase is slowly transferred to the soil matrix. Secondary consolidation occurs after the dissipation of the excess pore water pressure and is characterized by a much lower rate of settlement (compared to primary consolidation) continuing for the duration of the load application. In general, cohesive soils with higher moisture contents and lower pre-consolidation stress history have greater capacity for settlement, and vice-versa.

Based on the preliminary subgrade level information to establish the finish floor elevation of 805 feet for the northern building, we anticipate fills up of 12 feet within the northwest corner of the northern building (and adjacent pavements to the west). We are unclear on the finished level for the southern building, but similar 12-foot deep fill depths may be needed if the FFE for the test building is near 805 feet and the 20-foot wide test track elevation remains unchanged. Engineered fill will be placed on the exposed subgrade to establish final subgrade levels, and a retaining wall is anticipated based on the large site grade changes (refer to Section 4.3).

4.1.3.1 SETTLEMENT OF ENGINEERED FILL

When using cohesive soils as engineered fill (which is anticipated based on the existing fill within the mounds onsite and natural subgrade), some settlement of the engineered fill can occur even after it is placed and compacted to the specified criteria (e.g. minimum 95 percent of the soil's maximum dry density based on the modified proctor within 2 percent of optimum moisture content). For engineered fills less than about 12 feet thick, this settlement is relatively minor (typically about ½ inch or less) and occurs within 3 to 6 months. This time period is common with typical schedules for new construction, as final building finishes (e.g. floor slabs, pavements) are constructed several months after the site grades are raised to near final levels. The loads, and the resulting settlements, will transition gradually from cut areas, which will have no new settlement due to the fill, to areas with the maximum fill thickness where the largest settlements will occur.

As such, begin engineered fill placement at the deepest area within the building footprint as early as possible during rough grading to allow for a lag period (after placement of the engineered fill and before constructing the new building and pavement) during construction to reduce the potential for subgrade settlement to adversely affect the new construction.

4.1.3.2 SETTLEMENT OF UNDERLYING SUBGRADE

We understand the northwest corner of the planned northern building parking lot to the west will be located in a fill area. In addition to the settlement of the new engineered fill (Section 4.1.3.1 above), the underlying subgrade will experience settlement due to the weight of the engineered fill and the applied loads from the building foundations and floor slabs. We estimate the overburden load of the new engineered fill to be up to about 1,600 psf (for up to 12 feet of new fill at a moist unit weight of 135 pcf). The structural loads of the slab areas were unavailable, but anticipated to be no higher than 150 psf.

The magnitude of settlement is difficult to predict due to a number of variables and unknowns, such as the variations in soil conditions between the borings, varying type of fill planned to be reused to as engineered fill, and the final grades and structural loads for the project. Minor differences in subsurface conditions can have a significant impact on overall performance, both in the magnitude of actual settlement that occurs and in the time frame for the settlement to occur.

Assuming the full fill height of 12 feet with a slab load of 150 psf we estimate a total settlement of about 3/4 to 1-1/2 inches from the slab load and the new engineered fill (but not including settlement of the engineered fill – see Section 4.1.3.1 above). The time for this settlement to occur is estimated to be about 5 to 10 years.

Differential settlements could vary based on several scenarios, a few examples of which are summarized below.

- Variability of slab loading with time.
- Overburden loads from raising site grades (with new engineered fill) compared to areas where little fill is required.

We estimate differential settlements could range up to the estimate total settlement of about 3/4 to 1-1/2 inches over a span of 50 feet depending on the scenario. If these differential settlements cannot be tolerated, alternate slab support options must be considered.

4.1.4 SUBGRADE PREPARATION FOR FLOOR SLABS

Support the proposed floor slabs on a subgrade consisting of suitable improved sand or clay fill, or on engineered fill placed over suitable fill or natural sands and clays. Evaluate and prepare the subgrade as described in Sections 4.1.1 and 4.1.2, and place and compact engineered fill as discussed in Section 4.1.5.

Prior to concrete placement for floor slabs, SME needs to observe and test the subgrade in the pad areas of the proposed building to identify areas disturbed during construction activities and verify the final subgrade conditions are suitable for floor slab support. Recompact unsuitable subgrade identified by SME or remove and replace the unsuitable materials with engineered fill. Proofroll final subgrade areas accessible with large equipment in the presence of SME. For areas inaccessible to proofrolling equipment, use hand-operated equipment such as cone penetrometers, hand auger probes, and density gauges.

We recommend the top four inches of the slab subbase consist of an approved MDOT Class II granular material to provide a leveling surface for construction of the slab and a moisture capillary break between the slab and the underlying soils. MDOT 21AA dense-graded aggregate can be used as subbase material, instead of the Class II granular material, for improved stability and greater resistance to disturbance due to construction traffic. The thickness of aggregate needed to provide a stable construction platform will depend on the condition of subgrade soils during construction and the type and volume of construction equipment trafficking the prepared subgrade. The granular material, or dense-graded aggregate if used, must be compacted per Section 4.1.5.

Provide a vapor retarder below floor slabs to receive an impermeable floor finish/seal or a floor covering which would retard vapor transmission. The location of the vapor retarder (relative to the subbase) needs to be determined by the design Architect/Engineer based on the intended floor usage, planned finishes, and ACI recommendations. However, the placement of a vapor retarder affects construction of the floor slab, concrete curing, and the rate of moisture loss as the concrete dries. The flatwork contractor must use the appropriate equipment, materials, and placement/curing methods to prevent undesirable slab curling/warping.

Concrete mixes are regularly changing to optimize performance and economy. We recommend using only concrete contractor(s) with substantial experience in concrete mixing, placement and curing methods (e.g. to prevent undesirable slab curling, shrinkage, segregation, bleeding, etc.). The contractor may need to retain a concrete mix designer to develop the appropriate mix(es) for the project. We recommend using only specific type(s) of well-established concrete mixes ‘tried and tested’ to deliver successful long-term performance for each specific type of concrete application.

Separate floor slabs by isolation joints from structural walls and columns to permit relative movement. Place a minimum of 6 inches of engineered fill between the bottom of the slab and the top of the shallow foundation below.

Protect the slab-on-grade subgrade soils from frost action during winter construction. Frozen soils must be thawed and compacted or removed and replaced prior to slab-on-grade construction.

4.1.5 ENGINEERED FILL REQUIREMENTS

Fill placed within structural areas, including utility trench backfill, must be an approved material and free of frozen soil. If the proposed engineered fill soils contain more than 4 percent organics (or other deleterious materials), or debris larger than 6 inches in nominal diameter, do not use soils for engineered fill. Also, if debris material is significantly variable in nature, suspect in origin, or greater than about 5 percent of the soil (by weight), do not use soils for engineered fill.

Compact fill placed in structural areas to a minimum of 95 percent of the maximum dry density determined in accordance with the Modified Proctor test. Spread fill in level layers with a loose thickness appropriate for the type of equipment used to obtain compaction. Thinner lifts will be required in confined spaces and where compaction is achieved with hand-operated equipment. Sand fill can be compacted with a smooth-drum vibratory roller or vibratory plate compactors, including either walk-behind types or plate compactors mounted on a backhoe or excavator (i.e., hoe-pac). Clay fill can be compacted with sheepsfoot rollers at a moisture content between the optimum and two percent below the optimum.

Based on the information from the borings, the onsite natural sand and clay soils and portions of the existing fill (baring excess organics or debris) encountered at the boring locations are considered suitable for reuse as site engineered fill provided the material meets the requirements in the previous paragraph and is at a suitable moisture content for compaction. The on-site clays and sands in excess of 5 percent fines (silt or clay) will likely require moisture conditioning (i.e., aeration and drying) to achieve suitable moisture levels for proper compaction.

The site clays (with a USCS designation of “CL”) and sands with silt contents in excess of 5 percent (with USCS designations of “SC”, SM”, and “SP-SM”) will be difficult to compact in confined areas, such as in utility trenches and foundation excavations, where smaller, walk-behind type compaction equipment is used. Clayey and silty soils can be used as engineered fill in open areas where compaction is achieved with large equipment and where moisture conditioning is feasible. During wetter/colder periods of the year when moisture conditioning of the clayey and silty soils will likely not be feasible, we expect it will be necessary to import granular fill to the site and waste the clayey and silty soils on non-structural areas of the site. Do not use clayey and silty soils as engineered fill where drainage is required.

In utility trenches or foundation excavations, and in other areas where compaction is accomplished primarily by smaller plate compaction equipment, we recommend an approved granular material containing relatively low amounts of silt or clay, such as MDOT Class II granular material, be used as backfill. Thinner lift sizes may be required to achieve the required dry density in areas where smaller compaction equipment is used. We also recommend MDOT Class II granular material be used in areas requiring drainage or where the fill will serve as a capillary separation. The soils encountered in the borings, at locations and within depths where cuts are anticipated, are not expected to meet the gradational requirements of MDOT Class II granular material. Therefore, we anticipate soils conforming to MDOT Class II granular material will need to be imported to the site.

Coarse crushed aggregate used to backfill undercuts or to stabilize subgrades must consist of a well-graded crushed natural aggregate or crushed concrete ranging from 1 to 3 inches in nominal size with no more than 7 percent by weight passing the No. 200 sieve. In cases where granular engineered fill will be placed over the crushed aggregate, top the surface of the coarse crushed material with a layer of at least 6 inches of dense-graded aggregate, such as MDOT 21AA, or covered with a suitable non-woven geotextile, to prevent migration of the granular materials into the coarser crushed aggregate.

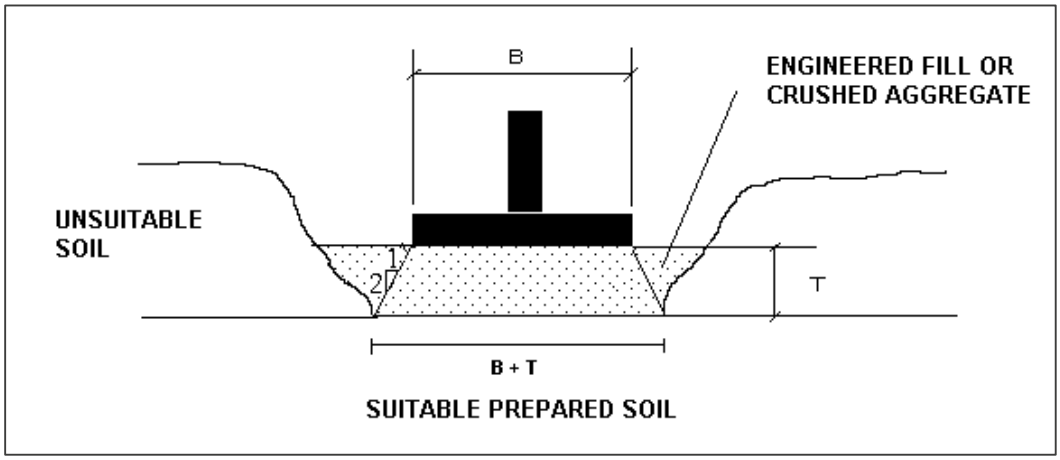
4.2 SHALLOW FOUNDATIONS

The borings indicate the soil conditions at typical foundation bearing levels (after mass excavation to remove the existing fill) are suitable for support of conventional spread footing type foundations. This type of foundation system is considered suitable for the anticipated loading/structures. The use of intermediate or deep foundation systems are not considered necessary based on the anticipated light to moderate structural loads.

After site has been properly prepared, we anticipate typical spread foundations will bear on suitable natural cohesive soils with at least a stiff consistency, on suitable natural sands at least medium dense in relative density, or on engineered fill placed over suitable natural sands and clays. We recommend a maximum net allowable soil bearing pressure of 4,000 psf for the northern building, assuming an FFE of 805 feet (i.e., bottom of foundation levels 801 to 803 feet). Net allowable bearing pressures in the range of 3,000 to 4,000 pounds per square foot (psf) are feasible for design of shallow foundations for the southern building, assuming an FFE of 800 to 805 feet. We can recommend a final design bearing pressure once the FFE of the test building is determined.

Once each foundation area is exposed, SME must observe and test the foundation subgrades to verify suitable bearing conditions are present. Suitable natural soils were generally encountered beginning below the existing fill. Undercut unsuitable soils (i.e., existing fill) to expose underlying suitable natural sands and clays. In general clays are anticipated to be exposed for the foundations, however, improve in-place any overly loose natural sands. Undercut and remove soils that cannot be successfully improved in-place.

Foundations can be constructed at the level where suitable subgrade is encountered, or the design foundation bearing level can be reestablished using engineered fill or crushed aggregate used to backfill the undercut excavation. Where backfilling to the design bearing level is performed, extend the zone of undercutting and backfill laterally on a two vertical to one horizontal slope from the edge of the foundation as shown on the following Typical Foundation Undercutting Diagram.



Situate foundations a minimum of 42 inches below final site grade in unheated areas for protection against frost action during normal winters. Interior foundations in heated areas can be constructed at shallower levels (but may require excavation to extend through unsuitable fill soils). Protect the foundations and proposed bearing soils from freezing during construction if work occurs in the winter months.

Vertical excavation sidewalls must be maintained during foundation concrete placement and not be allowed to “mushroom out” at the top. The presence of natural clays at this site indicate it may be generally feasible to construct earth-formed of neat-cut foundations. However, the natural sands are subject to caving. If vertical earthen sidewalls cannot be maintained, it will be necessary to slope back the foundation excavations and form foundation sidewalls to maintain vertical faces for foundations and reduce the potentially adverse effects resulting from frost heave. Remove caved soils from the foundation bearing surfaces before placing concrete. Place foundation concrete as soon as practical after foundation excavations have been completed and the design bearing pressure verified to reduce the potential for disturbance of the foundation subgrade.

For bearing capacity and settlement considerations, design continuous (wall) foundations with a minimum width of 16 inches and isolated (column) foundations with a minimum dimension of 30 inches. In cases where structural loading is light, the minimum recommended foundation size, and not the design bearing pressure, may govern the size of the foundation.

We estimate total settlement for shallow spread or continuous foundations using the recommended maximum net allowable bearing pressure and bearing on suitable soils, as described above, to be 1 inch or less and differential settlements not exceed about one-half the total settlement for similarly loaded foundations. We base the settlement estimates on the available boring information, the estimated structural loads, our experience with similar structures and soil conditions and field verification of suitable bearing soils by SME.

4.3 RETAINING WALLS AND DRAINAGE

Retaining walls will likely be required to facilitate grade changes, such as at the northwestern corner and along the western parking lot of the planned northern building. We assume the walls will be no taller than 12 feet and will be supported on shallow foundations that are suitable for the recommended allowable bearing pressure presented in Section 4.2 of this report.

Retaining grade walls need to be backfilled with MDOT Class II granular material. Retaining wall backfill that will support floor slabs, pavements and other improvements will need to be compacted to a minimum of 95 percent of the maximum dry density determined by the Modified Proctor test. As a minimum, backfill not used for structural support of floor slabs, pavements or sidewalks must be compacted to the degree where it is stable under construction equipment. Exercise care during compaction of the wall backfill to avoid overstressing the walls and design the walls to accommodate the additional stresses associated with operating compaction equipment adjacent to the wall.

For a drained granular backfill and a level finish surface behind the wall, we recommend an active equivalent fluid pressure of 40 pounds per cubic foot (pcf) for design. This earth pressure is based on the wall being flexible enough to permit the active earth pressure condition to be reached. An outward movement away from the backfill equal to approximately 0.001 times the height of the wall is generally required to achieve the active earth pressure condition for granular backfill. If the wall is restrained or is rigid enough so that it does not rotate sufficiently to reach the active earth condition, we recommend using a higher lateral earth pressure (at-rest condition) for design. For rigid walls backfilled with a free-draining granular material and a level finish surface behind the wall, we recommend an equivalent fluid pressure of 55 pcf for design. Also, any additional lateral pressures due to surcharge loading, such as adjacent floor or column loads, traffic loads, sloping ground, or parking loads, must be added to the above lateral earth pressures for design.

In the long term, we recommend controlling groundwater to minimize water seepage and the buildup of hydrostatic pressures against the walls. We recommend drainage controls (i.e. edge drains) be installed around the perimeter of below-grade walls. For conventional drainage control, we recommend permanent edge drains be installed along the retained side of the retaining walls. We recommend the perimeter edge drains consist of a minimum 4-inch-diameter perforated plastic drainpipe, wrapped with a filter fabric and surrounded by 4 inches of a filter material, such as pea gravel (MDOT 34G). As indicated above, the walls must be backfilled with MDOT Class II granular material. If walls are designed without drainage controls, then we recommend using a higher lateral earth pressure of 95 pcf for sizing the walls.

The following parameters for evaluating the stability of the retaining walls assume the base of the wall bears directly on the natural clays and the walls area backfilled with a well-draining granular backfill. To evaluate the sliding of the wall, compute the sliding resistance at the base and the passive (resisting) and active (driving) earth forces. The sliding resistance may be determined by using a recommended ultimate sliding coefficient of 0.35 for the natural clays. Passive, active and at-rest earth pressure coefficients of 3.0, 0.33 and 0.50, respectively, may be used for design in combination with a unit weight of backfill of 120 pcf. This assumes a granular backfill will be in contact with the wall on the backside and on the front, at the toe of the wall. Typically, a safety factor of 1.5 to 2.0 is used for the lateral sliding resistance analysis, depending on the boundary conditions. Consider the movement required to achieve the full passive pressure when using passive pressure for resistance.

In addition to checking sliding stability of the retaining walls, evaluate the safety factor from overturning, location of the resultant force at the base, mass stability, and contact pressure at the base.

4.4 SEISMIC SITE CLASS

Based on the subsurface information obtained from the borings to a maximum depth of 35 feet, and on our previous experience in the project area where deeper borings have been performed, seismic site Class D applies to this site in accordance with the 2015 MBC referencing Table 20.3-1 in ASCE Standard ASCE/SEI 7-16.

4.5 CONSTRUCTION CONSIDERATIONS

The contractor must take precautions to protect nearby existing pavements and utilities during construction. Exercise care during the excavating and compacting operations so excessive vibrations do not cause settlement of nearby existing pavements and utilities, and to avoid undermining existing utilities when performing excavations for the proposed construction.

The borings indicate groundwater levels as shallow as 1.5 feet below existing grade and present within the upper 5 feet at seven of the borings. Groundwater seepage could be encountered during foundation construction and utility installation. The depth and rate of potential seepage will depend on the groundwater levels and potential perched conditions within sands in the clay soils. Control water accumulations in excavations above the groundwater level using standard sump pit and pumping procedures. Utilize a working surface of either crushed aggregate or crushed concrete to protect the exposed subgrade where seepage is encountered.

The sand and clay soils at this site will be sensitive to disturbance when trafficked, especially when these soils become wet. If the subgrade is disturbed, it will be necessary to disc, aerate, and recompact the disturbed existing sand and clay fill, or to remove and replace the disturbed soils with engineered fill, crushed aggregate, or crushed concrete. To protect areas of prepared subgrade from disturbance and to create dependable haul routes and material laydown areas, placement of crushed aggregate or crushed concrete, possibly with a geotextile for separation, could be required.

Remove ponded surface water and prevent run-off from reaching foundation excavations and areas of prepared subgrade. Establish positive surface drainage at the onset of construction to mitigate the potential for subgrade disturbance.

Based on the borings (predominately clay profile, with limited deeper sand soil stratum with groundwater) we consider the site unfavorable for stormwater infiltration. We recommend the project civil engineer consider the poor subsurface drainage conditions in evaluating stormwater detention/discharge for the site.

The contractor must provide safely sloped excavations or adequately constructed and braced shoring systems in accordance with federal, state and local safety regulations for individuals working in an excavation exposing them to the danger of moving ground. If material is stored or heavy equipment is operated near an excavation, use appropriate shoring to resist the extra pressure due to the superimposed loads.

Handling, transportation and disposal of excavated materials and groundwater need to be performed in accordance with applicable environmental regulatory requirements.

5. SIGNATURES

Prepared by:

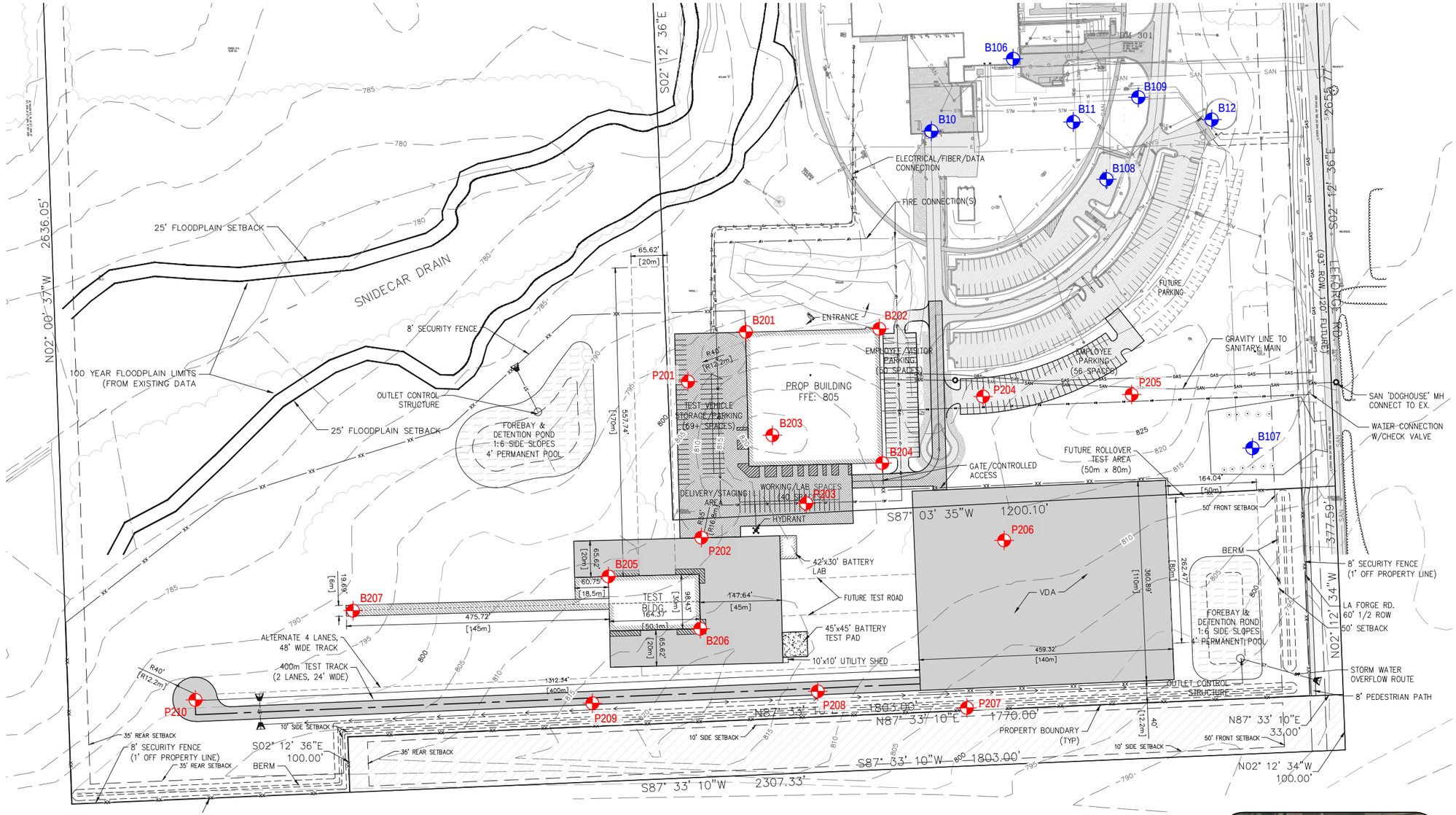
Jeremy S. Wahlstrom, PE
Project Engineer

Reviewed by:

Christopher G. Naida, PE
Senior Consultant

APPENDIX A

BORING LOCATION DIAGRAM (FIGURE NO. 1)
BORING LOG TERMINOLOGY
BORING LOGS (B201–B207 AND P201-P210)
UNCONFINED COMPRESSIVE STRENGTH TEST RESULTS (2 SHEETS)
CONSOLIDATION TEST RESULTS (2 SHEETS)
ATTERBERG LIMITS TEST RESULTS (2 SHEETS)



LEGEND

- APPROXIMATE BORING LOCATION (CURRENT EVALUATION)
- APPROXIMATE BORING LOCATION (2003 & 2004 SME EVALUATIONS)

NOTE:
DRAWING INFORMATION TAKEN FROM A PDF OF A DRAWING TITLED, "HATCI - SUPERIOR TWP. LAYOUT PLAN v21," (SHEET NO. CS0-121), PLOT DATE OF 09-24-2021, PREPARED BY IBI GROUP, INC.

0' 200' 400'

GRAPHIC SCALE: 1" = 200'

LOCATION MAP
NOT TO SCALE

SME
www.sme-usa.com

Project
HATCI R&D CENTER CRASH BUILDING AND TEST TRACK

Project Location
6800 GEDDES RD, SUPERIOR TOWNSHIP, MI

Sheet Name
BORING LOCATION DIAGRAM

No.	Revision Date

Date	10-22-21
CADD	JSW
Designer	JSW
Scale	1" = 200'
Project	087829.00
Figure No.	1

BORING LOG TERMINOLOGY

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOIL (more than 50% of material is larger than No. 200 sieve size.)			
GRAVEL More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravel (Less than 5% fines)	GW	Well-graded gravel; gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravel; gravel-sand mixtures, little or no fines
	Gravel with fines (More than 12% fines)	GM	Silty gravel; gravel-sand-silt mixtures
		GC	Clayey gravel; gravel-sand-clay mixtures
SAND 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sand (Less than 5% fines)	SW	Well-graded sand; sand-gravel mixtures, little or no fines
		SP	Poorly graded sand; sand-gravel mixtures, little or no fines
	Sand with fines (More than 12% fines)	SM	Silty sand; sand-silt-gravel mixtures
		SC	Clayey sand; sand–clay-gravel mixtures
FINE-GRAINED SOIL (50% or more of material is smaller than No. 200 sieve size)			
SILT AND CLAY Liquid limit less than 50%		ML	Inorganic silt; sandy silt or gravelly silt with slight plasticity
		CL	Inorganic clay of low plasticity; lean clay, sandy clay, gravelly clay
		OL	Organic silt and organic clay of low plasticity
SILT AND CLAY Liquid limit 50% or greater		MH	Inorganic silt of high plasticity, elastic silt
		CH	Inorganic clay of high plasticity, fat clay
		OH	Organic silt and organic clay of high plasticity
HIGHLY ORGANIC SOIL		PT	Peat and other highly organic soil

OTHER MATERIAL SYMBOLS

Topsoil, Void, Sandstone, Asphalt Concrete, Glacial Till, Siltstone, Aggregate Base, Coal, Limestone, Portland Cement Concrete, Shale, Fill

LABORATORY CLASSIFICATION CRITERIA

GW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with PI greater than 7	
SW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{D_{30}^2}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for SW	
SM	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
SC	Atterberg limits above "A" line with PI greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent……GW, GP, SW, SP
More than 12 percent……GM, GC, SM, SC
5 to 12 percent……Cases requiring dual symbols

- SP-SM or SW-SM (SAND with Silt or SAND with Silt and Gravel)
- SP-SC or SW-SC (SAND with Clay or SAND with Clay and Gravel)
- GP-GM or GW-GM (GRAVEL with Silt or GRAVEL with Silt and Sand)
- GP-GC or GW-GC (GRAVEL with Clay or GRAVEL with Clay and Sand)

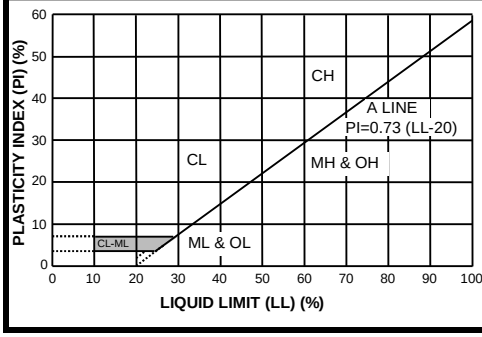
If the fines are CL-ML:

- SC-SM (SILTY CLAYEY SAND or SILTY CLAYEY SAND with Gravel)
- SM-SC (CLAYEY SILTY SAND or CLAYEY SILTY SAND with Gravel)
- GC-GM (SILTY CLAYEY GRAVEL or SILTY CLAYEY GRAVEL with Sand)

PARTICLE SIZES

Boulders	-	Greater than 12 inches
Cobbles	-	3 inches to 12 inches
Gravel- Coarse	-	3/4 inches to 3 inches
Fine	-	No. 4 to 3/4 inches
Sand- Coarse	-	No. 10 to No. 4
Medium	-	No. 40 to No. 10
Fine	-	No. 200 to No. 40
Silt and Clay	-	Less than (0.074 mm)

PLASTICITY CHART



VISUAL MANUAL PROCEDURE

When laboratory tests are not performed to confirm the classification of soils exhibiting borderline classifications, the two possible classifications would be separated with a slash, as follows:

For soils where it is difficult to distinguish if it is a coarse or fine-grained soil:

- SC/CL (CLAYEY SAND to Sandy LEAN CLAY)
- SM/ML (SILTY SAND to SANDY SILT)
- GC/CL (CLAYEY GRAVEL to Gravelly LEAN CLAY)
- GM/ML (SILTY GRAVEL to Gravelly SILT)

For soils where it is difficult to distinguish if it is sand or gravel, poorly or well-graded sand or gravel; silt or clay; or plastic or non-plastic silt or clay:

- SP/GP or SW/GW (SAND with Gravel to GRAVEL with Sand)
- SC/GC (CLAYEY SAND with Gravel to CLAYEY GRAVEL with Sand)
- SM/GM (SILTY SAND with Gravel to SILTY GRAVEL with Sand)
- SW/SP (SAND or SAND with Gravel)
- GP/GW (GRAVEL or GRAVEL with Sand)
- SC/SM (CLAYEY to SILTY SAND)
- GM/GC (SILTY to CLAYEY GRAVEL)
- CL/ML (SILTY CLAY)
- ML/CL (CLAYEY SILT)
- CH/MH (FAT CLAY to ELASTIC SILT)
- CL/CH (LEAN to FAT CLAY)
- MH/ML (ELASTIC SILT to SILT)

DRILLING AND SAMPLING ABBREVIATIONS

2ST	–	Shelby Tube – 2" O.D.
3ST	–	Shelby Tube – 3" O.D.
AS	–	Auger Sample
GS	–	Grab Sample
LS	–	Liner Sample
NR	–	No Recovery
PM	–	Pressuremeter
RC	–	Rock Core diamond bit. NX size, except where noted
SB	–	Split Barrel Sample 1-3/8" I.D., 2" O.D., except where noted
VS	–	Vane Shear
WS	–	Wash Sample

OTHER ABBREVIATIONS

WOH	–	Weight of Hammer
WOR	–	Weight of Rods
SP	–	Soil Probe
PID	–	Photo Ionization Device
FID	–	Flame Ionization Device

DEPOSITIONAL FEATURES

Parting	–	as much as 1/16 inch thick
Seam	–	1/16 inch to 1/2 inch thick
Layer	–	1/2 inch to 12 inches thick
Stratum	–	greater than 12 inches thick
Pocket	–	deposit of limited lateral extent
Lens	–	lenticular deposit
Hardpan/Till	–	an unstratified, consolidated or cemented mixture of clay, silt, sand and/or gravel, the size/shape of the constituents vary widely
Lacustrine	–	soil deposited by lake water
Mottled	–	soil irregularly marked with spots of different colors that vary in number and size
Varved	–	alternating partings or seams of silt and/or clay
Occasional	–	one or less per foot of thickness
Frequent	–	more than one per foot of thickness
Interbedded	–	strata of soil or beds of rock lying between or alternating with other strata of a different nature

DESCRIPTION OF RELATIVE QUANTITIES

The visual-manual procedure uses the following terms to describe the relative quantities of notable foreign materials, gravel, sand or fines:

Trace	–	particles are present but estimated to be less than 5%
Few	–	5 to 10%
Little	–	15 to 25%
Some	–	30 to 45%
Mostly	–	50 to 100%

CLASSIFICATION TERMINOLOGY AND CORRELATIONS

Cohesionless Soils

Relative Density	N_{60} (N-Value) (Blows per foot)
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	51 to 80
Extremely Dense	Over 81

Cohesive Soils

Consistency	N_{60} (N-Value) (Blows per foot)	Undrained Shear Strength (kips/ft^2)
Very Soft	<2	0.25 or less
Soft	2 - 4	> 0.25 to 0.50
Medium	5 - 8	> 0.50 to 1.0
Stiff	9 - 15	> 1.0 to 2.0
Very Stiff	16 - 30	> 2.0 to 4.0
Hard	> 30	> 4.0 or greater

Standard Penetration 'N-Value' = Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split barrel sampler, except where noted. N60 values as reported on boring logs represent raw N-values corrected for hammer efficiency only.

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BORING B201

BORING DEPTH: 15 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan
DATE STARTED: 10/7/21 **COMPLETED:** 10/7/21
BORING METHOD: Hollow-stem Augers
DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57)
LOGGED BY: KJT **CHECKED BY:** JSW

ELEVATION: 798± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
797.5	0.5	6 inches of TOPSOIL			
795.0	3.0	LEAN CLAY- Brown- Very Stiff (CL)	SB1	18	1 1 4
			SB2	18	4 6 11
790	5	Sandy LEAN CLAY- Brown and Gray to Brown- Hard (CL)	SB3	18	8 13 20
			SB4	18	4 8 12
786.0	12.0				
785	10	LEAN CLAY- Occasional Sand Layers- Brown- Very Stiff (CL)	SB5	18	14 13 18
783.0	15.0	END OF BORING AT 15.0 FEET.			
780	15				
775	20				
770	25				
	30				

HAMMER EFFICIENCY: 80%
DATE: 9/16/2021
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

SHEAR STRENGTH (KSF)
1 2 3 4
▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
◈ TRIAXIAL (UU)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

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BORING B202

BORING DEPTH: 15 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan

DATE STARTED: 10/5/21 **COMPLETED:** 10/5/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW

ELEVATION: 802± FT

ELEV (FT)	DEPTH (FT)	PROFILE DESCRIPTION	SAMPLE TYPE/NO.	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
	0	0.5 6 inches of TOPSOIL 801.5			
800		LEAN CLAY with Sand- Occasional Roots- Brown- Very Stiff (CL)	SB1	18	2 4 8
	4.0	798.0			
	5	Sandy SILT- Occasional Clayey Silt Layers- Brown and Gray- Wet- Medium Dense (ML)	SB2	18	3 4 5
	6.0	796.0			
795		LEAN CLAY- Brown- Stiff (CL)	SB3	16	4 5 7
	8.0	794.0			
	10	LEAN CLAY with Sand- Gray- Very Stiff (CL)	3ST4	14	
790					
	15	15.0 787.0	SB5	18	2 4 8
		END OF BORING AT 15.0 FEET.			
785					
	20				
780					
	25				
775					
	30				

HAMMER EFFICIENCY: 80%
DATE: 9/16/2021
N_{60} -- ○
10 20 30 40

DRY DENSITY (pcf) -- ■
90 100 110 120
MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
◈ TRIAXIAL (UU)
SHEAR STRENGTH (KSF)
1 2 3 4

REMARKS

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	4.0	798.0
▼ **AT END OF BORING:**	5.0	797.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/11/21 1:31:36 PM

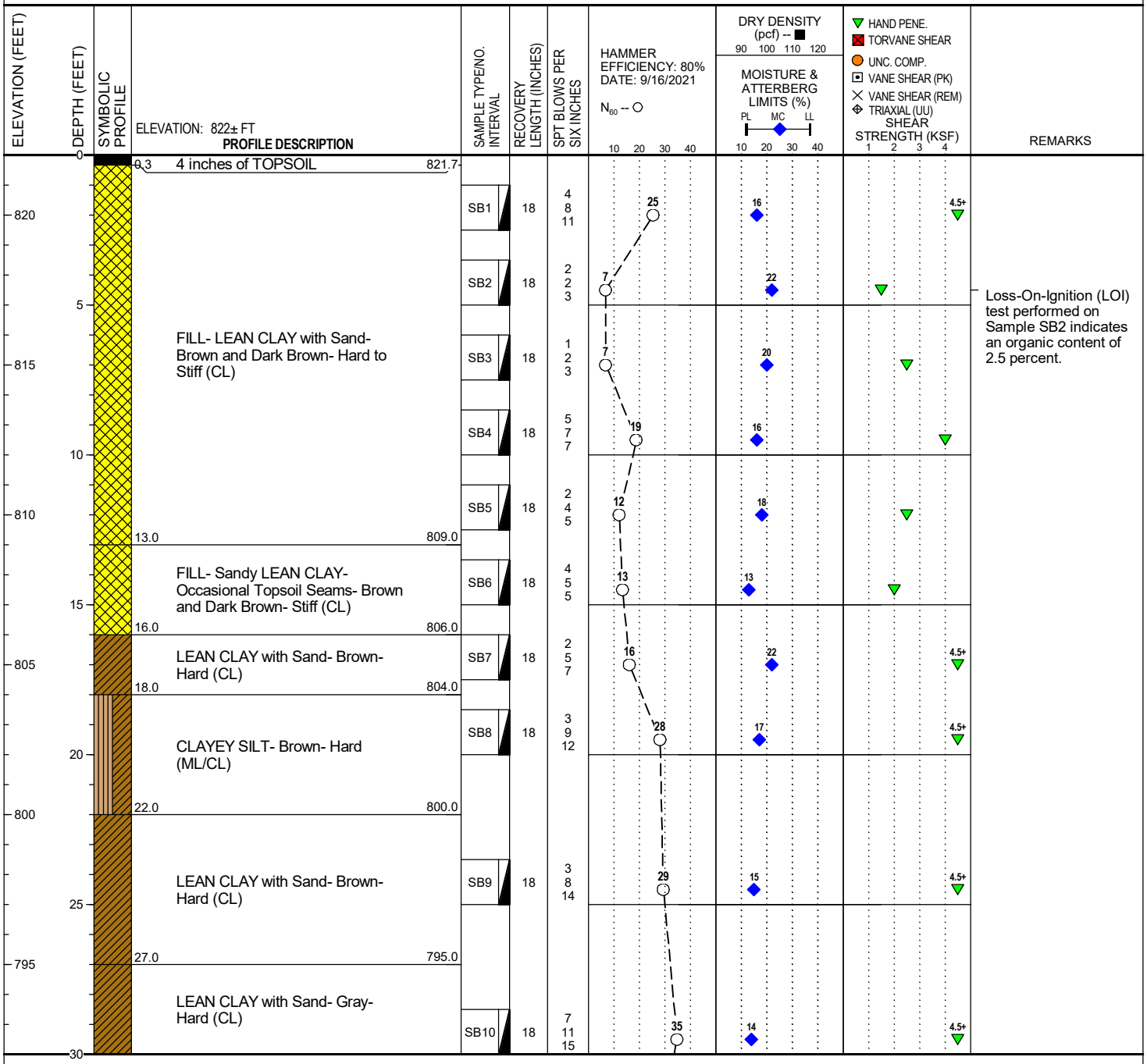
BORING B203

BORING DEPTH: 35 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan

DATE STARTED: 10/5/21 **COMPLETED:** 10/5/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW



GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

(Continued Next Page)

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SME

BORING B203

BORING DEPTH: 35 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track **PROJECT NUMBER:** 087829.00

CLIENT: IBI Group **PROJECT LOCATION:** Superior Township, Michigan

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 9/16/2021 N_{60} -- ○	DRY DENSITY (pcf) -- ■ / MOISTURE & ATTERBERG LIMITS (%) PL MC LL	HAND PENE. ▽ / TORVANE SHEAR ⊠ / UNC. COMP. ● / VANE SHEAR (PK) ⊡ / VANE SHEAR (REM) ⨯ / TRIAXIAL (UU) ⌖ SHEAR STRENGTH (KSF)	REMARKS
	30		ELEVATION: 822± FT				10 20 30 40	90 100 110 120 / 10 20 30 40	1 2 3 4	
790			LEAN CLAY with Sand- Gray- Hard (CL) *(continued)*							
			35.0 787.0	SB11	18	4 6 11	○ 23	◆ 15	▽ 4.5+	
	35		END OF BORING AT 35.0 FEET.							
785										
	40									
780										
	45									
775										
	50									
770										
	55									
765										
	60									
760										
	65									
755										
	70									

11/11/21 1:31:38 PM

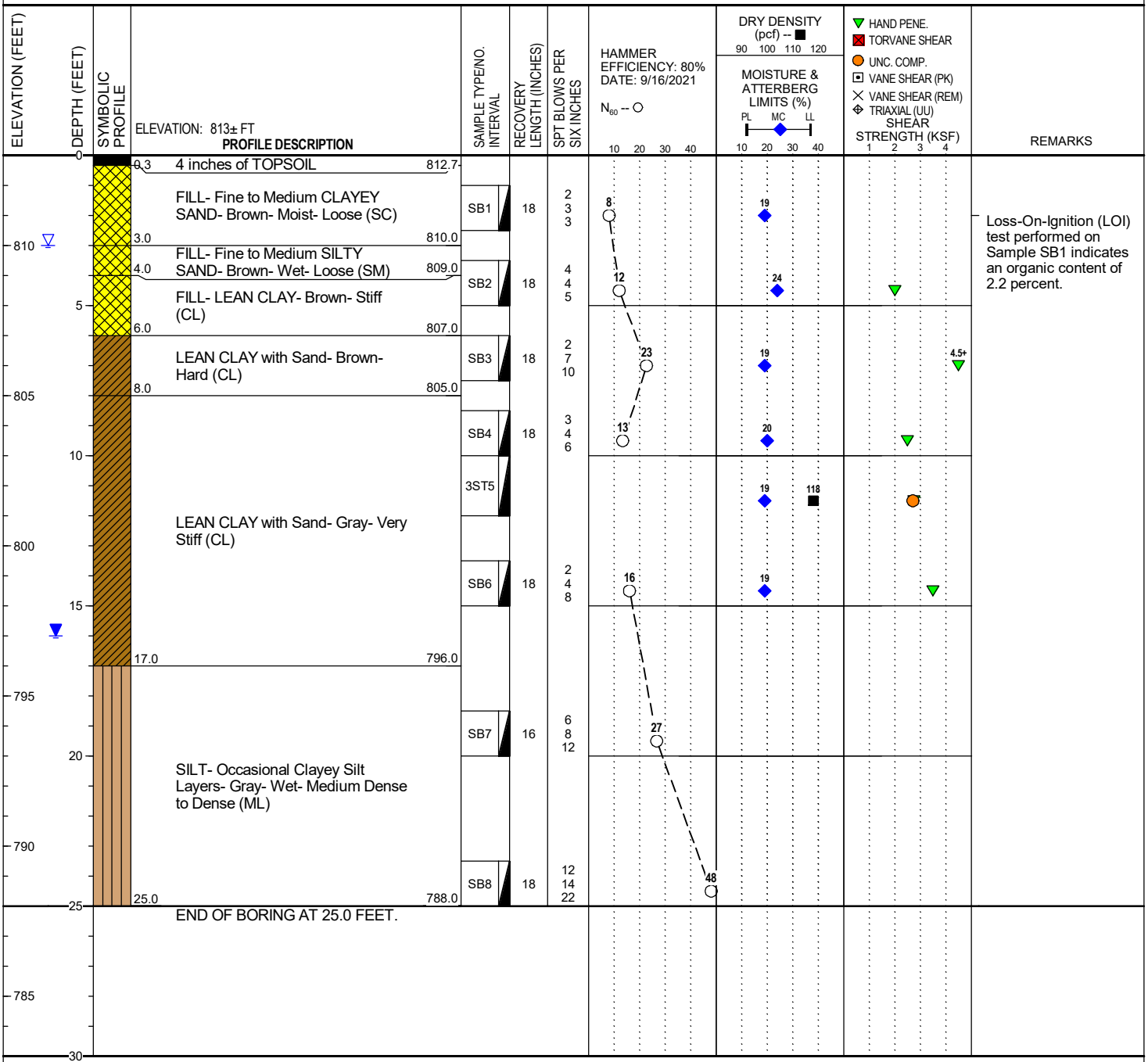
BORING B204

BORING DEPTH: 25 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan

DATE STARTED: 10/5/21 **COMPLETED:** 10/5/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	3.0	810.0
▼ AT END OF BORING:	16.0	797.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

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BORING B205

BORING DEPTH: 25 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track **PROJECT NUMBER:** 087829.00

CLIENT: IBI Group **PROJECT LOCATION:** Superior Township, Michigan

DATE STARTED: 10/6/21 **COMPLETED:** 10/6/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW

ELEVATION: 808± FT

ELEVATION (FEET)	DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
808	0	10 inches of TOPSOIL			
807.2	0.8	Sandy LEAN CLAY- Brown- Stiff (CL)	SB1	18	2 3 4
805.0	3.0	LEAN CLAY with Sand- Brown- Hard (CL)	SB2	16	4 8 10
802.0	6.0	CLAYEY SILT with Sand- Brown- Hard (ML/CL)	SB3	18	4 6 7
800.0	8.0	LEAN CLAY with Sand- Gray- Hard (CL)	SB4	18	5 7 10
794.0	14.0	CLAYEY SILT with Sand- Gray- Hard (ML/CL)	SB5	18	5 9 12
790.0	18.0	LEAN CLAY with Sand- Gray- Hard (CL)	SB6	18	5 10 12
783.0	25.0		SB7	18	4 10 16
	25	END OF BORING AT 25.0 FEET.			

HAMMER EFFICIENCY: 80%
DATE: 9/16/2021
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

HAND PENE. ▽
TORVANE SHEAR ⊠
UNC. COMP. ●
VANE SHEAR (PK) ⊡
VANE SHEAR (REM) ×
TRIAXIAL (UU) ◈
SHEAR STRENGTH (KSF)
1 2 3 4

REMARKS

GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

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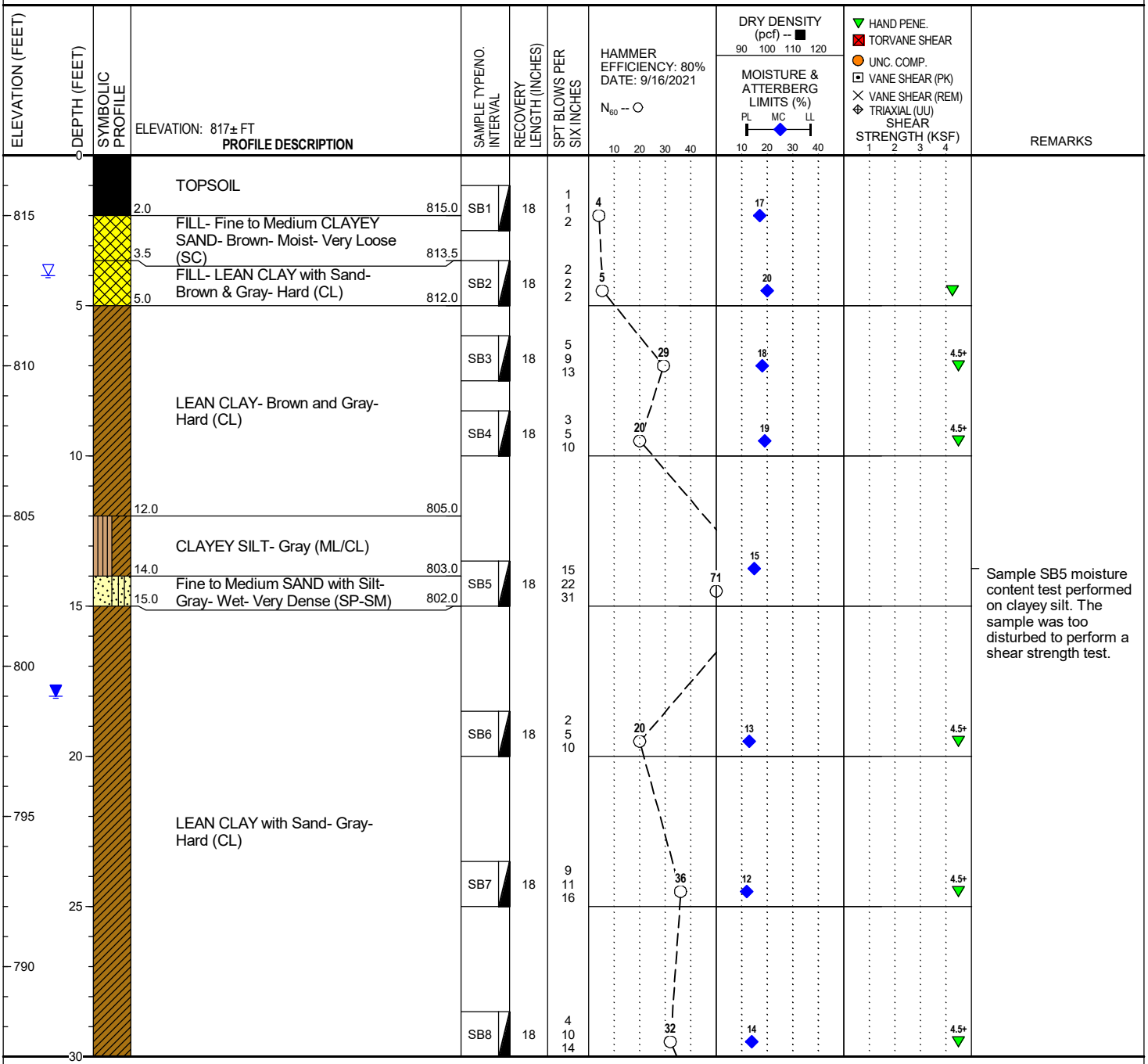
BORING B206

BORING DEPTH: 34.4 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan

DATE STARTED: 10/6/21 **COMPLETED:** 10/6/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	4.0	813.0
▼ **AT END OF BORING:**	18.0	799.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

(Continued Next Page)

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SME

BORING B206

BORING DEPTH: 34.4 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track

PROJECT NUMBER: 087829.00

CLIENT: IBI Group

PROJECT LOCATION: Superior Township, Michigan

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 9/16/2021 N_{60} -- ○ (10 20 30 40)	DRY DENSITY (pcf) -- ■ (90 100 110 120) MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)	HAND PENE. ▽ TORVANE SHEAR ⊠ UNC. COMP. ● VANE SHEAR (PK) ⊡ VANE SHEAR (REM) ✕ TRIAXIAL (UU) ◈ SHEAR STRENGTH (KSF) (1 2 3 4)	REMARKS
	30		ELEVATION: 817± FT							
785			LEAN CLAY with Sand- Gray- Hard (CL) *(continued)*							
			33.0 784.0							
			Sandy SILT- Gray- Wet- Extremely Dense (ML)	SB9	11	30 50/5"	67+			
	34.4		782.6							
			END OF BORING AT 34.4 FEET.							
	35									
780										
	40									
775										
	45									
770										
	50									
765										
	55									
760										
	60									
755										
	65									
750										
	70									

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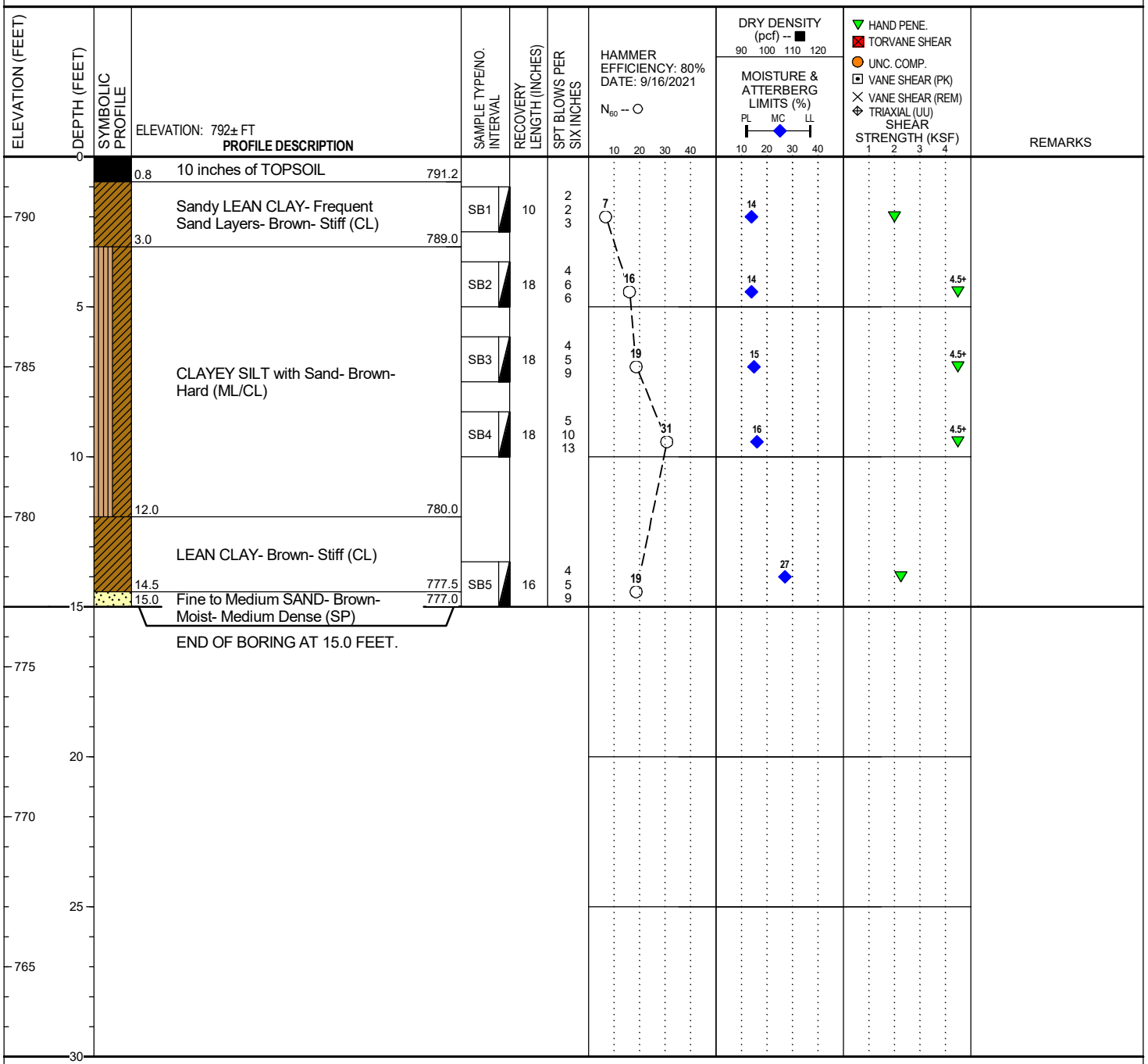
BORING B207

BORING DEPTH: 15 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan
DATE STARTED: 10/7/21 **COMPLETED:** 10/7/21
BORING METHOD: Hollow-stem Augers
DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57)
LOGGED BY: KJT **CHECKED BY:** JSW



GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

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BORING P201

BORING DEPTH: 10 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track **PROJECT NUMBER:** 087829.00

CLIENT: IBI Group **PROJECT LOCATION:** Superior Township, Michigan

DATE STARTED: 10/5/21 **COMPLETED:** 10/5/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION (ELEVATION: 800± FT)	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 9/16/2021 N_{60} -- ○ (10 20 30 40)	DRY DENSITY (pcf) -- ■ (90 100 110 120) MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)	HAND PENE. ▽ TORVANE SHEAR ⊠ UNC. COMP. ● VANE SHEAR (PK) ⊡ VANE SHEAR (REM) × TRIAXIAL (UU) ◈ SHEAR STRENGTH (KSF) (1 2 3 4)	REMARKS
800	0		0.5 6 inches of TOPSOIL 799.5							
			CLAYEY SILT with Sand- Brown- Hard (ML/CL)	SB1	18	3 6 10	21	14	4.5+	
				SB2	18	4 8 13	28	14	4.5+	
795	5		5.5 794.5							
			LEAN CLAY with Sand- Brown- Hard (CL)	SB3	18	8 13 16	39	15	4.5+	
				SB4	18	8 9 11	27	16	4.5+	
790	10		10.0 790.0 END OF BORING AT 10.0 FEET.							
785	15									
780	20									
775	25									
770	30									

GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

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BORING P202

BORING DEPTH: 15 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan

DATE STARTED: 10/6/21 **COMPLETED:** 10/6/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW

ELEVATION: 808± FT

DEPTH (FEET)	PROFILE DESCRIPTION	ELEVATION (FEET)	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
0	0.7 8 inches of TOPSOIL	807.3			
	2.0 Sandy LEAN CLAY- Brown- Stiff (CL)	806.0	SB1	18	3 3 3
5	LEAN CLAY with Sand- Occasional Wet Sand Seams- Brown- Hard (CL)		SB2	18	5 9 13
			SB3	18	3 7 12
	8.0	800.0	SB4	2	9 12 16
10	LEAN CLAY with Sand- Gray- Hard (CL)				
15	15.0	793.0	SB5	18	3 7 11
	END OF BORING AT 15.0 FEET.				
20					
25					
30					

HAMMER EFFICIENCY: 80%
DATE: 9/16/2021
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
◈ TRIAXIAL (UU)
SHEAR STRENGTH (KSF)
1 2 3 4

REMARKS

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	5.5	802.5
▼ AT END OF BORING:	6.0	802.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/11/21 1:31:46 PM

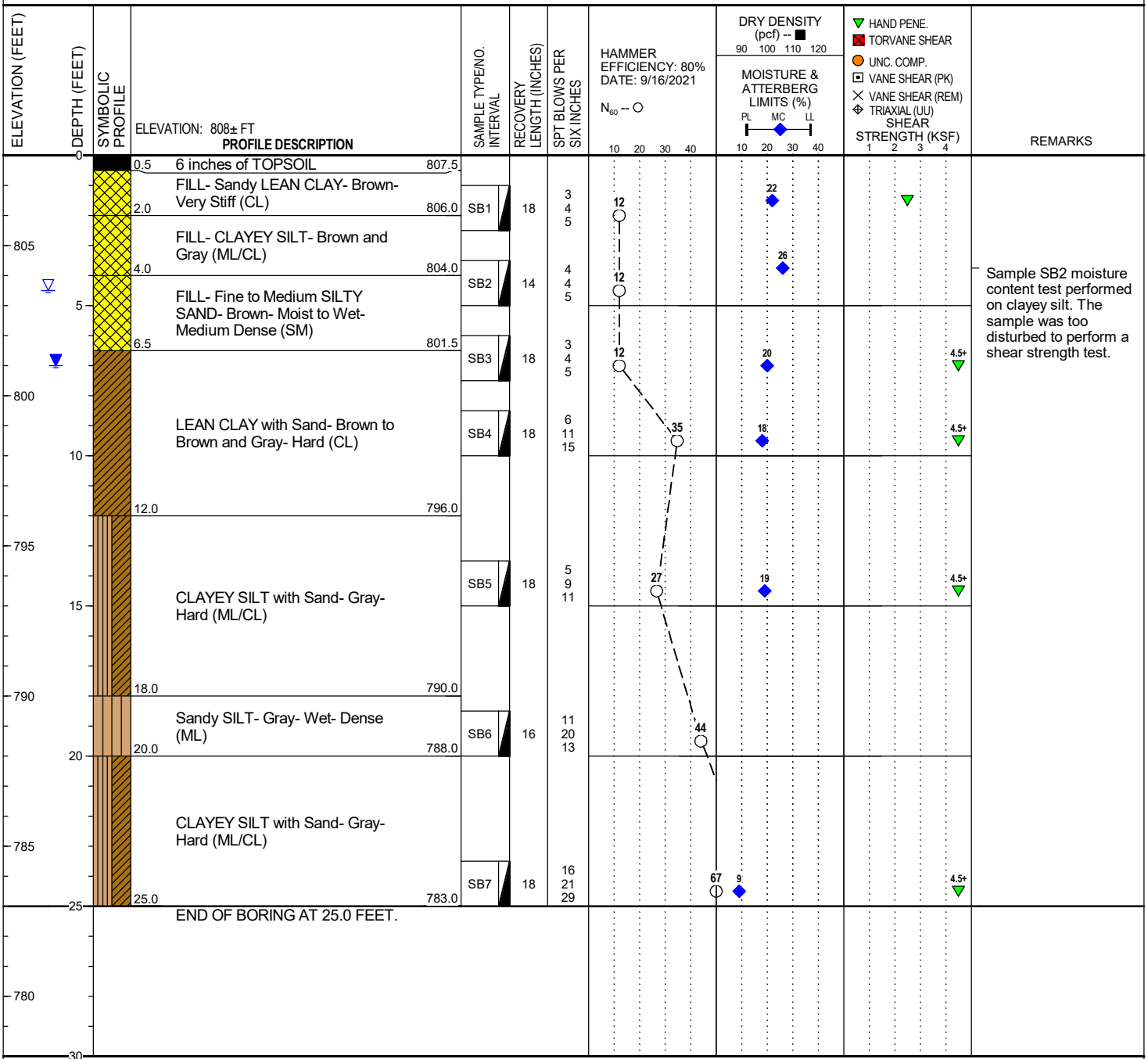
BORING P203

BORING DEPTH: 25 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan

DATE STARTED: 10/6/21 **COMPLETED:** 10/6/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	4.5	803.5
▼ AT END OF BORING:	7.0	801.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/11/21 1:31:47 PM

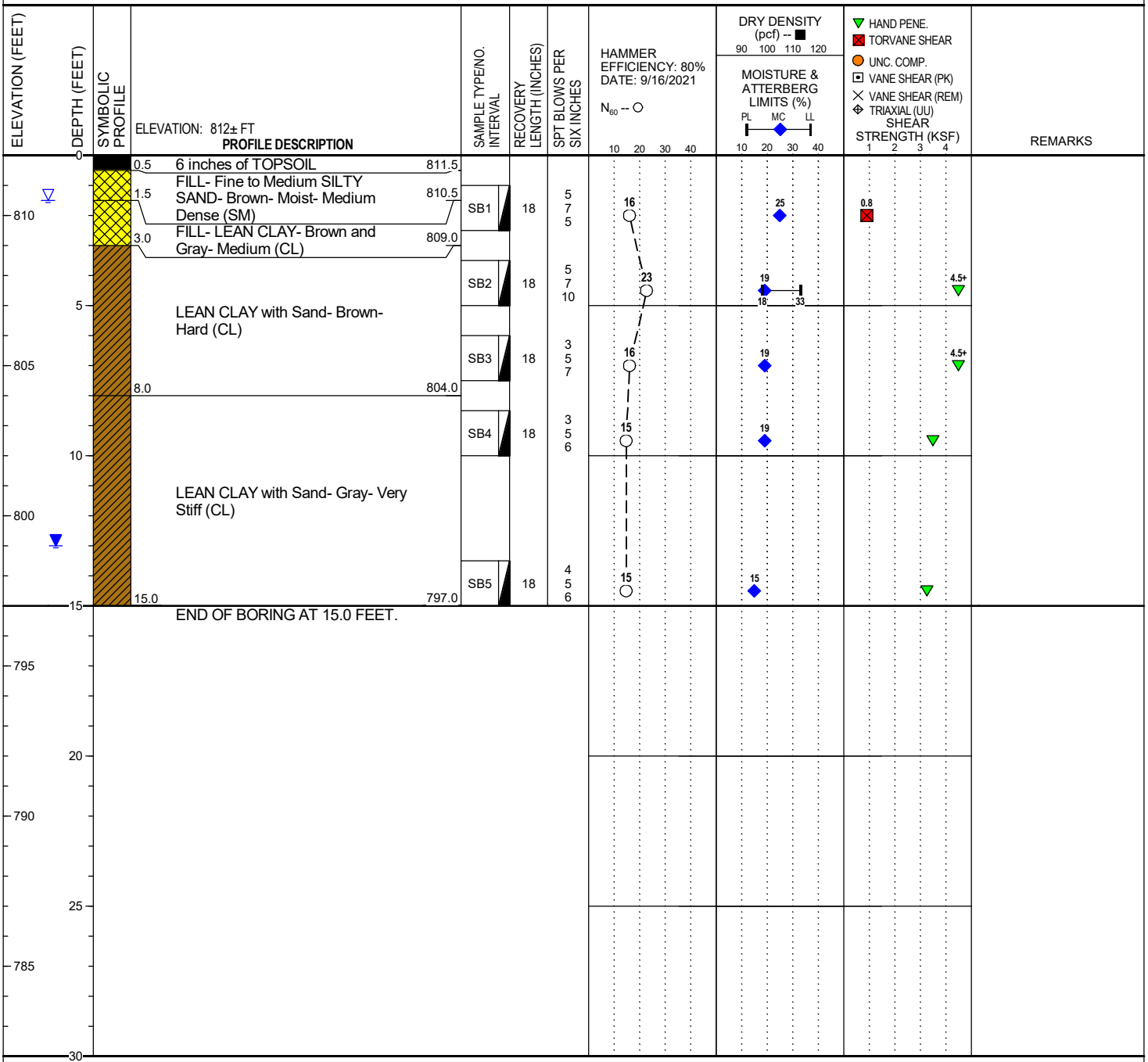
BORING P204

BORING DEPTH: 15 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan

DATE STARTED: 10/4/21 **COMPLETED:** 10/4/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	1.5	810.5
▼ AT END OF BORING:	13.0	799.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/11/21 1:31:48 PM

BORING P205

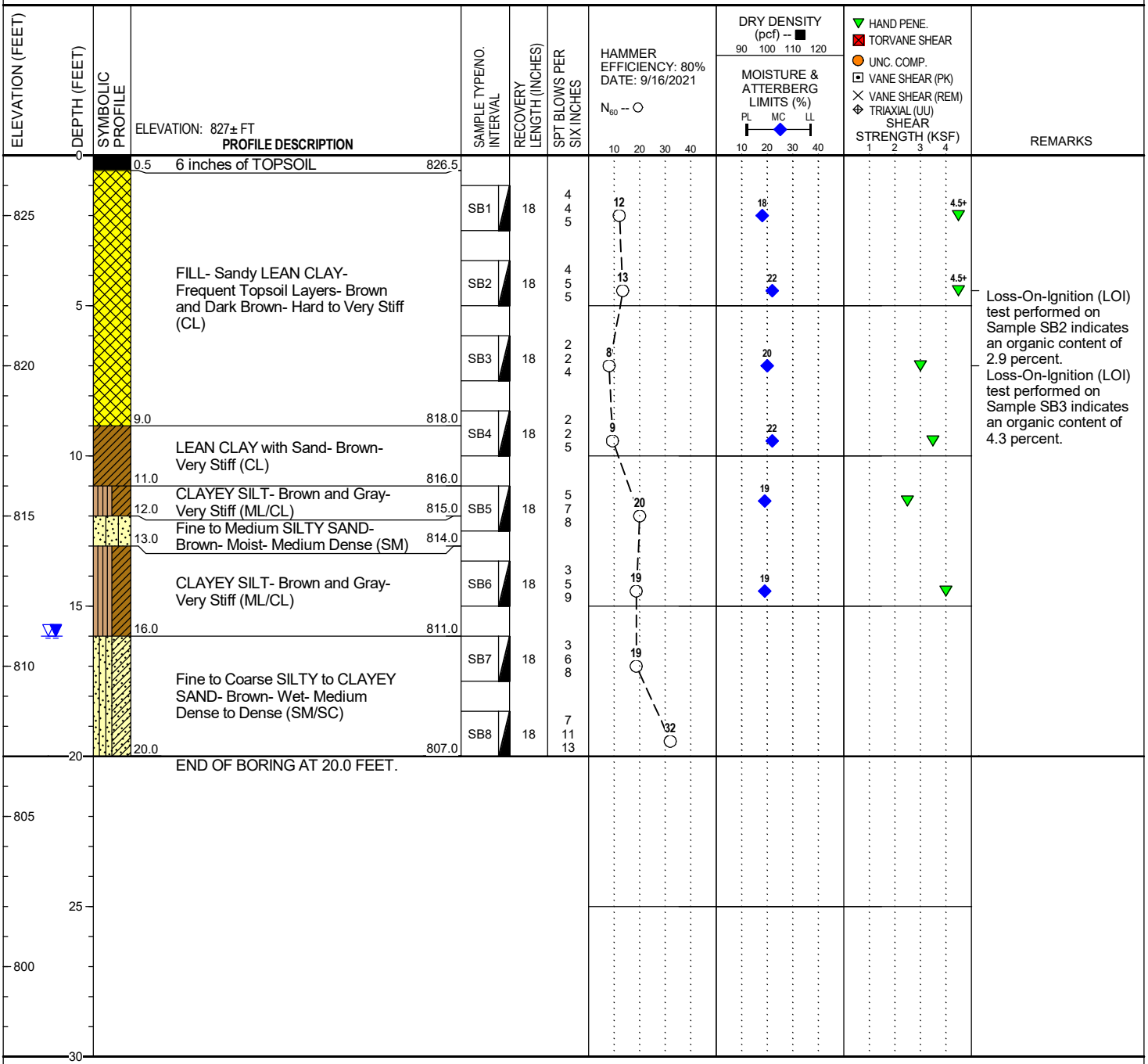
BORING DEPTH: 20 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track **PROJECT NUMBER:** 087829.00

CLIENT: IBI Group **PROJECT LOCATION:** Superior Township, Michigan

DATE STARTED: 10/7/21 **COMPLETED:** 10/7/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW



GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ DURING BORING:	16.0	811.0
▼ AT END OF BORING:	16.0	811.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/11/21 1:31:49 PM

BORING P206

BORING DEPTH: 15 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan
DATE STARTED: 10/5/21 **COMPLETED:** 10/5/21
BORING METHOD: Hollow-stem Augers
DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57)
LOGGED BY: KJT **CHECKED BY:** JSW

ELEVATION: 812± FT

DEPTH (FEET)	ELEVATION (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
0	812	0.7 8 inches of TOPSOIL 811.3			
		LEAN CLAY- Brown and Gray- Very Stiff (CL)	SB1	18	2 4 5
3.0	809.0				
			SB2	18	7 11 14
5	807				
		LEAN CLAY with Sand- Brown- Hard (CL)	SB3	18	4 8 13
			SB4	18	3 8 13
10	802				
12.0	800.0				
		LEAN CLAY- Gray- Very Stiff (CL)			
14.0	798.0				
		CLAYEY SILT- Gray- Very Stiff (ML/CL)	SB5	18	4 12 16
15.0	797.0				
15	797	END OF BORING AT 15.0 FEET.			
20	792				
25	787				
30	782				

HAMMER EFFICIENCY: 80%
DATE: 9/16/2021
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

SHEAR STRENGTH (KSF)
1 2 3 4
▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
◈ TRIAXIAL (UU)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/11/21 1:31:50 PM

BORING P207

BORING DEPTH: 10 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track **PROJECT NUMBER:** 087829.00

CLIENT: IBI Group **PROJECT LOCATION:** Superior Township, Michigan

DATE STARTED: 10/4/21 **COMPLETED:** 10/4/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	ELEVATION: 803± FT PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 9/16/2021 N_{60} -- ○ (10 20 30 40)	DRY DENSITY (pcf) -- ■ (90 100 110 120) MOISTURE & ATTERBERG LIMITS (%) PL MC LL (10 20 30 40)	▽ HAND PENE. ⊠ TORVANE SHEAR ● UNC. COMP. ⊡ VANE SHEAR (PK) × VANE SHEAR (REM) ◈ TRIAXIAL (UU) SHEAR STRENGTH (KSF) (1 2 3 4)	REMARKS
	0		0.7 8 inches of TOPSOIL 802.3							
			Sandy LEAN CLAY- Brown- Stiff (CL)	SB1	18	4 4 5	12	21	▽	
800			3.0 800.0							
				SB2	18	5 7 12	25	17	▽ 4.5+	
	5		LEAN CLAY with Sand- Brown- Hard (CL)							
				SB3	18	6 11 14	33	14	▽ 4.5+	
795			8.0 795.0							
			LEAN CLAY- Frequent Silt Layers- Brown- Very Stiff (CL)	SB4	18	10 16 16	43	15	▽	
	10		10.0 793.0							
			END OF BORING AT 10.0 FEET.							
790										
	15									
785										
	20									
780										
	25									
775										
	30									

GROUNDWATER & BACKFILL INFORMATION

GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/11/21 1:31:51 PM

BORING P208

BORING DEPTH: 10 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track **PROJECT NUMBER:** 087829.00

CLIENT: IBI Group **PROJECT LOCATION:** Superior Township, Michigan

DATE STARTED: 10/6/21 **COMPLETED:** 10/6/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW

ELEVATION: 812± FT

ELEV (FT)	DEPTH (FT)	PROFILE DESCRIPTION	SAMPLE TYPE/NO.	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
	0	0.5 6 inches of TOPSOIL 811.5			
810		FILL- Sandy LEAN CLAY- Brown- Stiff (CL)	SB1	18	1 1 1
	3.0	809.0			
	5		SB2	18	6 10 14
805		LEAN CLAY with Sand- Brown- Hard (CL)	SB3	18	5 11 17
	10	10.0 802.0	SB4	18	4 9 13
		END OF BORING AT 10.0 FEET.			
800	15				
795	20				
790	25				
785	30				

HAMMER EFFICIENCY: 80%
DATE: 9/16/2021
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

SHEAR STRENGTH (KSF)
1 2 3 4

▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
◈ TRIAXIAL (UU)

REMARKS

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	3.0	809.0
▼ **AT END OF BORING:**	5.0	807.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/11/21 1:31:52 PM

BORING P209

BORING DEPTH: 20 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track
PROJECT NUMBER: 087829.00
CLIENT: IBI Group
PROJECT LOCATION: Superior Township, Michigan

DATE STARTED: 10/6/21 **COMPLETED:** 10/6/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW

ELEVATION: 817± FT

ELEV (FT)	DEPTH (FT)	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES
816.5	0.5	6 inches of TOPSOIL	SB1	8	2 3 8
815		Fine to Medium SILTY SAND- Brown- Moist- Medium Dense (SM)	SB2	10	7 8 8
	5		SB3	14	4 6 6
810					
809.0	8.0		SB4	18	5 5 5
	10	Fine to Medium SILTY to CLAYEY SAND- Brown- Wet- Medium Dense (SM/SC)			
805.5	11.5		SB5	10	4 5 9
805		LEAN CLAY with Sand- Gray- Hard (CL)	SB6	18	3 5 9
	15				
801.5	15.5				
801.0	16.0	Fine to Medium SAND- Gray- Moist (SP)	SB7	16	15 32 43
800		CLAYEY SILT- Gray- Hard (ML/CL)			
799.0	18.0		SB8	18	15 29 48
		Sandy SILT- Gray- Wet- Extremely Dense (ML)			
797.0	20.0				
795	20	END OF BORING AT 20.0 FEET.			
790	25				
	30				

HAMMER EFFICIENCY: 80%
DATE: 9/16/2021
N_{60} -- ○

DRY DENSITY (pcf) -- ■
90 100 110 120

MOISTURE & ATTERBERG LIMITS (%)
PL MC LL
10 20 30 40

SHEAR STRENGTH (KSF)
▽ HAND PENE.
⊠ TORVANE SHEAR
● UNC. COMP.
⊡ VANE SHEAR (PK)
× VANE SHEAR (REM)
⊕ TRIAXIAL (UU)
1 2 3 4

REMARKS

Sample SB1 loss-by-wash test indicates 12.1 percent soil fines content.

Sample SB2 loss-by-wash test indicates 17.5 percent soil fines content.

GROUNDWATER & BACKFILL INFORMATION

	DEPTH (FT)	ELEV (FT)
▽ **DURING BORING:**	8.0	809.0
▼ **AT END OF BORING:**	15.0	802.0

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

11/11/21 1:31:53 PM

BORING P210

BORING DEPTH: 10 FEET

PROJECT NAME: HATCI R&D Center | Crash Building & Test Track **PROJECT NUMBER:** 087829.00

CLIENT: IBI Group **PROJECT LOCATION:** Superior Township, Michigan

DATE STARTED: 10/7/21 **COMPLETED:** 10/7/21 **BORING METHOD:** Hollow-stem Augers

DRILLER: MC (D&T Drilling) **RIG NO.:** D&T (ATV B57) **LOGGED BY:** KJT **CHECKED BY:** JSW

ELEVATION (FEET)	DEPTH (FEET)	SYMBOLIC PROFILE	PROFILE DESCRIPTION	SAMPLE TYPE/NO. INTERVAL	RECOVERY LENGTH (INCHES)	SPT BLOWS PER SIX INCHES	HAMMER EFFICIENCY: 80% DATE: 9/16/2021 N_{60} -- ○	DRY DENSITY (pcf) -- ■ / MOISTURE & ATTERBERG LIMITS (%) PL MC LL	SHEAR STRENGTH (KSF) ▽ HAND PENE. ⊠ TORVANE SHEAR ● UNC. COMP. ⊡ VANE SHEAR (PK) × VANE SHEAR (REM) ◈ TRIAXIAL (UU)	REMARKS
800	0		ELEVATION: 801± FT				10 20 30 40	90 100 110 120 / 10 20 30 40	1 2 3 4	
	0.5		6 inches of TOPSOIL 800.5							
			Sandy LEAN CLAY- Brown- Very Stiff (CL)	SB1	18	3 3 4	9	19	▽ 4.5+	
	3.0		798.0							
			LEAN CLAY with Sand- Brown- Hard (CL)	SB2	18	6 10 14	32	14	▽ 4.5+	
795	5									
	6.0		795.0							
			CLAYEY SILT- Brown- Hard (ML/CL)	SB3	18	6 8 13	28	14	▽ 4.5+	
				SB4	18	6 11 19	40	13	▽ 4.5+	
	10		10.0 791.0							
790			END OF BORING AT 10.0 FEET.							
	15									
785										
	20									
780										
	25									
775										
	30									

GROUNDWATER & BACKFILL INFORMATION

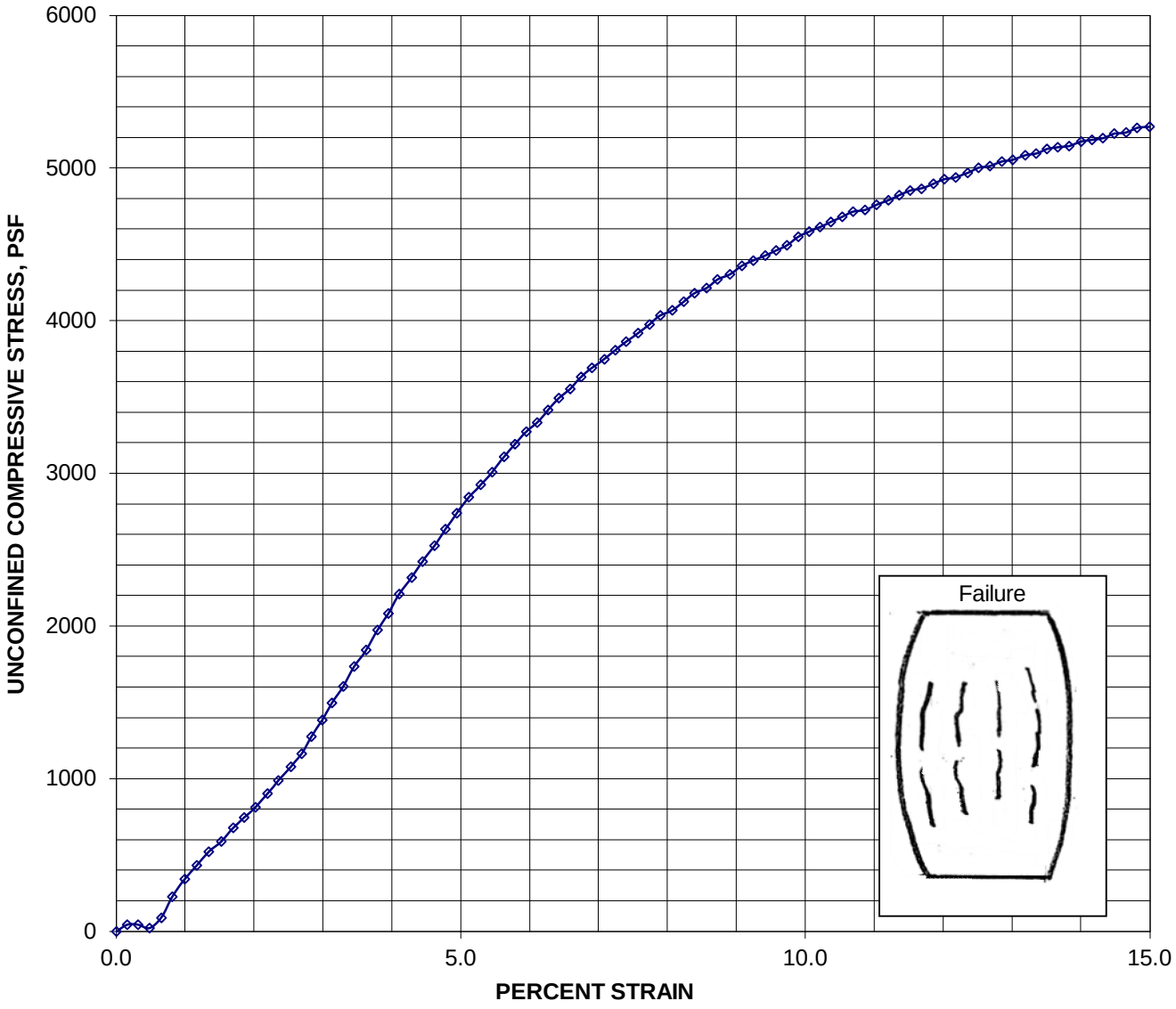
GROUNDWATER WAS NOT ENCOUNTERED

BACKFILL METHOD: Auger Cuttings

NOTES: 1. The indicated stratification lines are approximate. The in-situ transitions between materials may be gradual.
2. The colors depicted on the symbolic profile are solely for visualization purposes and do not necessarily represent the in-situ colors encountered.

UNCONFINED COMPRESSIVE STRENGTH OF COHESIVE SOIL
ASTM D2166

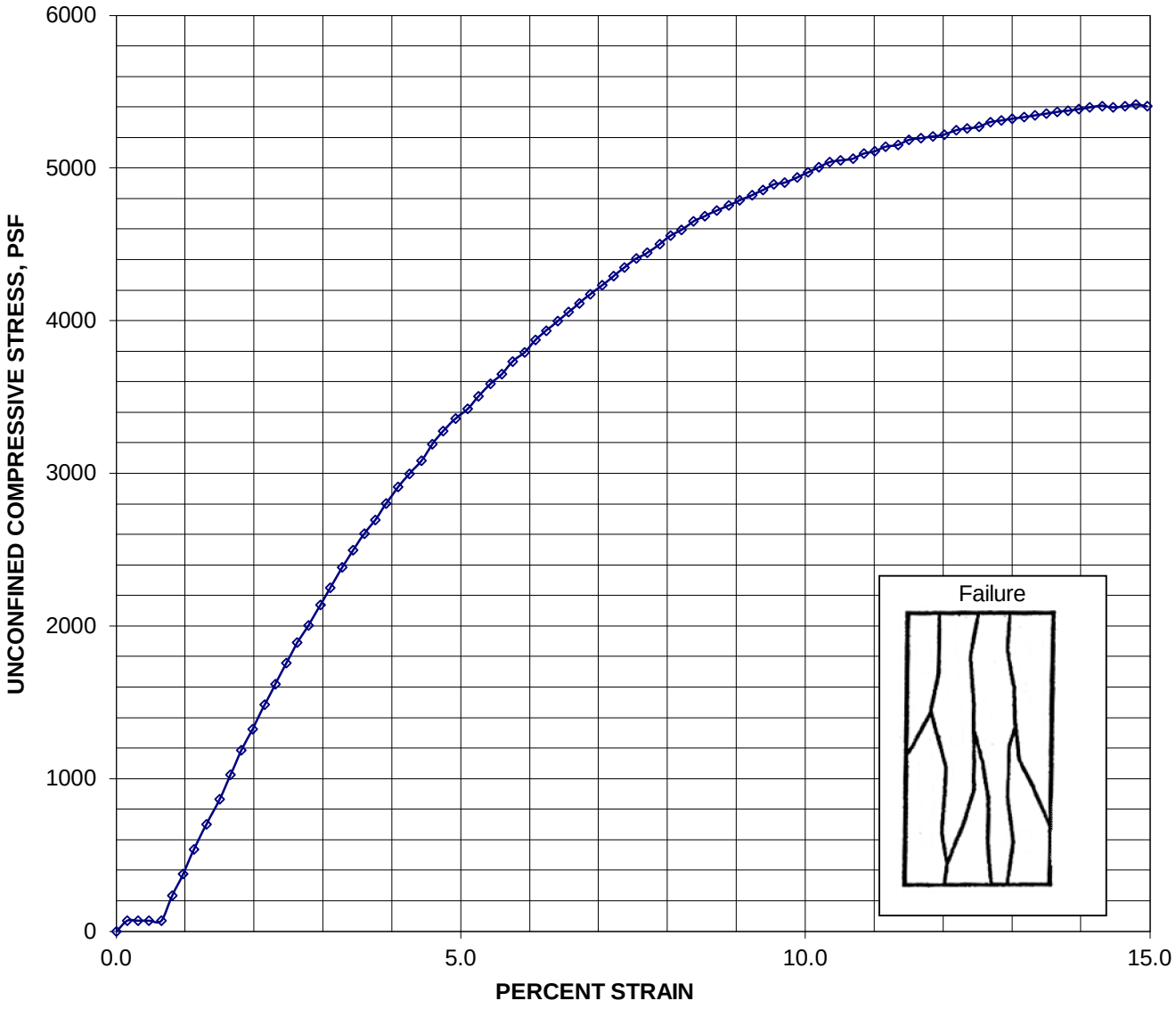
Project: HATCI R&D Center | Crash Building & Test Track
Project #: 087829.00
Date: October 14, 2021



SAMPLE INFORMATION		TEST RESULTS	
Sample Description:	LEAN CLAY with Sand	***Unconfined Compressive Strength (psf):***	5,270
Sample Location:	B202 3ST4	***Strain at Failure (%):***	15.0
Sample Depth:	8.0'-10.0'	***Water Content (after shear) (%):***	16.4
USCS Classification:	CL	***Dry Density (pcf):***	122.0
Height (in):	5.65	***Average Strain Rate (%/min):***	1.4
Diameter (in):	2.82		
Height/Diameter Ratio:	2.0	***Hand Penetrometer / Torvane:***	3.00

UNCONFINED COMPRESSIVE STRENGTH OF COHESIVE SOIL
ASTM D2166

Project: HATCI R&D Center | Crash Building & Test Track
Project #: 087829.00
Date: October 14, 2021



SAMPLE INFORMATION		TEST RESULTS	
Sample Description:	LEAN CLAY with Sand	***Unconfined Compressive Strength (psf):***	5,420
Sample Location:	B204 3ST5	***Strain at Failure (%):***	14.8
Sample Depth:	10.0'-12.0'	***Water Content (after shear) (%):***	18.5
USCS Classification:	CL	***Dry Density (pcf):***	117.5
Height (in):	5.67	***Average Strain Rate (%/min):***	1.4
Diameter (in):	2.78		
Height/Diameter Ratio:	2.0	***Hand Penetrometer / Torvane:***	2.75

ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS ASTM D4546

PROJECT INFORMATION

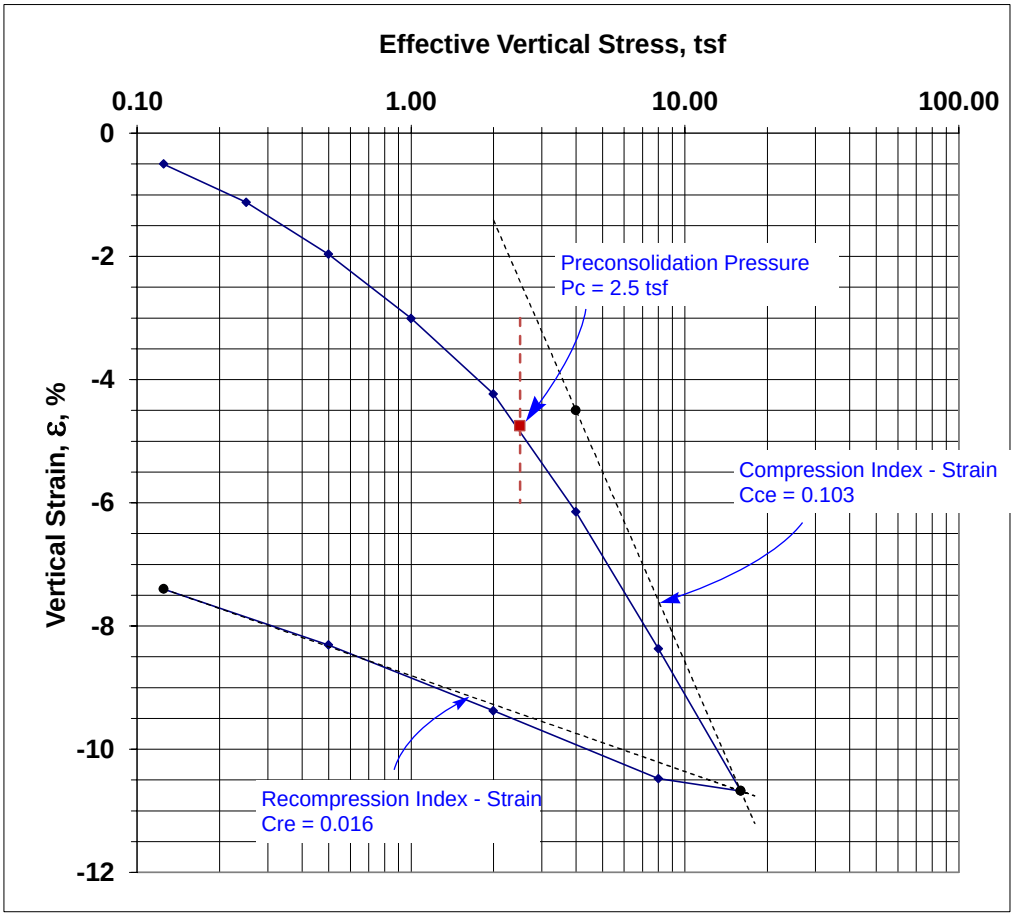
Project:	HATCI R&D Center | Crash Building & Test Track	Project Number:	087829.00		
Location:	Superior Township, Michigan	Date Started:	10/18/21	Test Frame Number:	E
Client:	IBI Group	Engineer:	JSW	Tested by:	KJT

SAMPLE IDENTIFICATION

Sample Location	Type of Sample	Description
B202 3ST4 (8.0'-10.0')	Undisturbed Shelby Tube	LEAN CLAY with Sand

TEST CONDITIONS

Loading Method (A), (B) or (C)	Cyclic Loading	Initial Stone & Reservoir Water Conditions
B	x	Dry stone and reservoir; water after initial consolidation



	Initial	Final
Void Ratio, e	0.35	0.26
Saturation, %	112	100
Water Content	14.8	10.0
Wet Unit Weight	138.9	142.0
Dry Unit Weight	121.0	129.1
% Heave	----	
Swell Pressure	----	

Overburden Pressure, P_o, tsf	0.66
Preconsolidation Pressure, P_c, tsf	2.50
Recompression Index – Strain, C_{re}	0.016
Recompression Index, C_r	0.021
Compression Index – Strain, C_{ce}	0.103
Compression Index, C_c	0.138
Coefficient of Consolidation @ _ tsf, c_v	----
Coefficient of Consolidation @ _ tsf, c_v	----

ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS ASTM D4546

PROJECT INFORMATION

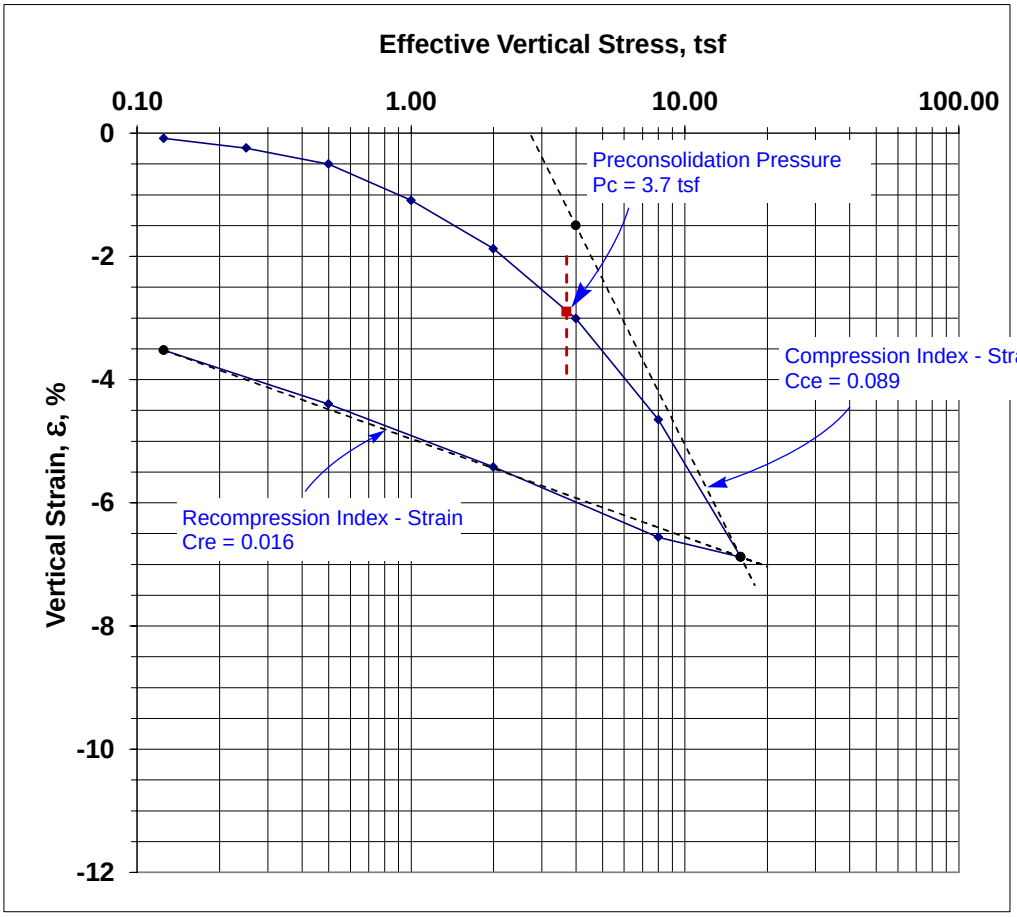
Project:	HATCI R&D Center | Crash Building & Test Trac	Project Number:	087829.00		
Location:	Superior Township, Michigan	Date Started:	10/21/21	Test Frame Number:	E
Client:	IBI Group	Engineer:	JSW	Tested by:	KJT

SAMPLE IDENTIFICATION

Sample Location	Type of Sample	Description
B204 3ST5 (10.0'-12.0')	Undisturbed Shelby Tube	LEAN CLAY with Sand

TEST CONDITIONS

Loading Method (A), (B) or (C)	Cyclic Loading	Initial Stone & Reservoir Water Conditions
B	x	Dry stone and reservoir; water after initial consolidation



	Initial	Final
Void Ratio, e	0.57	0.47
Saturation, %	97	100
Water Content	20.1	17.3
Wet Unit Weight	131.5	136.4
Dry Unit Weight	109.5	116.3
% Heave	----	
Swell Pressure	----	

Overburden Pressure, P_o, tsf	0.76
Preconsolidation Pressure, P_c, tsf	3.70
Recompression Index – Strain, C_{re}	0.016
Recompression Index, C_r	0.025
Compression Index – Strain, C_{ce}	0.089
Compression Index, C_c	0.140
Coefficient of Consolidation @ _ tsf, c_v	----
Coefficient of Consolidation @ _ tsf, c_v	----

LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX
ASTM D4318 - A

PROJECT: HATCI R&D Center | Crash Building & Test Track
LOCATION: Superior Township, MI
PROJECT#: 087829.00
DATE: October 18, 2021

DATE OBTAINED: October 14, 2021
SAMPLE NUMBER: SB2 3.5'-5.0'
SAMPLE LOCATION: P204
SAMPLE DESCRIPTION: LEAN CLAY with Sand
TECHNICIAN: Kyle Tobin

TEST METHOD: ASTM D4318
METHOD - A

TEST DATA:

LIQUID LIMIT

Point #:	1	2	3
Wet Wt + Tare, g:	26.72	27.29	30.01
Dry Wt + Tare, g:	24.01	24.43	26.32
Tare Wt.:	15.65	15.78	15.59
Water Content:	32.42	33.06	34.39
Number of Blows:	35	26	19

Water Content corrected for method B:	NA

PLASTIC LIMIT TEST

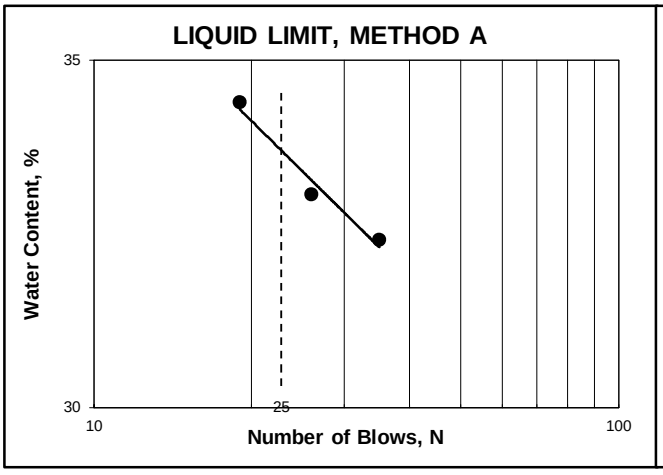
Wet Wt + Tare, g:	20.22	19.61
Dry Wt + Tare, g:	19.50	18.98
Tare Wt, g:	15.62	15.44
Water Content:	18.56	17.80

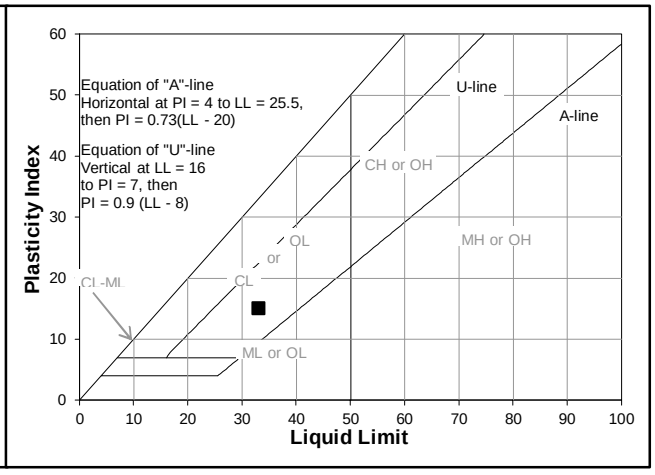
PLASTICITY INDEX

LIQUID LIMIT:	33
PLASTIC LIMIT:	18
PLASTICITY INDEX:	15

CLASSIFICATION: CL

REMARKS: Sample air dried prior to testing





LIQUID LIMIT, PLASTIC LIMIT & PLASTICITY INDEX
ASTM D4318 - A

PROJECT: HATCI R&D Center | Crash Building & Test Track
LOCATION: Superior Township, MI
PROJECT#: 087829.00
DATE: October 18, 2021

DATE OBTAINED: October 14, 2021
SAMPLE NUMBER: SB1 1.0'-2.5'
SAMPLE LOCATION: P206
SAMPLE DESCRIPTION: LEAN CLAY
TECHNICIAN: Kyle Tobin

TEST METHOD: ASTM D4318
METHOD - A

TEST DATA:

LIQUID LIMIT

Point #:	1	2	3
Wet Wt + Tare, g:	25.69	30.39	29.29
Dry Wt + Tare, g:	23.27	26.71	25.80
Tare Wt.:	15.74	15.80	15.80
Water Content:	32.14	33.73	34.90
Number of Blows:	35	25	19

Water Content corrected for method B:	NA

PLASTIC LIMIT TEST

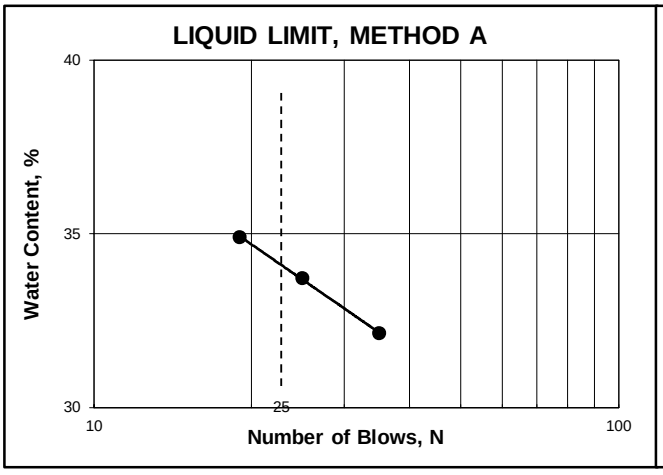
Wet Wt + Tare, g:	20.07	20.70
Dry Wt + Tare, g:	19.38	19.92
Tare Wt, g:	15.62	15.63
Water Content:	18.35	18.18

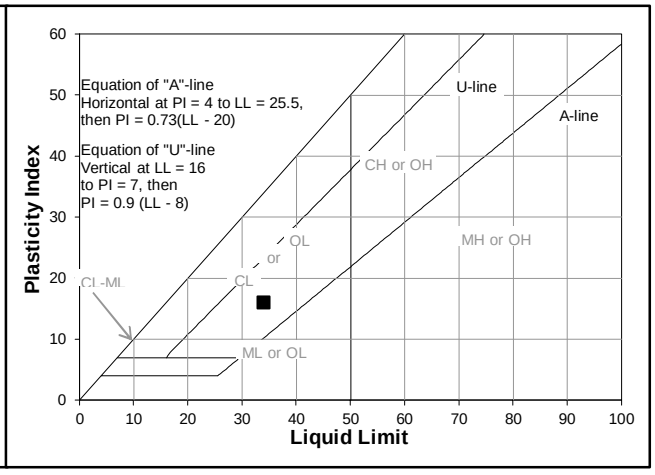
PLASTICITY INDEX

LIQUID LIMIT:	34
PLASTIC LIMIT:	18
PLASTICITY INDEX:	16

CLASSIFICATION: CL

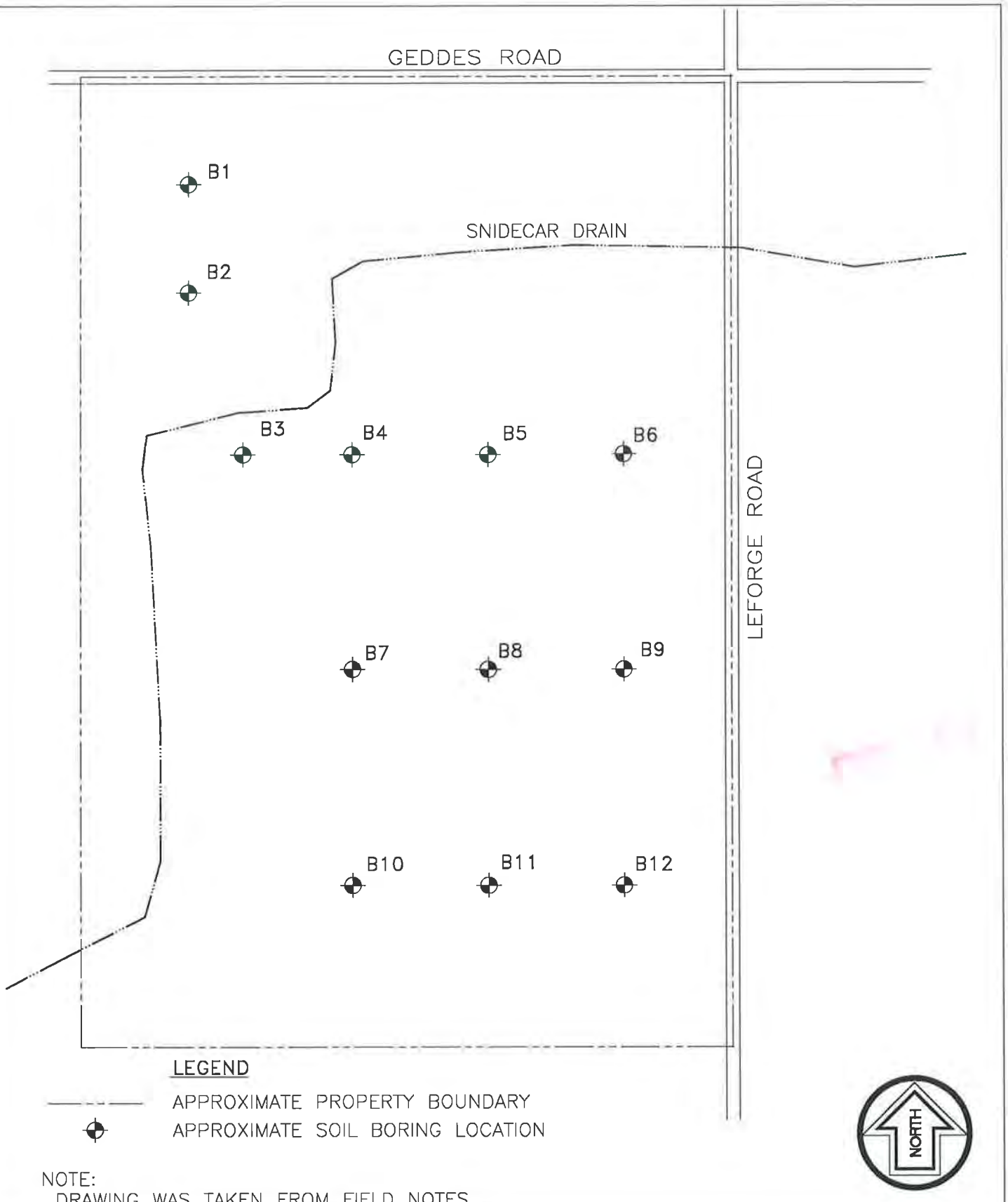
REMARKS: Sample air dried prior to testing





APPENDIX B

RELEVANT DATA FROM PREVIOUS GEOTECHNICAL EVALUATION REPORT (SME PROJECT NO. 044853.00) DATED AUGUST 7, 2003 – BORING LOCATION DIAGRAM AND BORING LOGS (B1-B12)



NOTE:
DRAWING WAS TAKEN FROM FIELD NOTES.

smeg
43980 PLYMOUTH OAKS BOULEVARD
PLYMOUTH, MICHIGAN 48170
(734) 454-9900

BAY CITY
GRAND RAPIDS
KALAMAZOO
LANSING
PLYMOUTH
TOLEDO

DATE	7-22-03
DRAWN BY	ARR
SCALE	1" = 250'
JOB	PG 44853

SOIL BORING LOCATION DIAGRAM PROPOSED RESEARCH AND DEVELOPMENT BUILDING SUPERIOR TOWNSHIP, MICHIGAN

FILE NAME S:44000\44853-01.DWG

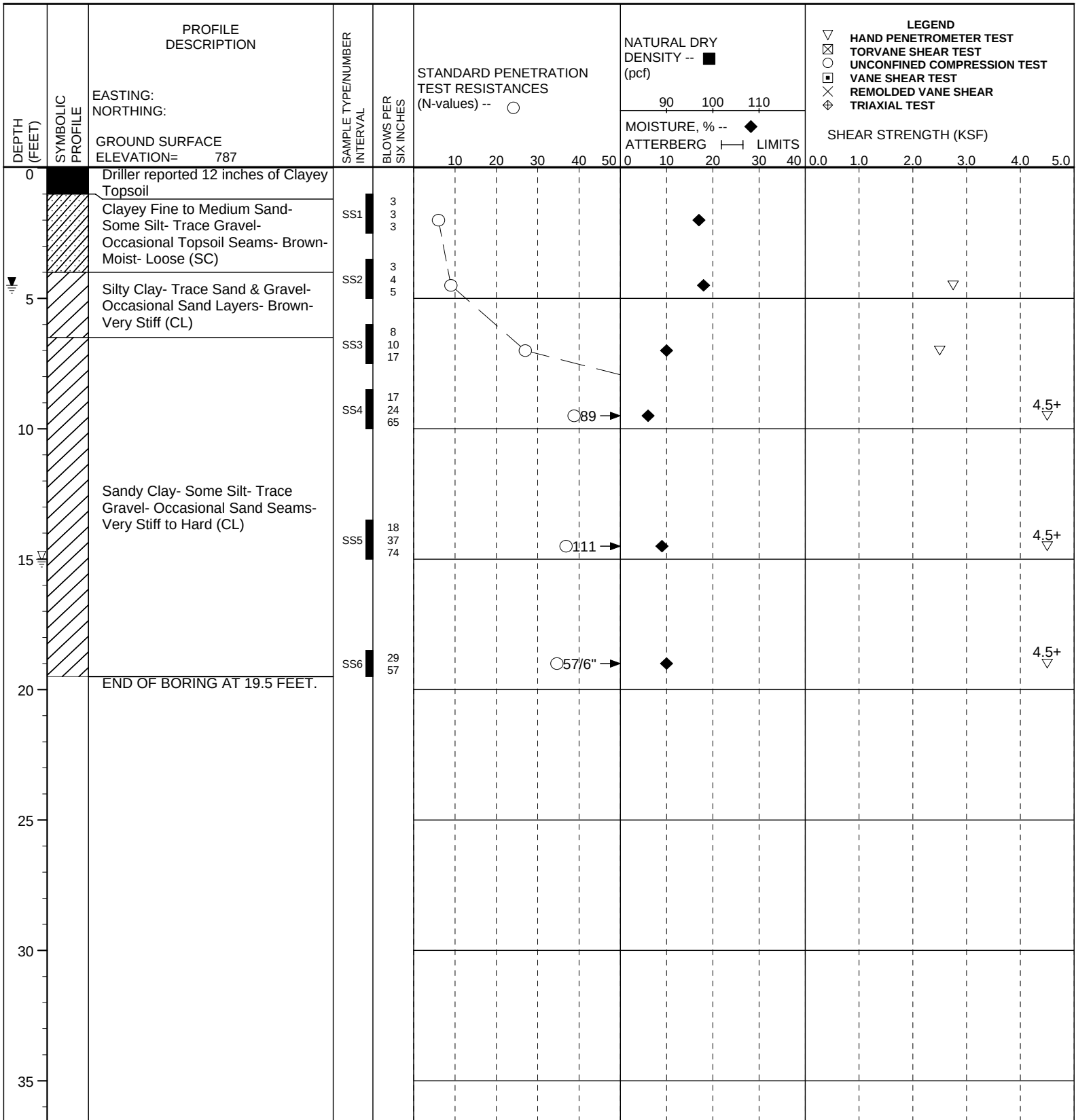
Figure No. 1

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/18/03 **BORING B1**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1



WATER LEVEL OBSERVATIONS

GROUNDWATER ENCOUNTERED DURING DRILLING

GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 4.5 **WATER LEVEL** **HOURS AFTER COMPLETION:**

RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 15 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/18/03 **BORING B2**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1

EASTING:
NORTHING:

GROUND SURFACE ELEVATION= 785

DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NUMBER INTERVAL	BLOWS PER SIX INCHES
0	Clayey Fine to Medium Sand- Some Silt- Trace Gravel- Dark Brown & Black- Moist (SC/Topsoil)	SS1	2 2 3
	Silty Clay- Some Sand- Trace Gravel- Brown- Stiff (CL)		
5	Clayey Fine to Coarse Sand- Some Gravel- Trace Silt- Brown- Wet- Medium Dense (SC)	SS2	3 5 10
		SS3	5 10 10
		SS4	5 9 14
10	Sandy Clay- Some Silt & Gravel- Occasional Fine to Medium Sand Layers- Gray- Stiff to Hard (CL)	SS5	50 65/4"
15			
		SS6	27 42 55
20	END OF BORING AT 20 FEET.		
25			
30			
35			

STANDARD PENETRATION TEST RESISTANCES (N-values) -- ○
10 20 30 40 50

NATURAL DRY DENSITY -- ■ (pcf)
90 100 110

MOISTURE, % -- ◆
ATTERBERG ⊢ LIMITS
0 10 20 30 40

SHEAR STRENGTH (KSF)
0.0 1.0 2.0 3.0 4.0 5.0

65/4" → ◆
97 → ◆

4.5+ ▽
4.5+ ▽

LEGEND
- ▽ HAND PENETROMETER TEST
- ⊠ TORVANE SHEAR TEST
- ○ UNCONFINED COMPRESSION TEST
- ▣ VANE SHEAR TEST
- × REMOLDED VANE SHEAR
- ⊕ TRIAXIAL TEST

WATER LEVEL OBSERVATIONS
- ▼ GROUNDWATER ENCOUNTERED DURING DRILLING
- ▽ GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 3.5 **WATER LEVEL HOURS AFTER COMPLETION:**

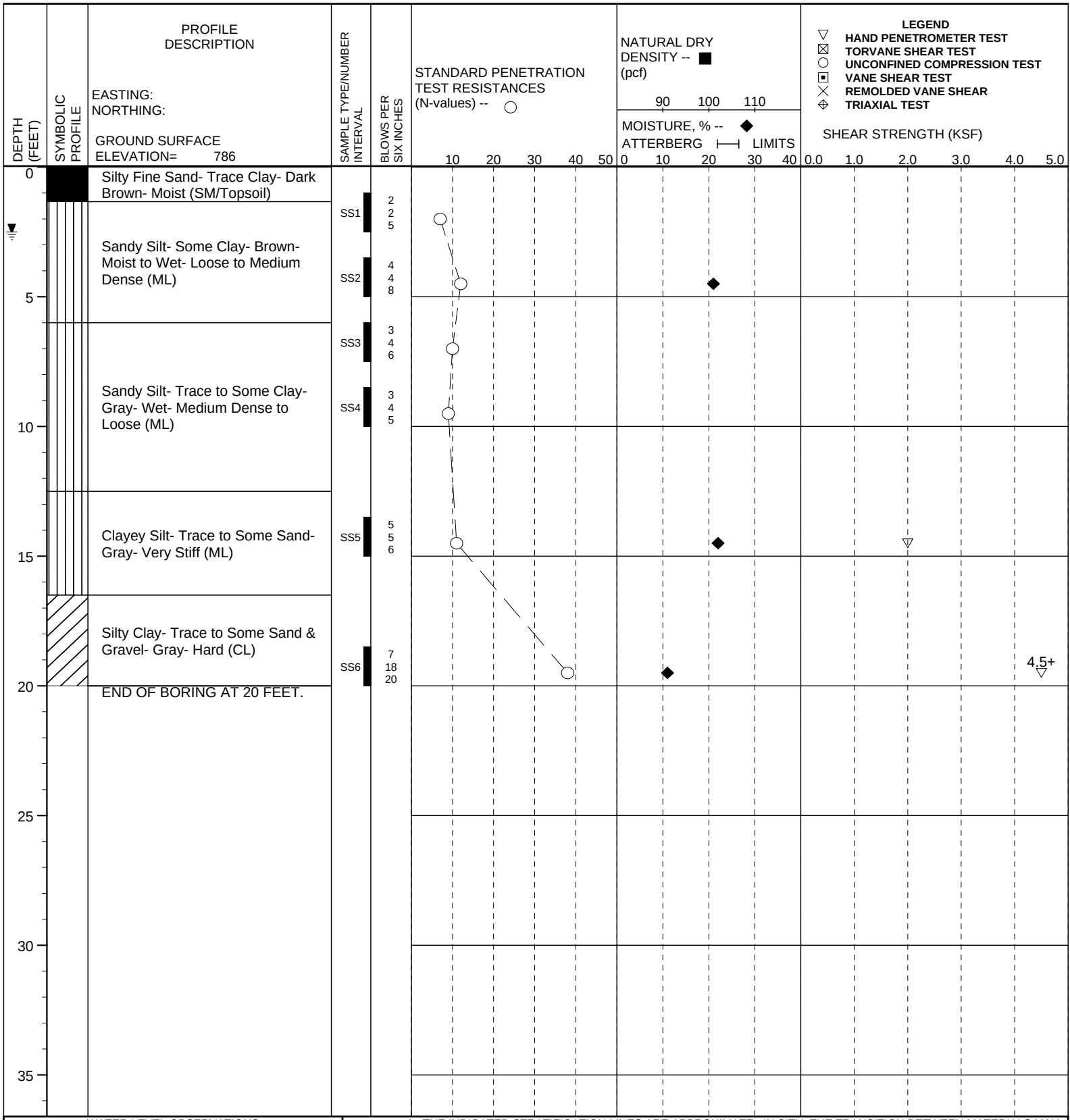
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 4 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/25/03 **BORING B3**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1



WATER LEVEL OBSERVATIONS

GROUNDWATER ENCOUNTERED DURING DRILLING

GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. GROUNDWATER WAS NOT ENCOUNTERED UPON COMPLETION OF DRILLING.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 2.5 **WATER LEVEL HOURS AFTER COMPLETION:**

RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** None **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/25/03 **BORING B4**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1

EASTING:
NORTHING:

GROUND SURFACE ELEVATION= 790

DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NUMBER INTERVAL	BLOWS PER SIX INCHES
0	Driller reported 6 inches of Sandy Topsoil- Dark Brown		
	Clayey Fine to Medium Sand- Some Silt- Trace Gravel- Brown- Moist- Loose (SC)	SS1	4 4 4
	Fine Sand- Trace to Some Silt- Occasional Silty Clay Layers- Brown- Moist to Wet- Medium Dense (SP-SM)	SS2	4 5 8
5	Sandy Silt- Some Clay- Brown- Wet- Medium Dense (ML)	SS3	5 11 12
		SS4	4 7 6
10	Fine Sand- Some Silt- Trace Clay- Gray- Wet- Medium Dense to Loose (SM)	SS5	3 4 5
15	Sandy Silt- Some Clay- Gray- Wet- Medium Dense (ML)	SS6	5 7 10
20	END OF BORING AT 20 FEET.		
25			
30			
35			

STANDARD PENETRATION TEST RESISTANCES (N-values) -- ○
10 20 30 40 50

NATURAL DRY DENSITY -- ■ (pcf)
90 100 110

MOISTURE, % -- ◆
ATTERBERG ⊢⊣ LIMITS
0 10 20 30 40

SHEAR STRENGTH (KSF)
0.0 1.0 2.0 3.0 4.0 5.0

LEGEND
- ▽ HAND PENETROMETER TEST
- ⊠ TORVANE SHEAR TEST
- ○ UNCONFINED COMPRESSION TEST
- ⊡ VANE SHEAR TEST
- ⨯ REMOLDED VANE SHEAR
- ⊕ TRIAXIAL TEST

WATER LEVEL OBSERVATIONS
- ▼ GROUNDWATER ENCOUNTERED DURING DRILLING
- ▽ GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 5.5 **WATER LEVEL** **HOURS AFTER COMPLETION:**

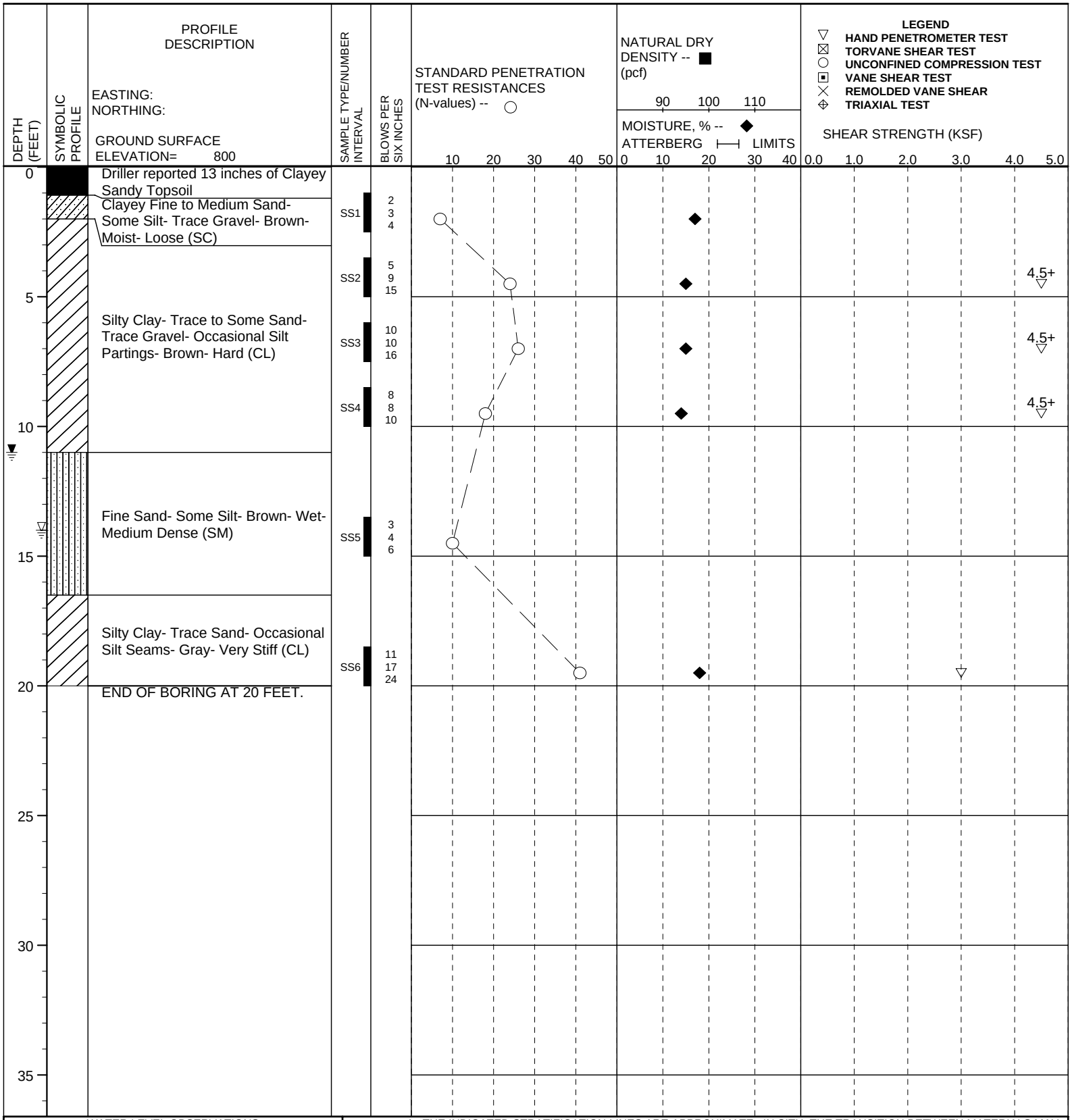
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 10 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/24/03 **BORING B5**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1



WATER LEVEL OBSERVATIONS

GROUNDWATER ENCOUNTERED DURING DRILLING

GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 11 **WATER LEVEL HOURS AFTER COMPLETION:**

RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 14 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/24/03 **BORING B6**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1

DEPTH (FEET)	PROFILE DESCRIPTION	SAMPLE TYPE/NUMBER	BLOWS PER SIX INCHES
0	Driller reported 12 inches of Clayey Topsoil- Brown	SS1	4, 5, 6
		SS2	5, 11, 14
5	Silty Clay- Trace to Some Sand- Trace Gravel- Occasional to Frequent Silt Partings- Brown- Hard (CL)	SS3	10, 13, 24
		SS4	11, 17, 23
10		SS5	8, 10, 11
15	Silty Clay- Trace to Some Sand- Trace Gravel- Gray- Very Stiff (CL)		
	Sandy Silt- Some Clay- Gray- Wet- Dense (ML)	SS6	11, 14, 24
20	END OF BORING AT 20 FEET.		
25			
30			
35			

EASTING:
NORTHING:
GROUND SURFACE ELEVATION= 804

STANDARD PENETRATION TEST RESISTANCES (N-values) -- ○ (10 20 30 40 50)

NATURAL DRY DENSITY -- ■ (pcf) (90 100 110)

MOISTURE, % -- ◆ ATTERBERG ⊢⊣ LIMITS (0 10 20 30 40)

SHEAR STRENGTH (KSF) (0.0 1.0 2.0 3.0 4.0 5.0)

LEGEND
- ▽ HAND PENETROMETER TEST
- ⊠ TORVANE SHEAR TEST
- ○ UNCONFINED COMPRESSION TEST
- ▣ VANE SHEAR TEST
- ✕ REMOLDED VANE SHEAR
- ⊕ TRIAXIAL TEST

4.5+ ▽ (SS2)
4.5+ ▽ (SS3)
4.5+ ▽ (SS4)

WATER LEVEL OBSERVATIONS
- GROUNDWATER ENCOUNTERED DURING DRILLING
- GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 18 **WATER LEVEL** **HOURS AFTER COMPLETION:**

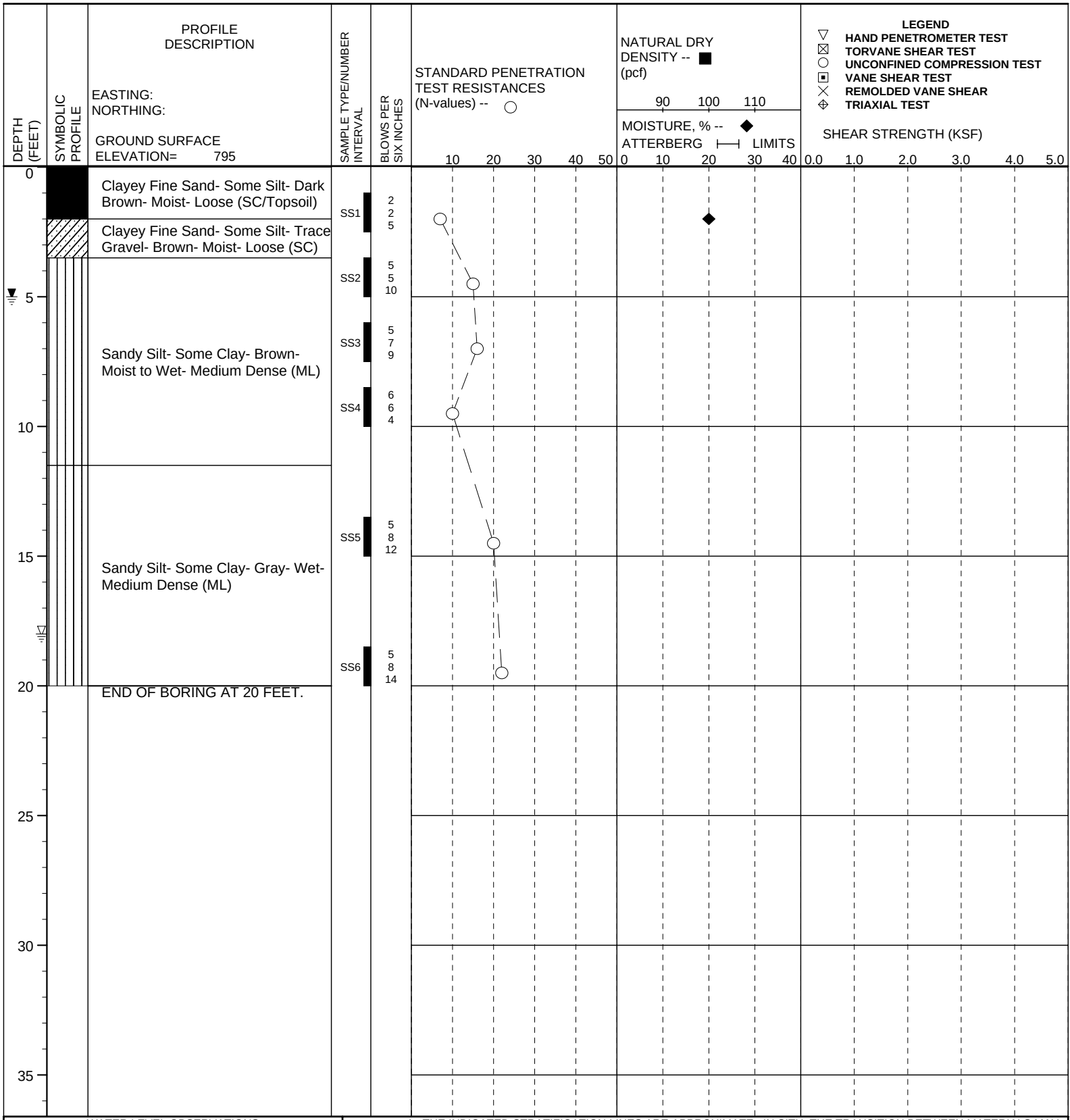
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 18 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/25/03 **BORING B7**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1



WATER LEVEL OBSERVATIONS

GROUNDWATER ENCOUNTERED DURING DRILLING

GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 5 **WATER LEVEL** **HOURS AFTER COMPLETION:**

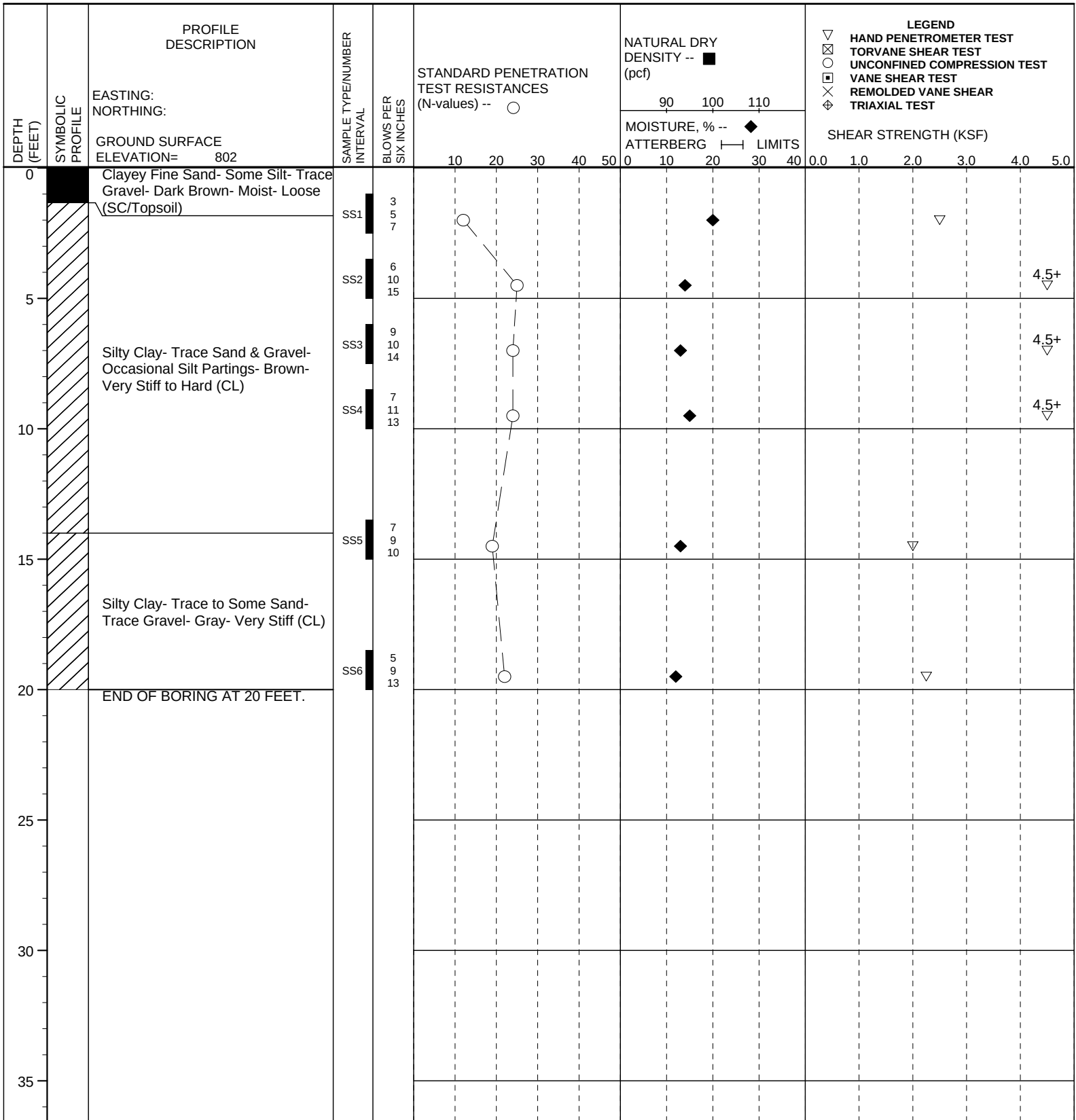
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 18 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/25/03 **BORING B8**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1



WATER LEVEL OBSERVATIONS

- GROUNDWATER ENCOUNTERED DURING DRILLING
- GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. GROUNDWATER WAS NOT ENCOUNTERED.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** None **WATER LEVEL HOURS AFTER COMPLETION:**

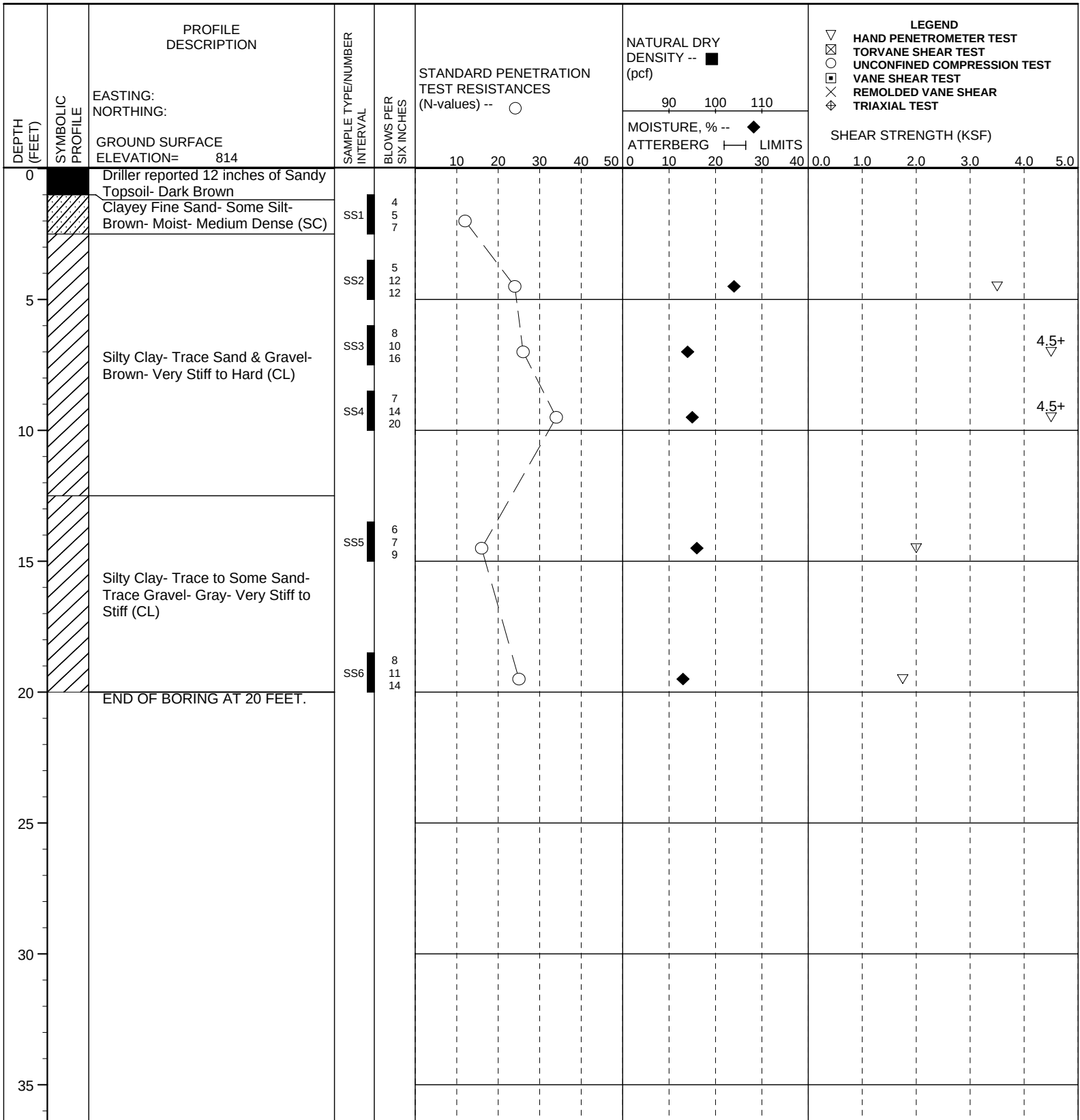
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** None **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/25/03 **BORING B9**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1



WATER LEVEL OBSERVATIONS

GROUNDWATER ENCOUNTERED DURING DRILLING

GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. GROUNDWATER WAS NOT ENCOUNTERED.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** None **WATER LEVEL HOURS AFTER COMPLETION:**

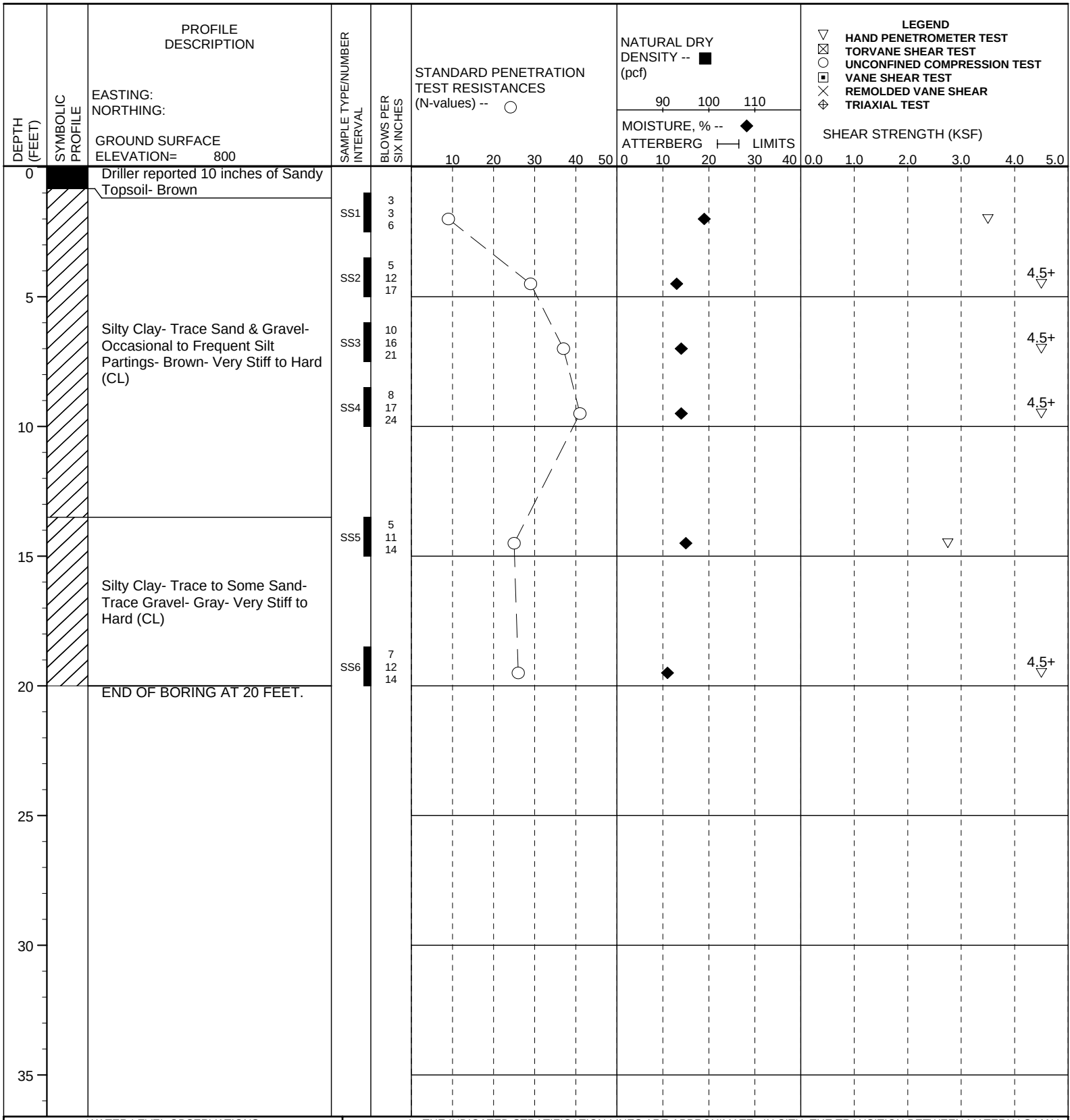
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** None **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/18/03 **BORING B10**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1



WATER LEVEL OBSERVATIONS

GROUNDWATER ENCOUNTERED DURING DRILLING

GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. GROUNDWATER WAS NOT ENCOUNTERED.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** None **WATER LEVEL HOURS AFTER COMPLETION:**

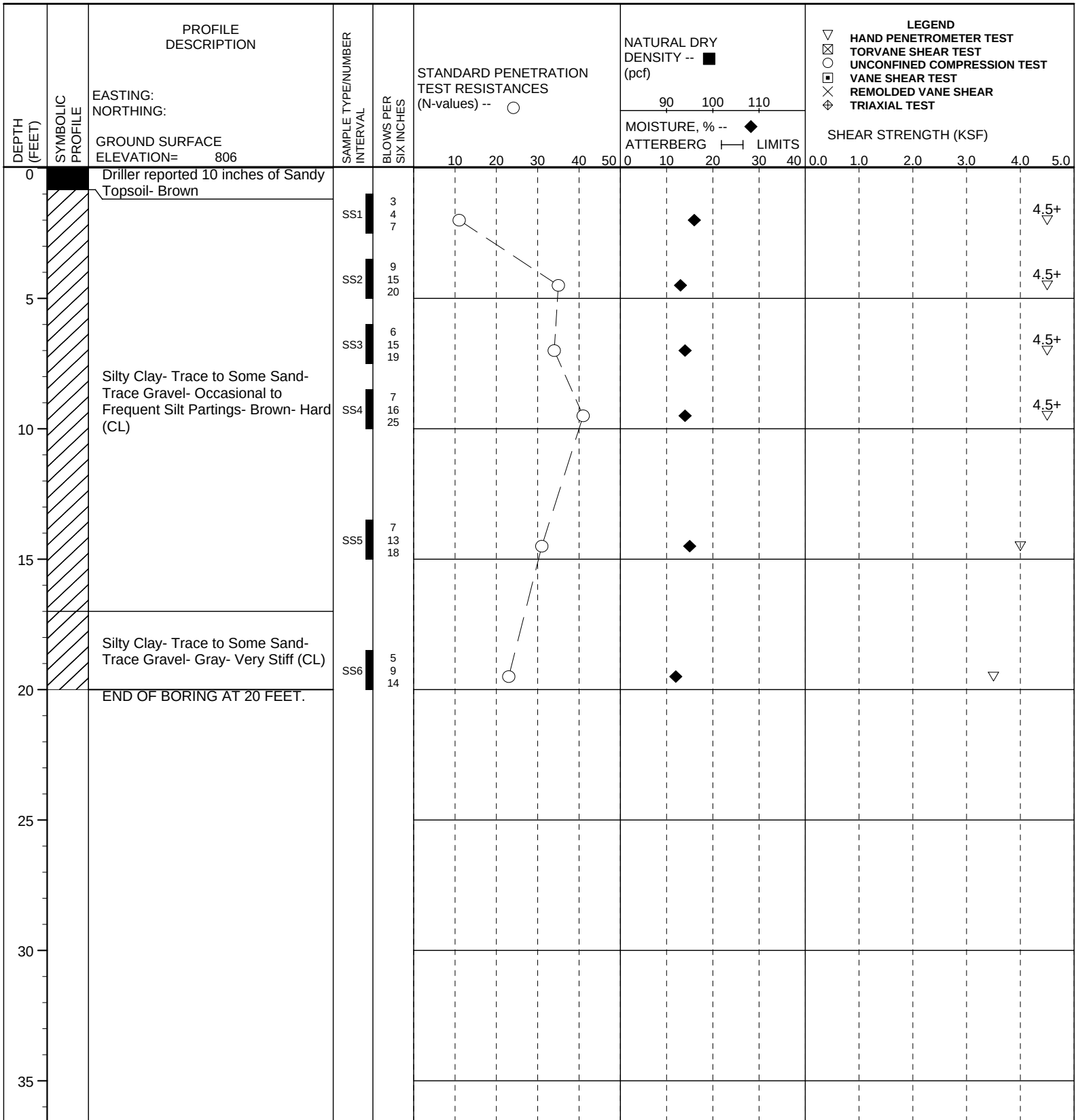
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** None **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/18/03 **BORING B11**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1



WATER LEVEL OBSERVATIONS

GROUNDWATER ENCOUNTERED DURING DRILLING

GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. GROUNDWATER WAS NOT ENCOUNTERED.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** None **WATER LEVEL HOURS AFTER COMPLETION:**

RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** None **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: PROPOSED RESEARCH & DEVELOPMENT BUILDING **A/E:** TETRA TECH MPS

PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN **BY:** GD/KLW **DATE:** 7/18/03 **BORING B12**

CLIENT: TETRA TECH MPS **PROJECT NUMBER:** PG44853 **SHEET:** 1

PROFILE DESCRIPTION

EASTING:
NORTHING:

GROUND SURFACE ELEVATION= 815

DEPTH (FEET)	SAMPLE TYPE/NUMBER	BLOWS PER SIX INCHES
0		
	SS1	5, 7, 11
	SS2	7, 11, 18
5	SS3	10, 12, 16
	SS4	10, 17, 28
10		
	SS5	5, 9, 16
15		
	SS6	7, 11, 20
20		
25		
30		
35		

Driller reported 8 inches of Sandy Topsoil- Brown

Silty Clay- Trace to Some Sand- Trace Gravel- Occasional Sand Seams Brown- Hard to Very Stiff (CL)

Silty Clay- Trace to Some Sand- Trace Gravel- Gray- Stiff to Very Stiff (CL)

END OF BORING AT 20 FEET.

STANDARD PENETRATION TEST RESISTANCES (N-values) -- ○
10 20 30 40 50

NATURAL DRY DENSITY -- ■ (pcf)
90 100 110

MOISTURE, % -- ◆
ATTERBERG ⊢⊣ LIMITS
0 10 20 30 40

SHEAR STRENGTH (KSF)
0.0 1.0 2.0 3.0 4.0 5.0

LEGEND
- ▽ HAND PENETROMETER TEST
- ⊠ TORVANE SHEAR TEST
- ○ UNCONFINED COMPRESSION TEST
- ▣ VANE SHEAR TEST
- ✕ REMOLDED VANE SHEAR
- ⊕ TRIAXIAL TEST

4.5+ ▽ (SS1)
4.5+ ▽ (SS2)
4.5+ ▽ (SS3)
▽ (SS4)
▽ (SS5)
▽ (SS6)

WATER LEVEL OBSERVATIONS
- GROUNDWATER ENCOUNTERED DURING DRILLING
- GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 9.5 **WATER LEVEL** **HOURS AFTER COMPLETION:**

RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 16 **CAVE OF BOREHOLE AT**

APPENDIX C

RELEVANT DATA FROM PREVIOUS GEOTECHNICAL EVALUATION REPORT (SME PROJECT NO. 044853.00) DATED MARCH 4, 2004 – BORING LOCATION DIAGRAM AND BORING LOGS (B101-B109)

SOIL BORING LOCATION DIAGRAM
HATCI MICHIGAN R & D CENTER
SWC OF LEFORGE & GEDDES ROADS
SUPERIOR TOWNSHIP, MICHIGAN

LEFORGE ROAD

GEDDES ROAD

HYUNDAI
DESIGN & RESEARCH
CENTER
FIN FL EL 799.00

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B101 B102 B103 B104 B105 B106 B107 B108 B109

LEGEND

APPROXIMATE LOCATION
OF CURRENT SOIL BORINGS

APPROXIMATE LOCATION
OF JULY 2003 SOIL BORINGS

NORTH

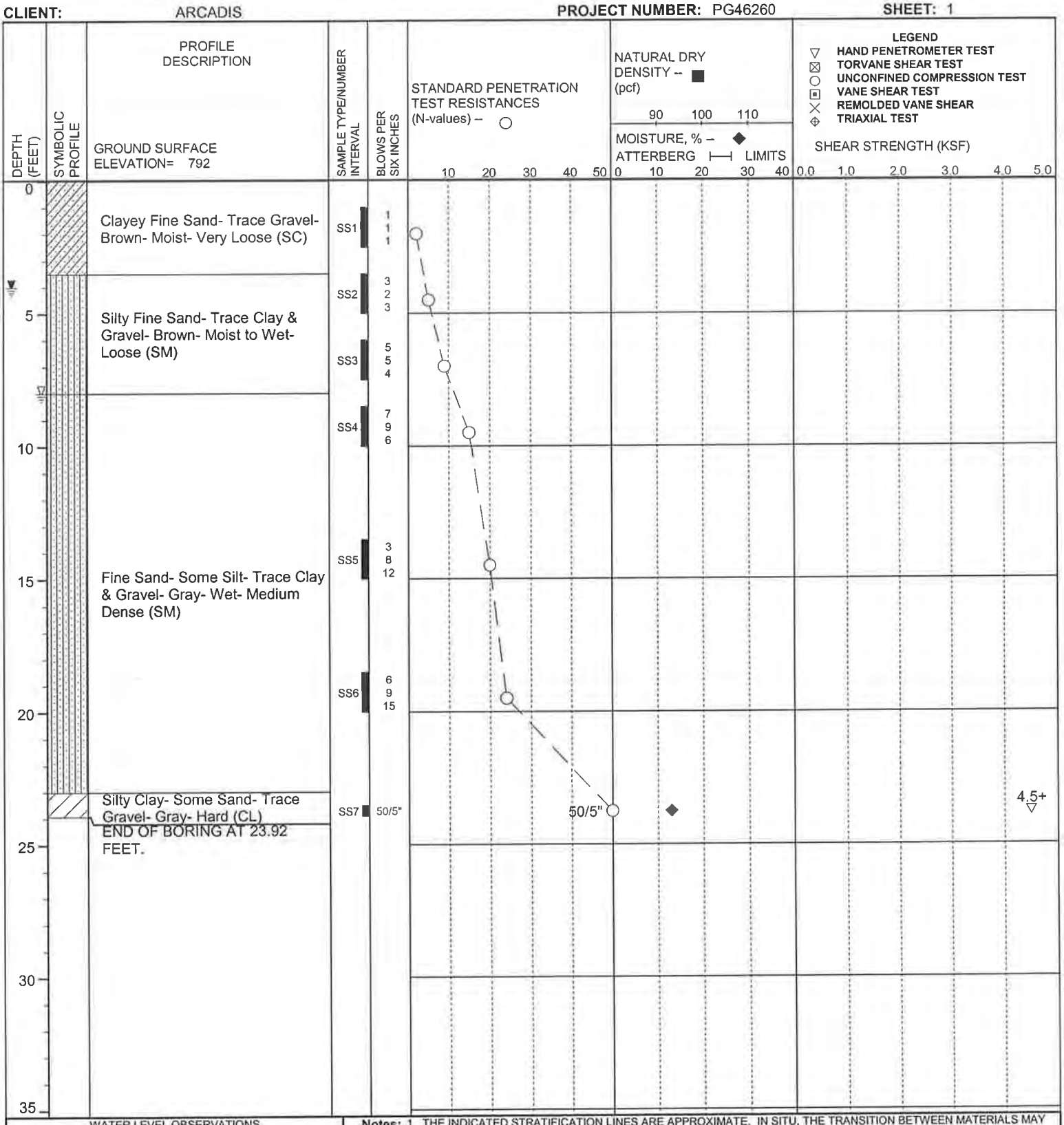
DATE: 03-03-04
SCALE: 1" = 200'
DRAFTER: MBA
JOB: PG 46260

BAY CITY GRAND RAPIDS KALAMAZOO
LANSING PLYMOUTH TOLEDO

FILE NAME S:46000\PG46260\46260.DWG

soil and materials engineers, inc.

PROJECT NAME: HATCI MICHIGAN R & D CENTER
A/E: ARCADIS
PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN
BY: AMF/EOL **DATE:** 1/16/04 **BORING B101**
CLIENT: ARCADIS
PROJECT NUMBER: PG46260 **SHEET:** 1



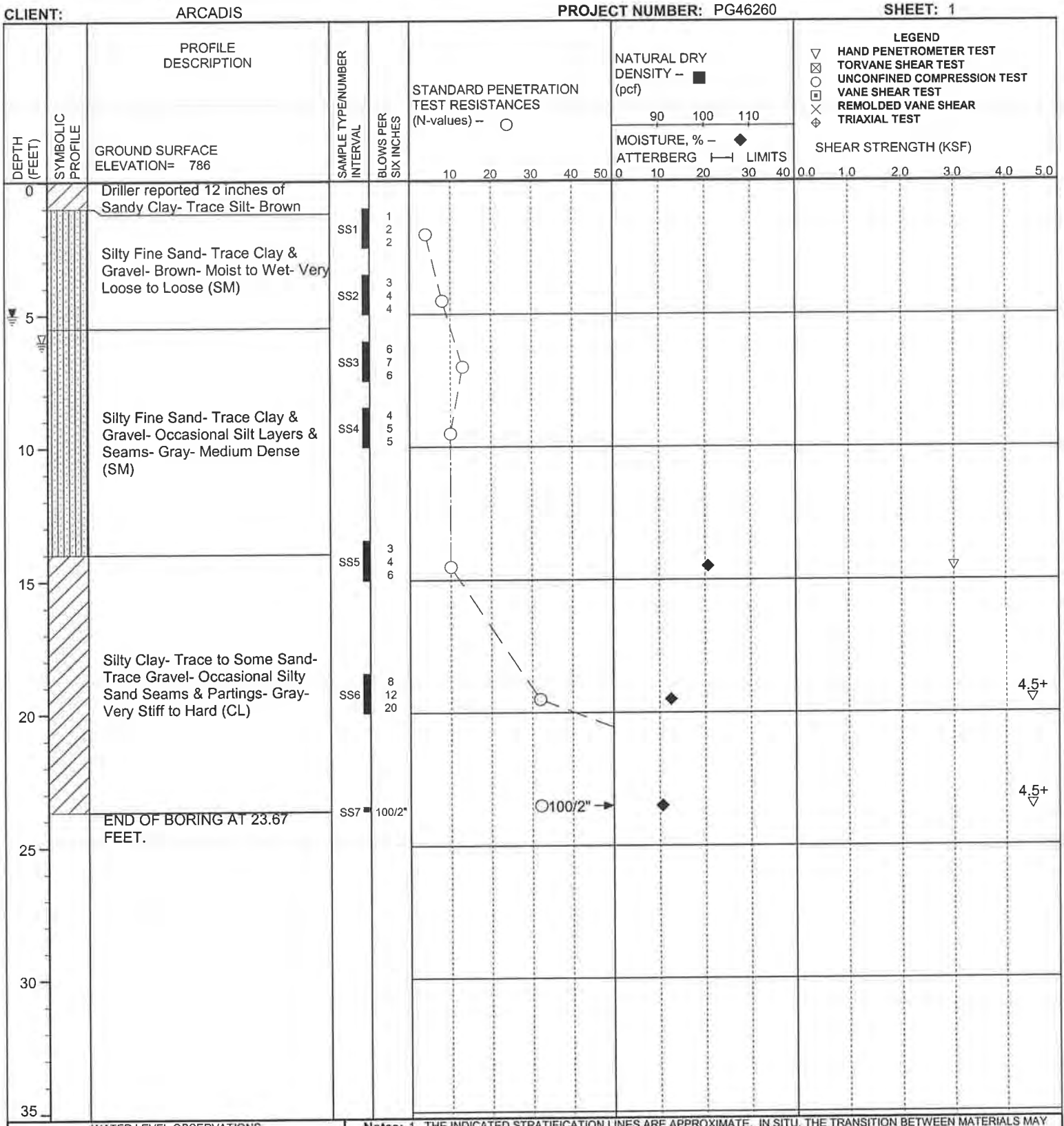
WATER LEVEL OBSERVATIONS
GROUNDWATER ENCOUNTERED DURING DRILLING
GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. DRILLER NOTED AUGER REFUSAL AT 25 FEET BELOW THE GROUND SURFACE.

DRILLER: JB **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 4 **WATER LEVEL HOURS AFTER COMPLETION:**
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 8 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: HATCI MICHIGAN R & D CENTER
A/E: ARCADIS
PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN
BY: AMF/EOL **DATE:** 1/16/04 **BORING** B102
CLIENT: ARCADIS
PROJECT NUMBER: PG46260 **SHEET:** 1



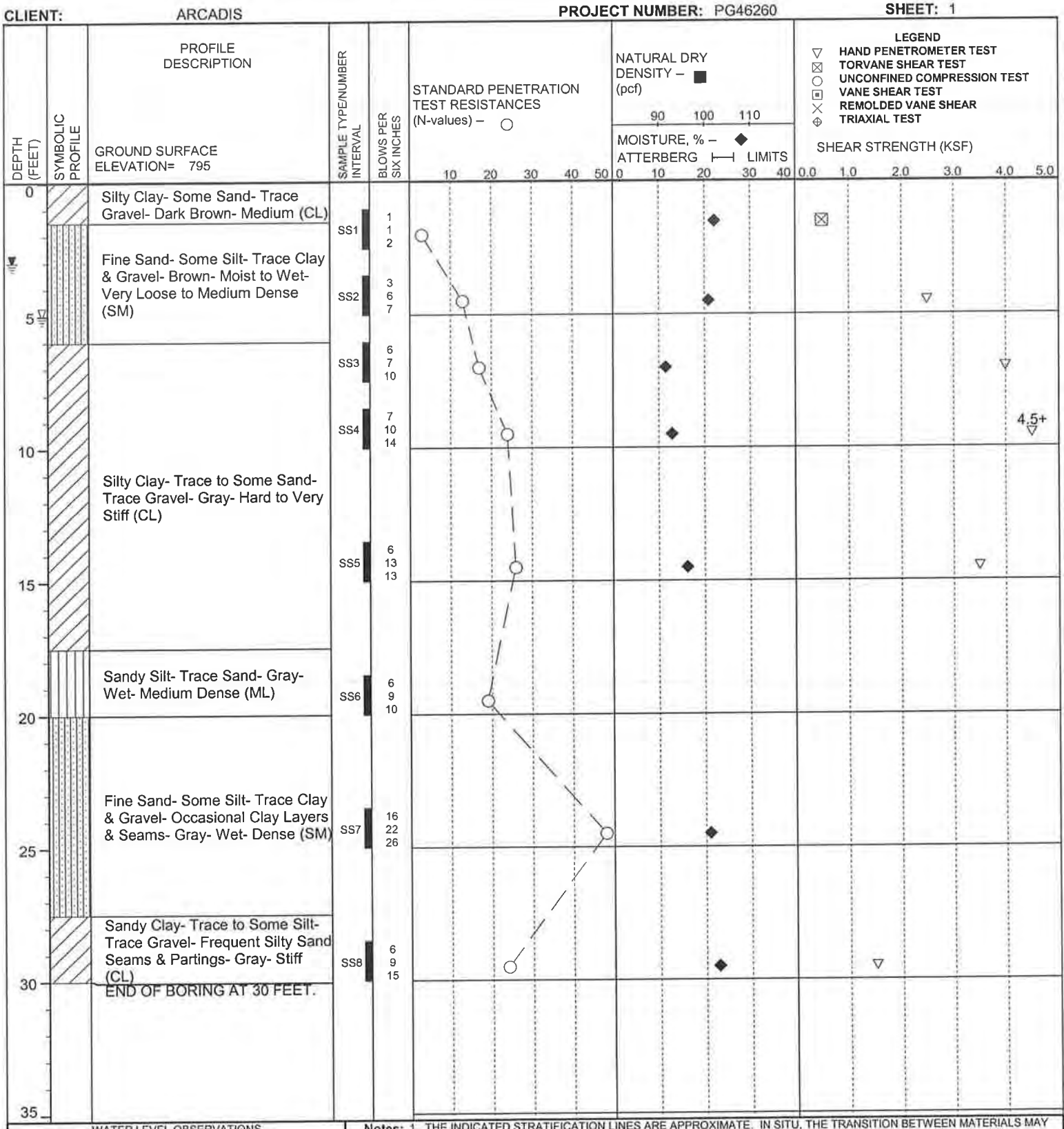
WATER LEVEL OBSERVATIONS
GROUNDWATER ENCOUNTERED DURING DRILLING
GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. DRILLER NOTED AUGER REFUSAL AT 24 FEET BELOW THE GROUND SURFACE.

DRILLER: JB **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 5 **WATER LEVEL HOURS AFTER COMPLETION:**
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 6 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: HATCI MICHIGAN R & D CENTER
A/E: ARCADIS
PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN
BY: AMF/EOL **DATE:** 1/16/04
BORING B103
CLIENT: ARCADIS
PROJECT NUMBER: PG46260
SHEET: 1



WATER LEVEL OBSERVATIONS
GROUNDWATER ENCOUNTERED DURING DRILLING
GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. MOISTURE CONTENT & SHEAR STRENGTH ON SAMPLE SS2 WERE PERFORMED ON A CLAY SEAM.

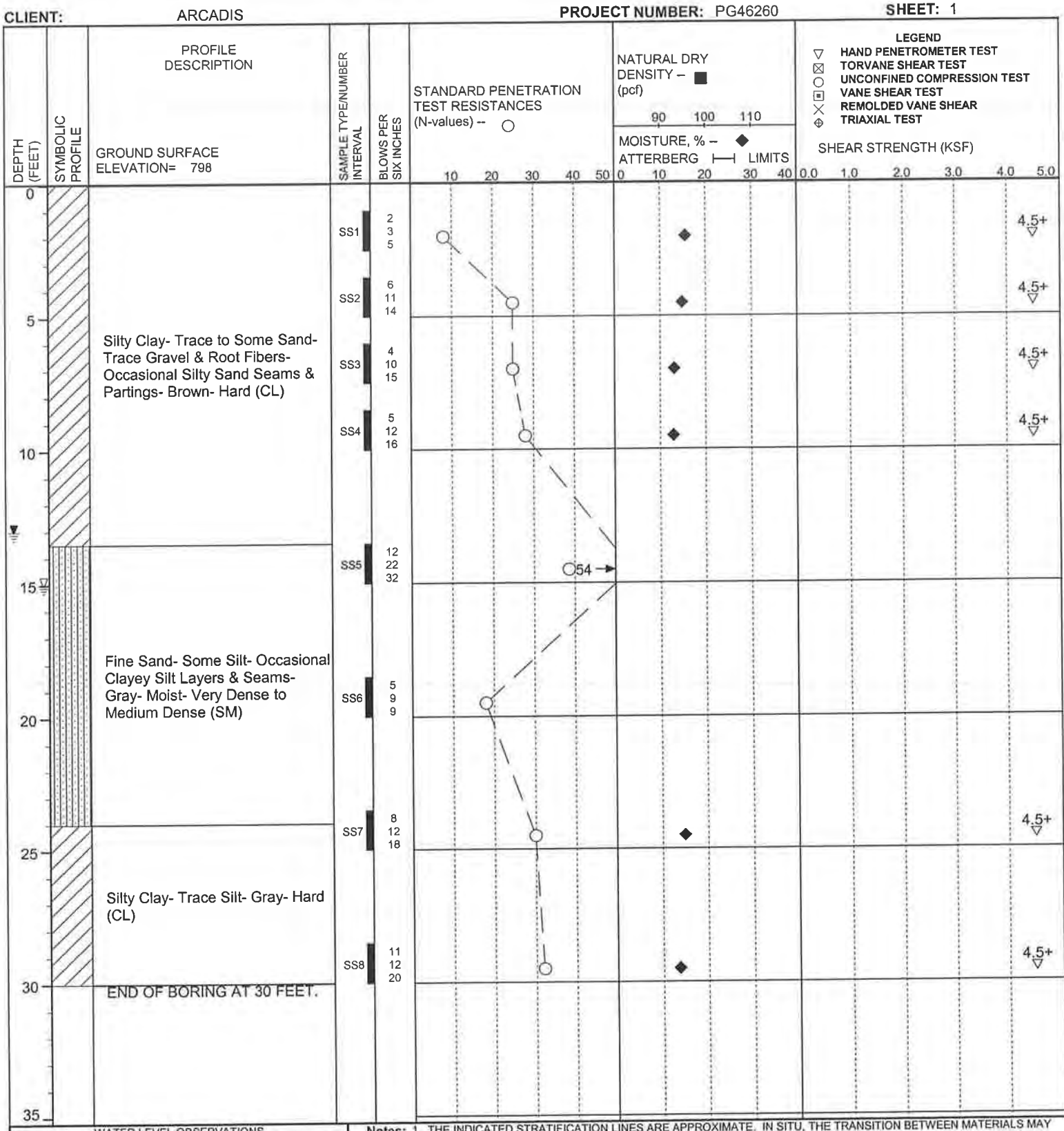
DRILLER: JB **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 3 **WATER LEVEL** **HOURS AFTER COMPLETION:**
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 5 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: HATCI MICHIGAN R & D CENTER
PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN
CLIENT: ARCADIS

A/E: ARCADIS
BY: AMF/EOL **DATE:** 1/16/04
PROJECT NUMBER: PG46260

BORING B104
SHEET: 1



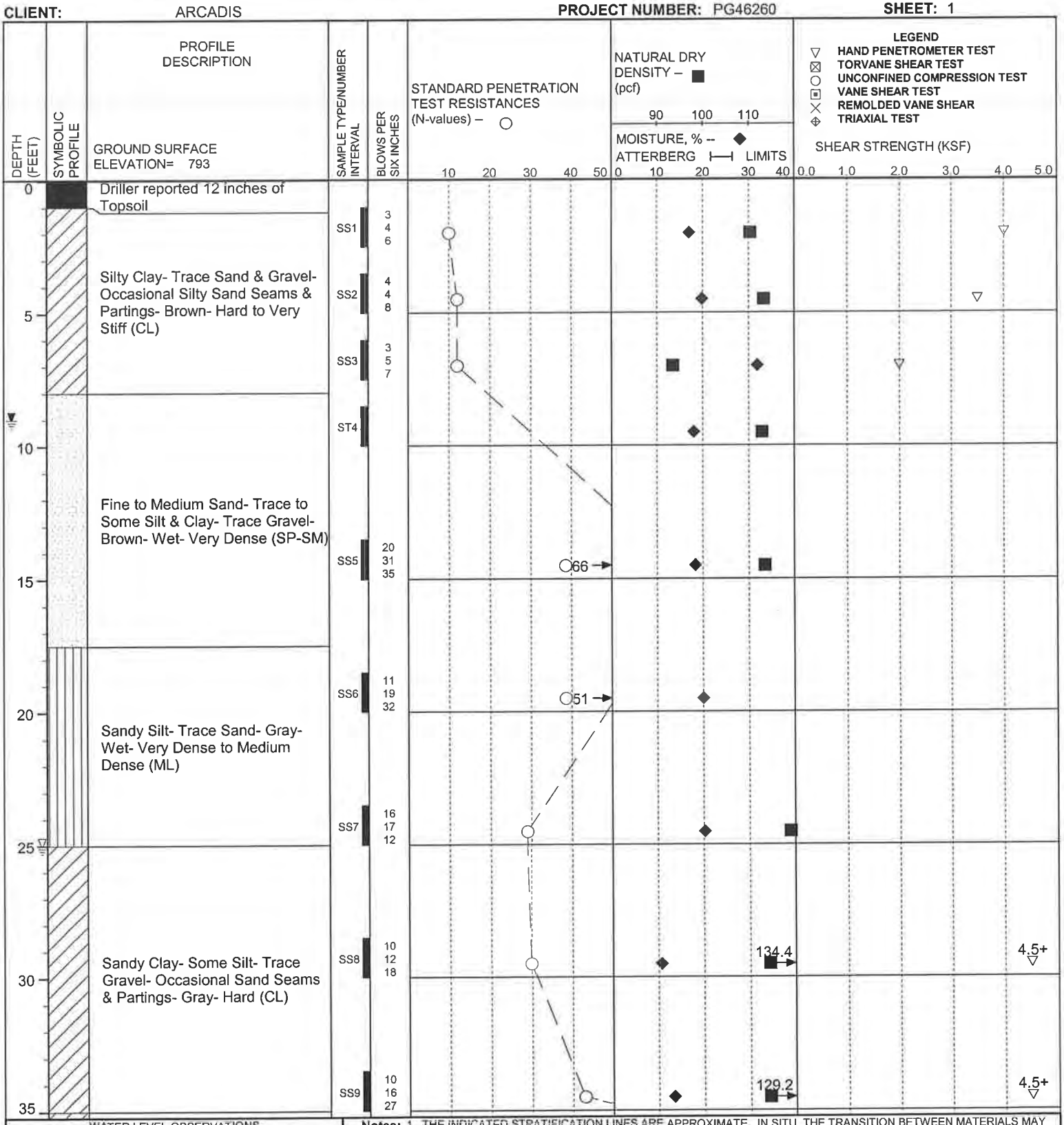
WATER LEVEL OBSERVATIONS
GROUNDWATER ENCOUNTERED DURING DRILLING
GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: JB **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 13 **WATER LEVEL HOURS AFTER COMPLETION:**
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 15 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: HATCI MICHIGAN R & D CENTER
A/E: ARCADIS
PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN
BY: AMF/EOL **DATE:** 1/19/04 **BORING** B105
CLIENT: ARCADIS
PROJECT NUMBER: PG46260 **SHEET:** 1



WATER LEVEL OBSERVATIONS
GROUNDWATER ENCOUNTERED DURING DRILLING
GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

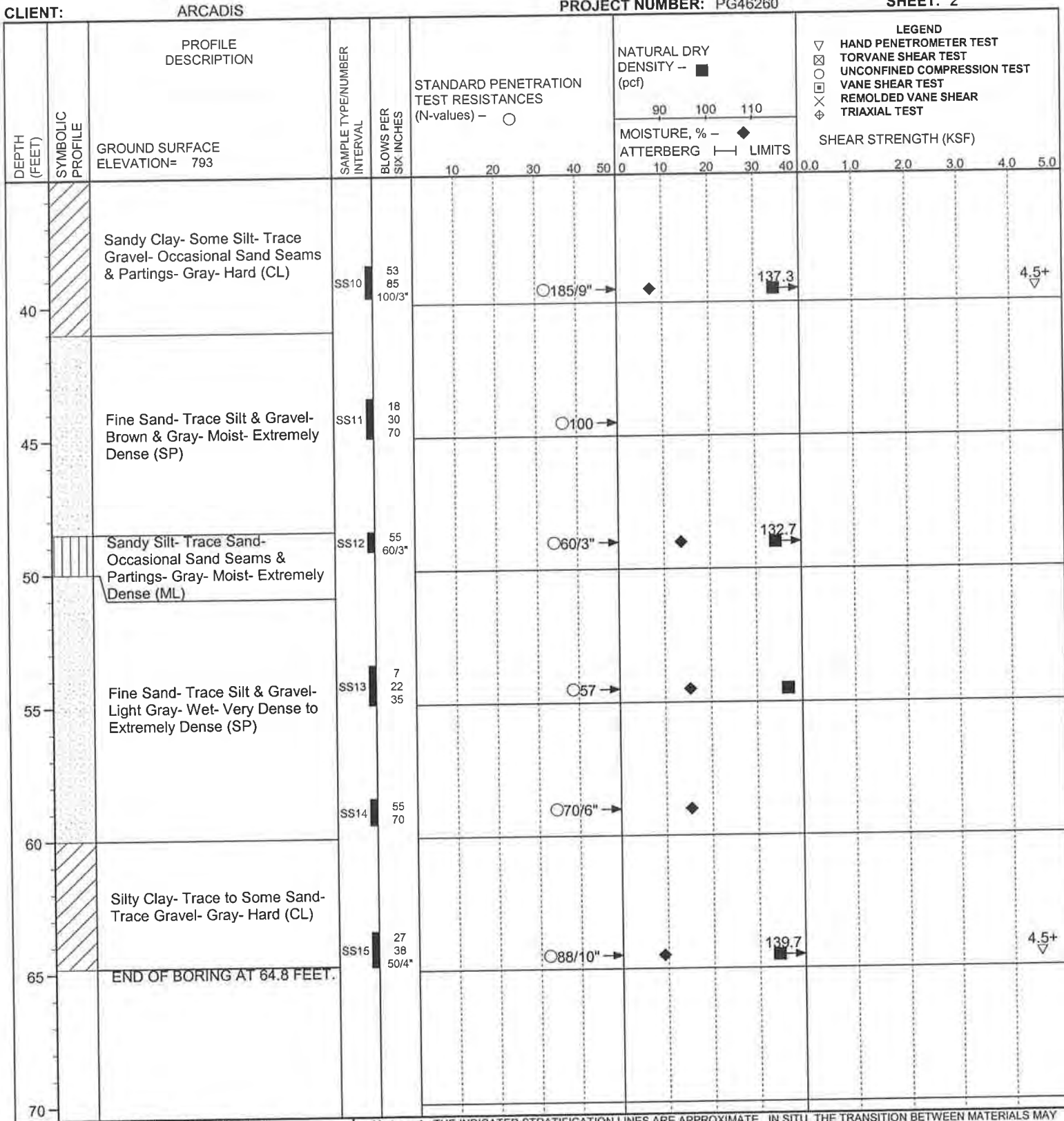
DRILLER: JB **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 9 **WATER LEVEL HOURS AFTER COMPLETION:**
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 25 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: HATCI MICHIGAN R & D CENTER
PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN
CLIENT: ARCADIS

A/E: ARCADIS
BY: AMF/EOL **DATE:** 1/19/04
PROJECT NUMBER: PG46260

BORING B105
SHEET: 2



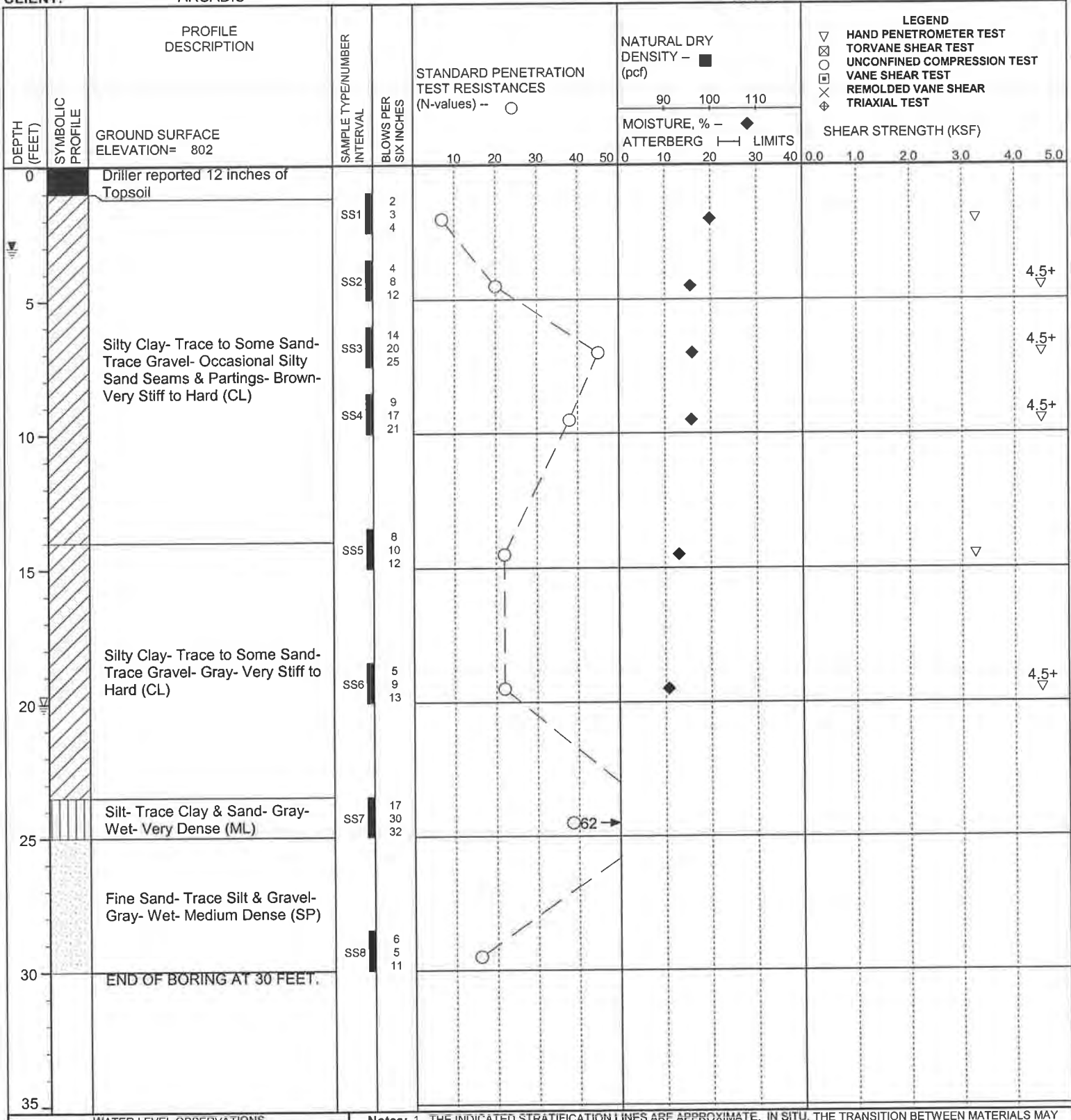
WATER LEVEL OBSERVATIONS
▼ GROUNDWATER ENCOUNTERED DURING DRILLING
▽ GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: JB
RIG NO.: 26
DRILL METHOD: Solid-stem Augers
BACKFILL METHOD: Auger Cuttings
WATER LEVEL DURING DRILLING: 9
WATER LEVEL UPON COMPLETION: 25
WATER LEVEL HOURS AFTER COMPLETION:
CAVE OF BOREHOLE AT

soil and materials engineers, inc.

PROJECT NAME: HATCI MICHIGAN R & D CENTER
PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN
CLIENT: ARCADIS
A/E: ARCADIS
BY: AMF/EOL **DATE:** 1/19/04
PROJECT NUMBER: PG46260
BORING B106
SHEET: 1



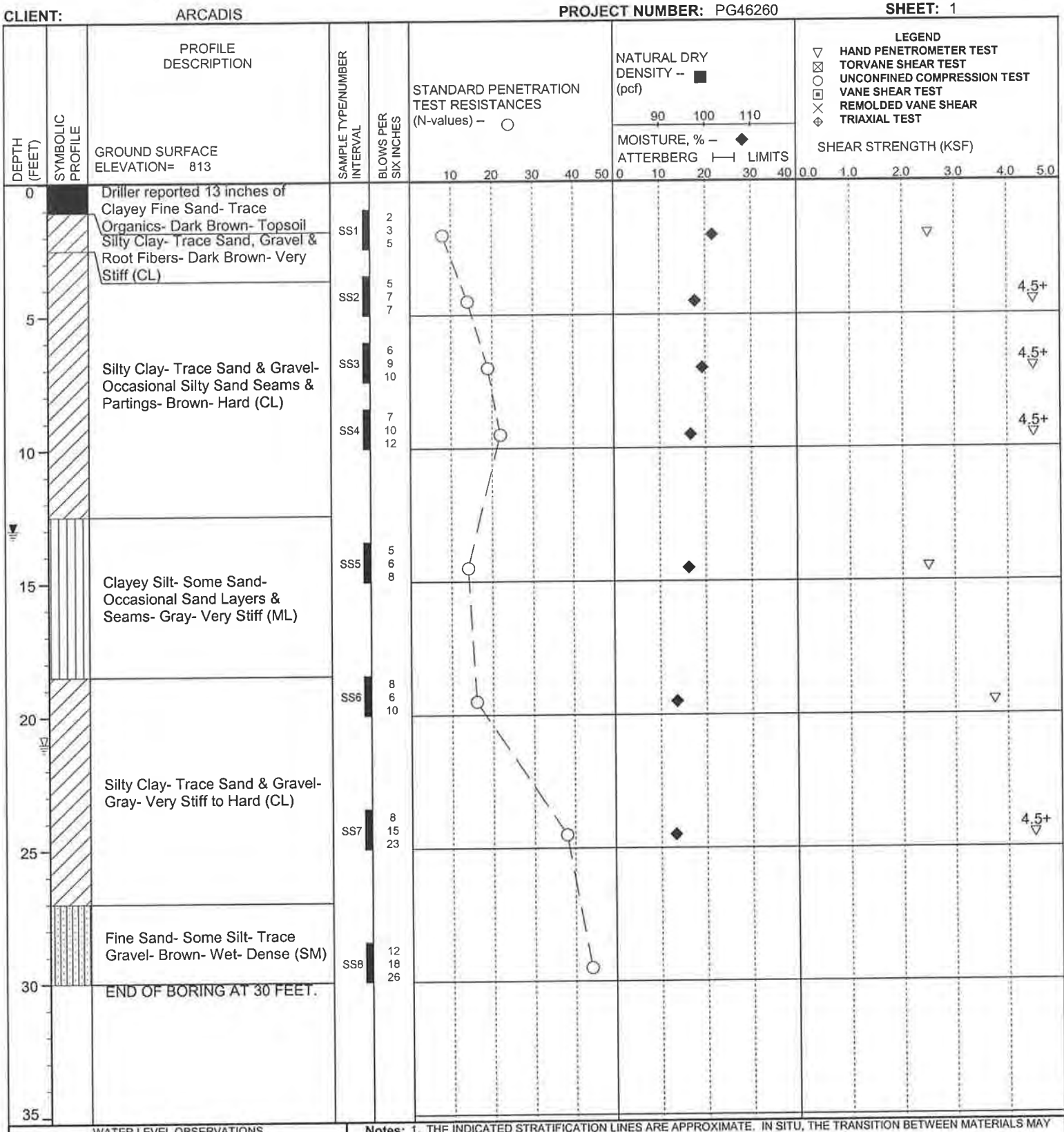
WATER LEVEL OBSERVATIONS
GROUNDWATER ENCOUNTERED DURING DRILLING
GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: JB **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 3 **WATER LEVEL HOURS AFTER COMPLETION:**
RIG NO.: 26 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 20 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: HATCI MICHIGAN R & D CENTER
A/E: ARCADIS
PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN
BY: AMF/EOL **DATE:** 1/16/04
BORING B107
CLIENT: ARCADIS
PROJECT NUMBER: PG46260
SHEET: 1



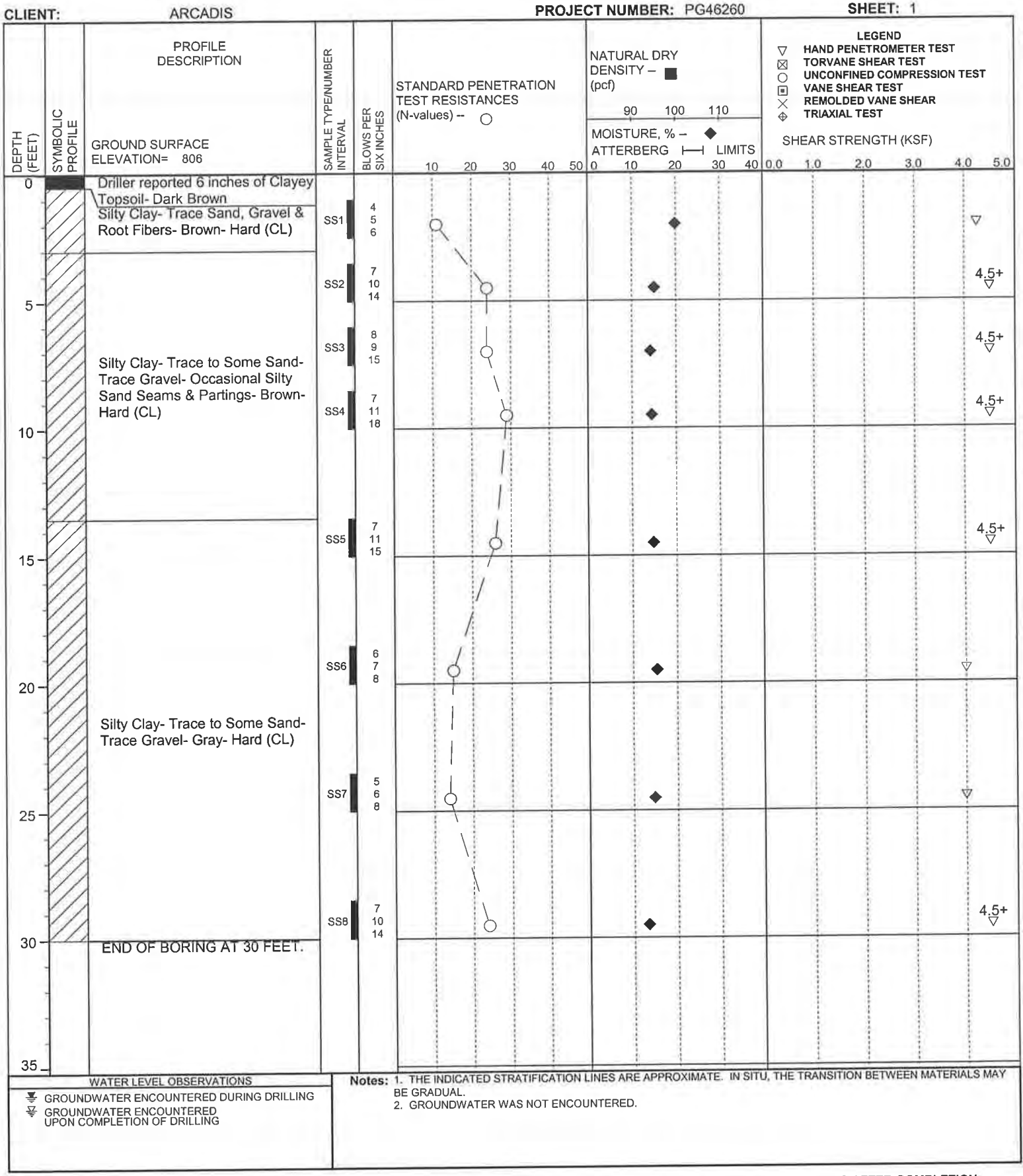
WATER LEVEL OBSERVATIONS
GROUNDWATER ENCOUNTERED DURING DRILLING
GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 13 **WATER LEVEL HOURS AFTER COMPLETION:**
RIG NO.: 167 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 21 **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: HATCI MICHIGAN R & D CENTER
A/E: ARCADIS
PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN
BY: AMF/EOL **DATE:** 1/16/04
BORING B108
CLIENT: ARCADIS
PROJECT NUMBER: PG46260
SHEET: 1



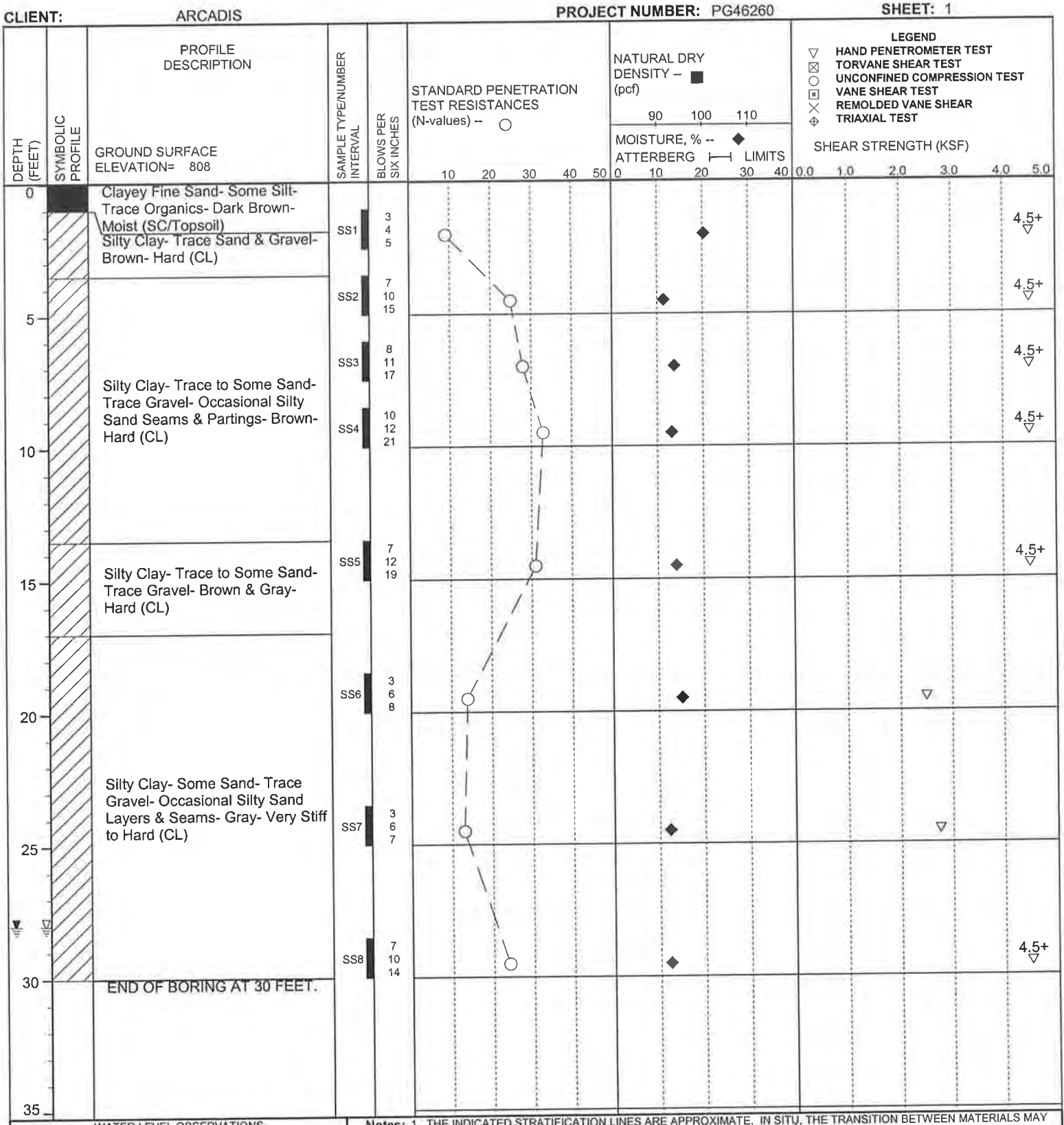
WATER LEVEL OBSERVATIONS
GROUNDWATER ENCOUNTERED DURING DRILLING
GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. GROUNDWATER WAS NOT ENCOUNTERED.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** None **WATER LEVEL HOURS AFTER COMPLETION:**
RIG NO.: 167 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** None **CAVE OF BOREHOLE AT**

soil and materials engineers, inc.

PROJECT NAME: HATCI MICHIGAN R & D CENTER
A/E: ARCADIS
PROJECT LOCATION: SUPERIOR TOWNSHIP, MICHIGAN
BY: AMF/EOL **DATE:** 1/16/04
BORING B109
CLIENT: ARCADIS
PROJECT NUMBER: PG46260
SHEET: 1



WATER LEVEL OBSERVATIONS
GROUNDWATER ENCOUNTERED DURING DRILLING
GROUNDWATER ENCOUNTERED UPON COMPLETION OF DRILLING

Notes: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.

DRILLER: RM **DRILL METHOD:** Solid-stem Augers **WATER LEVEL DURING DRILLING:** 28 **WATER LEVEL HOURS AFTER COMPLETION:**
RIG NO.: 167 **BACKFILL METHOD:** Auger Cuttings **WATER LEVEL UPON COMPLETION:** 28 **CAVE OF BOREHOLE AT**

APPENDIX D

IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL ENGINEERING REPORT
GENERAL COMMENTS
LABORATORY TESTING PROCEDURES

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

GENERAL COMMENTS

BASIS OF GEOTECHNICAL REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practices to assist in the design and/or evaluation of this project. If the project plans, design criteria, and other project information referenced in this report and utilized by SME to prepare our recommendations are changed, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions and recommendations of this report are modified or approved in writing by our office.

The discussions and recommendations submitted in this report are based on the available project information, described in this report, and the geotechnical data obtained from the field exploration at the locations indicated in the report. Variations in the soil and groundwater conditions commonly occur between or away from sampling locations. The nature and extent of the variations may not become evident until the time of construction. If significant variations are observed during construction, SME should be contacted to reevaluate the recommendations of this report. SME should be retained to continue our services through construction to observe and evaluate the actual subsurface conditions relative to the recommendations made in this report.

In the process of obtaining and testing samples and preparing this report, procedures are followed that represent reasonable and accepted practice in the field of soil and foundation engineering. Specifically, field logs are prepared during the field exploration that describe field occurrences, sampling locations, and other information. Samples obtained in the field are frequently subjected to additional testing and reclassification in the laboratory and differences may exist between the field logs and the report logs. The engineer preparing the report reviews the field logs, laboratory classifications, and test data and then prepares the report logs. Our recommendations are based on the contents of the report logs and the information contained therein.

REVIEW OF DESIGN DETAILS, PLANS, AND SPECIFICATIONS

SME should be retained to review the design details, project plans, and specifications to verify those documents are consistent with the recommendations contained in this report.

REVIEW OF REPORT INFORMATION WITH PROJECT TEAM

Implementation of our recommendations may affect the design, construction, and performance of the proposed improvements, along with the potential inherent risks involved with the proposed construction. The client and key members of the design team, including SME, should discuss the issues covered in this report so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk, and expectations for performance and maintenance.

FIELD VERIFICATION OF GEOTECHNICAL CONDITIONS

SME should be retained to verify the recommendations of this report are properly implemented during construction. This may avoid misinterpretation of our recommendations by other parties and will allow us to review and modify our recommendations if variations in the site subsurface conditions are encountered.

PROJECT INFORMATION FOR CONTRACTOR

This report and any future addenda or other reports regarding this site should be made available to prospective contractors prior to submitting their proposals for their information only and to supply them with facts relative to the subsurface evaluation and laboratory test results. If the selected contractor encounters subsurface conditions during construction, which differ from those presented in this report, the contractor should promptly describe the nature and extent of the differing conditions in writing and SME should be notified so that we can verify those conditions. The construction contract should include provisions for dealing with differing conditions and contingency funds should be reserved for potential problems during earthwork and foundation construction. We would be pleased to assist you in developing the contract provisions based on our experience.

The contractor should be prepared to handle environmental conditions encountered at this site, which may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers. Any Environmental Assessment reports prepared for this site should be made available for review by bidders and the successful contractor.

THIRD PARTY RELIANCE/REUSE OF THIS REPORT

This report has been prepared solely for the use of our Client for the project specifically described in this report. This report cannot be relied upon by other parties not involved in the project, unless specifically allowed by SME in writing. SME also is not responsible for the interpretation by other parties of the geotechnical data and the recommendations provided herein.

LABORATORY TESTING PROCEDURES

VISUAL ENGINEERING CLASSIFICATION

Visual classification was performed on recovered samples. The appended General Notes and Unified Soil Classification System (USCS) sheets include a brief summary of the general method used visually classify the soil and assign an appropriate USCS group symbol. The estimated group symbol, according to the USCS, is shown in parentheses following the textural description of the various strata on the boring logs appended to this report. The soil descriptions developed from visual classifications are sometimes modified to reflect the results of laboratory testing.

MOISTURE CONTENT

Moisture content tests were performed by weighing samples from the field at their in-situ moisture condition. These samples were then dried at a constant temperature (approximately 110º C) overnight in an oven. After drying, the samples were weighed to determine the dry weight of the sample and the weight of the water that was expelled during drying. The moisture content of the specimen is expressed as a percent and is the weight of the water compared to the dry weight of the specimen.

HAND PENETROMETER TESTS

In the hand penetrometer test, the unconfined compressive strength of a cohesive soil sample is estimated by measuring the resistance of the sample to the penetration of a small calibrated, spring-loaded cylinder. The maximum capacity of the penetrometer is 4.5 tons per square-foot (tsf). Theoretically, the undrained shear strength of the cohesive sample is one-half the unconfined compressive strength. The undrained shear strength (based on the hand penetrometer test) presented on the boring logs is reported in units of kips per square-foot (ksf).

TORVANE SHEAR TESTS

In the Torvane test, the shear strength of a low strength, cohesive soil sample is estimated by measuring the resistance of the sample to a torque applied through vanes inserted into the sample. The undrained shear strength of the samples is measured from the maximum torque required to shear the sample and is reported in units of kips per square-foot (ksf).

LOSS-ON-IGNITION (ORGANIC CONTENT) TESTS

Loss-on-ignition (LOI) tests are conducted by first weighing the sample and then heating the sample to dry the moisture from the sample (in the same manner as determining the moisture content of the soil). The sample is then re-weighed to determine the dry weight and then heated for 4 hours in a muffle furnace at a high temperature (approximately 440º C). After cooling, the sample is re-weighed to calculate the amount of ash remaining, which in turn is used to determine the amount of organic matter burned from the original dry sample. The organic matter content of the specimen is expressed as a percent compared to the dry weight of the sample.

ATTERBERG LIMITS TESTS

Atterberg limits tests consist of two components. The plastic limit of a cohesive sample is determined by rolling the sample into a thread and the plastic limit is the moisture content where a 1/8-inch thread begins to crumble. The liquid limit is determined by placing a ½-inch thick soil pat into the liquid limits cup and using a grooving tool to divide the soil pat in half. The cup is then tapped on the base of the liquid limits device using a crank handle. The number of drops of the cup to close the gap formed by the grooving tool ½ inch is recorded along with the corresponding moisture content of the sample. This procedure is repeated several times at different moisture contents and a graph of moisture content and the corresponding number of blows is plotted. The liquid limit is defined as the moisture content at a nominal 25 drops of the cup. From this test, the plasticity index can be determined by subtracting the plastic limit from the liquid limit.

Passionate People Building
and Revitalizing our World

SME

IBI GROUP
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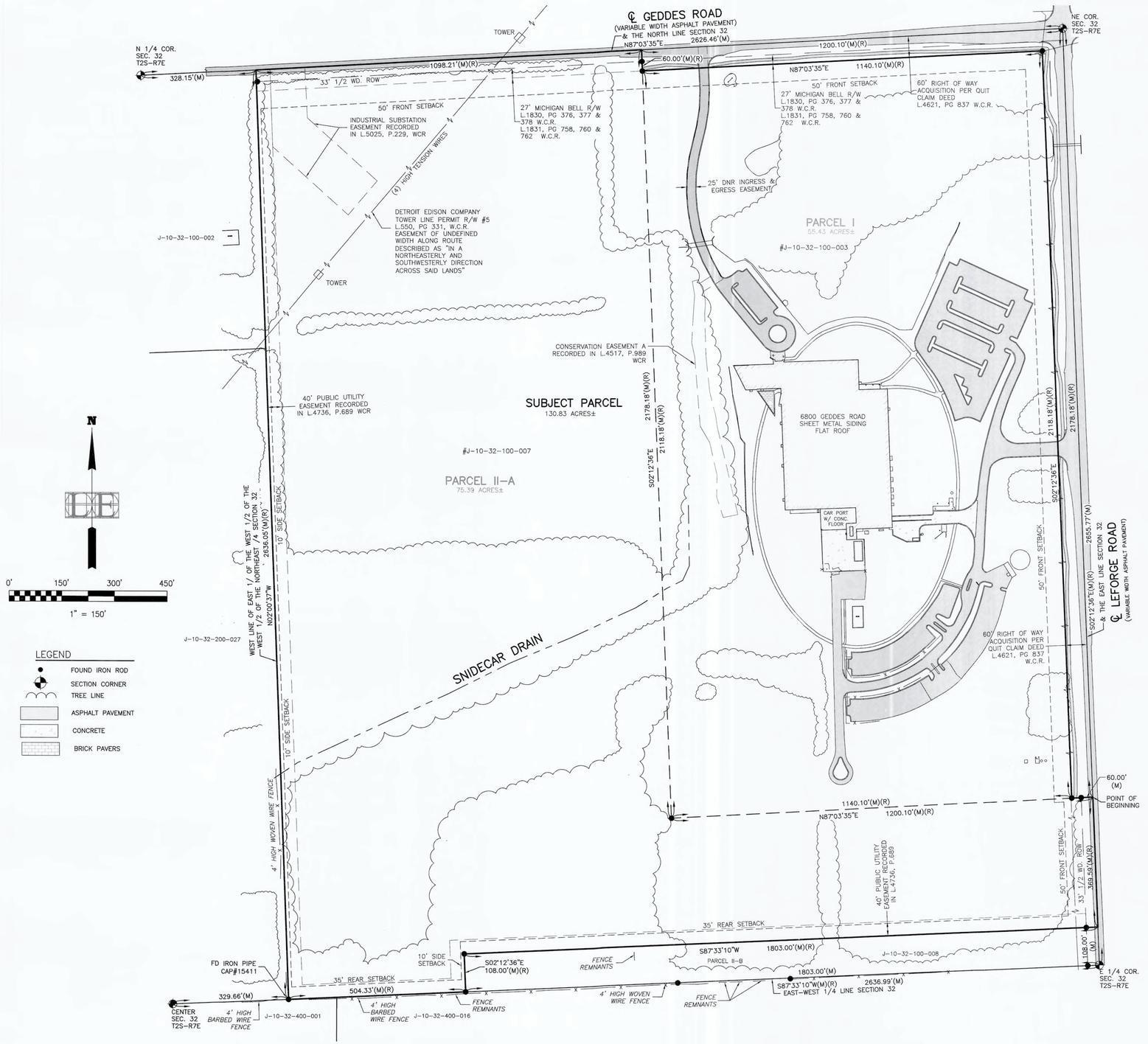
Southfield MI 48033 USA
Tel: 248 936 8000 fax: 248 936 8111
ibigroup.com

Appendix B

Boundary Survey

BOUNDARY SURVEY



LEGAL DESCRIPTION PARCEL 1 (per Quit Claim Deed recorded in Liber 4621, Page 837)

Commencing at the Northeast corner of Section 32, Town 2 South, Range 7 East, Superior Township, Washtenaw County, Michigan; thence South 02°12'36" East 2178.18 feet along the East line of said Section and the centerline of LeForge Road to the point of beginning; thence continuing South 02°12'36" East 369.59 feet along said East line and said centerline; thence South 87°33'10" West 1803.00 feet; thence South 02°12'36" East 108.00 feet to a point on the East–West ¼ line of said Section; thence South 87°33'10" West 504.33 feet along said East–West ¼ line to a point on the West line of the East ½ of the West ½ of the West ½ of the Northeast ¼ of said Section; thence North 02°00'37" West 2636.05 feet along said West line to a point on the North line of said Section and the centerline of Geddes Road; thence North 87°03'35" East 1098.21 feet along said North line and said centerline; thence South 02°12'36" East 2178.18 feet; thence North 87°03'35" East 1200.10 feet to the point of beginning. Being a part of the East ½ of the Northeast ¼ and a part of the East ¾ of the West ½ of the Northeast ¼ of Section 32, Town 2 South, Range 7 East, Superior Township, Washtenaw County, Michigan.

LEGAL DESCRIPTION PARCEL II-A (per Warranty Deed recorded in Liber 4567, Page 710)

Commencing at the Northeast corner of Section 32, Town 2 South, Range 7 East, Superior Township, Washtenaw County, Michigan; thence South 02°12'36" East 2178.18 feet along the East line of said Section and the centerline of LeForge Road to the point of beginning; thence continuing South 02°12'36" East 369.59 feet along said East line and said centerline; thence South 87°33'10" West 1803.00 feet; thence South 02°12'36" East 108.00 feet to a point on the East and West 1/4 line of said Section; thence South 87°33'10" West 504.33 feet along said East and West 1/4 line to a point on the West line of the East 1/2 of the West 1/2 of the west 1/2 of the Northeast 1/4 of said Section; thence North 02°00'31" West 2636.05 feet along said West line to a point on the North line of said Section and the centerline of Geddes Road; thence North 87°03'35" East 1098.21 feet along said North line and said centerline; thence South 02°12'36" East 2178.18 feet; thence North 87°03'35" East 1200.10 feet to the point of beginning. Being a part of the East 1/2 of the Northeast 1/4 and a part of the East 3/4 of the West 1/2 of the Northeast 1/4 of Section 32, Town 2 South, Range 7 East, Superior Township, Washtenaw County, Michigan.

OVERALL LEGAL DESCRIPTION (As Surveyed)

Part of the Northeast ¼ of Section 32, Town 2 South, Range 7 East, Superior Township, Washtenaw County, Michigan, more particularly described as follows: Commencing at the Northeast corner of said Section 32; thence along the East line of said Section 32 and the Centerline of LeForge Road (variable width public right of way), S 02°12'36" E, 2178.18 feet to the POINT OF BEGINNING of the parcel to be described; thence continuing along the East line of said Section 32 and the centerline of said LeForge Road, S 02°12'36" E, 369.59 feet; thence S 87°33'10" W, 1803.00 feet; thence S 02°12'36" E, 108.00 feet to a point on the East–West ¼ line of said Section 32; thence along East–West ¼ line of said Section 32, S 87°33'10" W, 504.33 feet to a found iron pipe with cap #15411; thence along the West line of the East ½ of the West ½ of the Northeast ¼ of said Section 32, N 02°00'37" W, 2636.05 feet to a point on the the North line of said section 32 and the centerline of Geddes Road (variable width public right of way); thence along the North line said Section 32 and the centerline of said Geddes Road, N 87°03'35" E, 1098.21 feet; thence S 02°12'36" E, 60.00 feet to a point on the Southerly right of way line of said Geddes Road; thence along the Southerly right of way line of said Geddes Road, N 87°03'35" E, 1140.10 feet to a point on the Westerly right of way line of said Leforge Road; thence along the Westerly right of way line of said Leforge Road, S 02°12'36" E, 2118.18 feet; thence N 87°03'35" E, 60.00 feet to the Point of Beginning, containing 130.83 acres, more or less. Subject to the rights of the public over Geddes Road and LeForge Road. Also subject to any other easements or restrictions of record.

LIVINGSTON ENGINEERING
CIVIL ENGINEERING SURVEYING PLANNING
3300 S. OLD U.S. 23, BRIGHTON, MI 48114
PHONE: (810) 225-7100 FAX: (810) 225-7699
www.livingstoneng.com

Client
IBI GROUP
25200 TELEGRAPH RD., SUITE 300
SOUTHFIELD, MI 48033

BOUNDARY SURVEY
HATCI
SUPERIOR TOWNSHIP, MICHIGAN

DATE	REVISIONS

Drawn: N. LEMONS
Checked:
Approved:
Date: 2021-10-20

Job. no. 12121-1
Scale:
Vertical:
Horizontal: 1" = 150'

Dennis James Long
License No. 4001050913
STATE OF MICHIGAN
REGISTERED PROFESSIONAL SURVEYOR

1 of 1

FILE: C:\Users\User\Dropbox (Living)\Projects\2012\12121-1 IBI HATCI Superior Twp\03 DWGS\Exst Cond\12121-1SU.dwg

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ibigroup.com

Appendix C

Stream and Wetland Delineation Report

Wetland and Stream Delineation Report

October 2021
ECT No. 210731

IBI Group
25200 Telegraph Rd. Ste. 300
Southfield, MI 48033

3720 Wilder Road, Unit B
Bay City, Michigan 48706
www.ectinc.com

Document Review

The dual signatory process is an integral part of Environmental Consulting & Technology, Inc.'s (ECT's) Document Review Policy No. 9.03. All ECT documents undergo technical/peer review before dispatching these documents to any outside entity.

This document has been authored and reviewed by the following employees:

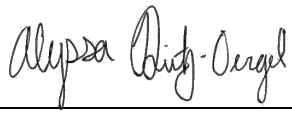
Heather Darrow	Alyssa Dietz-Oergel
Author	Peer Review
	
Signature	Signature
10/27/2021	10/27/2021
Date	Date

Table of Contents

List of Tables

List of Acronyms and Abbreviations

CWA	Clean Water Act
EGLE	Department of Environment, Great Lakes, and Energy
ECT	Environmental Consulting & Technology, Inc.
EPA	United States Environmental Protection Agency
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
FEMA	Federal Emergency Management Agency
FIRM	Federal Insurance Rate Map
GPS	Global Positioning System
HMA	Hyundai Motor America
HUC	Hydrologic Unit Code
MIRIS	Michigan Resource Inventory System
MWI	Michigan Wetlands Inventory
NHD	National Hydrological Dataset
NRCS	Natural Resources Conservation Service
NREPA	Natural Resources and Environmental Protection Act
NWI	National Wetlands Inventory
OBL	Obligate
OHWM	Ordinary High-Water Mark
PFO	Palustrine Forested Wetland
Project	HMA STIL Facility
SFHA	Special Flood Hazard Area
STIL	Safety Test Investigation Laboratory
UPL	Obligate Upland
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WOTUS	Waters of the United States

Executive Summary

IBI Group contracted Environmental Consulting & Technology, Inc. (ECT) to perform a wetland and stream delineation for the Hyundai Motor America (HMA) Safety Test Investigation Laboratory (STIL) Facility Project (Project) located, on approximately 46-acres of undeveloped land (Project Area) east of Ann Arbor, in Superior Charter Township (T2S R7E), Washtenaw County, Michigan (**Appendix A: Figure 1**).

The proposed Project is located in the Ford Lake-Huron River (Hydrologic Unit Code [HUC] 040900050403) watershed. On October 6 and 22, 2021, ECT conducted a field reconnaissance of the Project Area to identify, delineate, characterize wetland and stream features, and to determine their likely regulatory status.

ECT evaluated the Project Area for on-site water resources to determine the regulatory status of these features based on the Natural Resources and Environmental Protection Act (NREPA), 1994, PA 451, as amended (Act 451), currently in effect in Michigan. ECT identified six (6) wetlands within the Project Area (wetlands W1A, W2A, W3A, W4A, W5A, and W6A), and two (2) streams: stream S1A (Snidecar Drain) and S2A (unnamed). Based on current provisions under Part 303, Wetlands Protection, and conditions observed during the site visit and delineation, ECT believes that four (4) of these wetlands are likely regulated due to their proximity to regulated streams and/or their size. Wetlands W1A, W2A, W3A, W4A, and W6A are within 500 feet of a stream (S1A [Snidecar Drain] and unnamed offside) and therefore are likely regulated. Wetland W5A is less than five (5) acres in size; is not contiguous to an inland lake, pond, or stream; and, is not located within 500 feet of an inland lake, pond, or stream.

The identification of wetlands herein is based on the condition of the Project Area at the time of the investigation. All wetland boundaries, and likely jurisdictional statuses, are considered preliminary in that the Michigan Department of Environment, Great Lakes, and Energy (EGLE) has the authority to confirm, deny, or change wetland and stream determinations through the permit review process.

1.0 Introduction and Methodology

IBI Group contracted Environmental Consulting & Technology, Inc. (ECT) to perform a wetland and stream delineation to support the Hyundai Motor America (HMA) Safety Test Investigation Laboratory (STIL) Project (Project). The Project is located on approximately 46-acres of undeveloped land (Project Area) in Superior Charter Township (T2S R7E), Washtenaw County, approximately 2.3 miles east of the City of Ann Arbor, Michigan (**Appendix A: Figure 1**). The Project is within the Ford Lake-Huron River (Hydrologic Unit Code [HUC] 040900050403) watershed, which is part of the larger Huron River watershed (HUC 04090005).

On October 6 and 22, 2021, ECT conducted a field reconnaissance of the Project Area to identify, delineate, and characterize wetlands, assess water features and streams, and determine the likely regulatory status of the identified water resources. The Project Area is dominated by agricultural land, upland forest, maintained/mowed areas, and emergent wetlands. The Project Area is surrounded by forested areas on three (3) sides (northwest, south, and west), manufacturing/commercial development to the north, and agricultural land to the east. Snidecar Drain (not a regulated county drain) flows along the northwestern boundary of the Project Area.

Wetlands within the Project Area were delineated following the *1987 U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Army Corps of Engineers Wetland Delineation Manual: Midwest* (USACE 2012) guidelines. The presence of wetlands is determined based on three (3) parameters: the presence of hydric vegetation (hydrophytes), hydric soils, and wetland hydrology. Wetland boundaries were mapped using a sub-meter Trimble® R1 global positioning system (GPS) unit. Wetland data points and corresponding upland points were also mapped with the same GPS unit. USACE regional determination forms were completed for each wetland and its corresponding upland point (See **Appendix B: USACE Wetland Determination Data Forms**).

Plant species were identified by flowers, leaves, bark, twigs, stems, reproductive structures, and/or persistent remains from the preceding growing season. The wetland indicator status for vegetation noted during the evaluation was obtained from the USACE Midwest Region 2018 Regional Wetland Plant List (USACE 2018). Soils were evaluated by digging test pits sufficient to document hydric

indicators, up to 24 inches deep. Soil conditions were evaluated using criteria established by the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) *Field Indicators of Hydric Soils in the United States* (USDA-NRCS 2018), and soil colors were evaluated using a Munsell® color chart. Hydrology was evaluated through direct observation of primary indicators (e.g., standing water and/or saturated soil) and indirectly through observation of secondary hydrology indications.

The presence of morphological features such as a defined bed, banks, the presence of ordinary high-water mark (OHWM), and evidence of water flow was observed indicating the presence of streams within the Project Area.

2.0 Available Mapping and Data

Prior to the fieldwork, ECT conducted a preliminary desktop site assessment of existing information and imagery, including aerial photographs, United States Geological Service (USGS) topographic maps, National Wetland Inventory (NWI) maps, Michigan Wetland Inventory (MWI) maps, soil survey maps, and Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs). The results of this desktop review were used to focus field efforts on protected natural resources that are likely to occur within the Project Area.

2.1 Aerial Imagery Review

Aerial imagery of the Project Area was reviewed before the field reconnaissance to identify past and current land use and potential water resources. Per the aerial review, the Project Area likely consists primarily of agricultural land, upland forest, maintained/mowed areas, emergent wetlands, and one (1) stream. The area immediately surrounding the Project Area is industrially developed (manufacturing laboratory) to the north, forest to the south, west, and northwest, and Laforge Road and agricultural land to the east. The aerial imagery analysis determined that land use within the Project Area and the surrounding area has remained mostly unchanged throughout the previous 16 years.

2.2 U.S. Geographical Survey Topographic Map

The U.S. Geological Survey (USGS) Ann Arbor East, Michigan 7.5-minute quadrangle maps (USGS 2019) depict the elevation within the Project Area ranges from 780 to 825 feet above mean sea level (USGS 2021b); **Appendix A: Figure 2**). One (1) intermittent stream is identified on the USGS map, flowing near the northwestern Project Area.

2.3 National Wetland Inventory, National Hydrography Dataset Map, and Michigan Wetland Inventory Map

The NWI, MWI, and the NHD were reviewed to determine the likely presence, location, size, and type of water resources that may be within the Project Area (USFWS 2021; USGS 2021a; EGLE 2021). The United States Fish & Wildlife Service (USFWS) generates NWI maps through high-altitude imagery. MWI maps are produced by overlaying data from the NWI, land cover as mapped by the Michigan

Department of Natural Resources' Michigan Resource Inventory System (MIRIS), and soils as mapped by USDA-NRCS. These maps were used for preliminary analysis only as these maps may not accurately depict the extent or existence of wetlands in a specific area, nor do they always correctly identify the types of wetlands present. On-site field mapping is required to determine the actual presence and types of wetlands within the Project Area.

The NWI database identified one (1) riverine wetland located in the northwest corner of the Project Area (USFWS 2021; **Appendix A: Figure 3**).

The NHD mapped one (1) stream within the Project Area. Snidecar Drain is mapped along the northwest boundary of the Project Area and flows southwest (USGS 2021a; **Appendix A: Figure 3**).

Additionally, MWI maps were reviewed and hydric soils are mapped along the northern quarter of the Project Area, including along Snidecar Drain in the northwestern boundary of the Project Area, consistent with onsite wetland delineation findings (EGLE 2021; **Appendix A: Figure 4**).

2.4 NRCS Soils Map

ECT reviewed the USDA-NRCS soil data for hydric soils that may be present within the Project Area. Hydric soils form under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil (USDA-NRCS 2018). A total of five (5) soil map types are mapped within the Project Area (**Appendix A: Figure 5**). Soils within the Project Area were rated from predominantly hydric to nonhydric by the USDA-NRCS (**Table 2-1**).

Table 2-1. USDA-NRCS Soil Map Units

Soils Unit Name	Symbol	Hydric	Acreage in Project Area	% of Project Area
Kendallville loam, 2 to 6 percent slopes	KeB	Nonhydric	15.50	33.40%
St. Clair clay loam, 6 to 12 percent slopes	StC	Nonhydric	10.20	22.00%
Hoytville silty clay loam	Ho	Predominantly Hydric	8.90	19.20%
Fox sandy loam, till plain, 2 to 6 percent slopes	FoB	Predominantly Nonhydric	6.70	14.50%
Nappanee silty clay loam, 2 to 6percent slopes	NaB	Predominantly Nonhydric	5.00	10.90%
		Total	46.30	100.00%

Source: USDA-NRCS, 2021.

2.5 FEMA Flood Zone Map

Flood hazard areas identified on the FIRMS are identified as a Special Flood Hazard Area (SFHA). SFHA is defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance of flood is also referred to as the base flood or the 100-year flood.

Moderate flood hazard areas, labeled Zone B or Zone X (shaded) are also shown on the FIRM and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled Zone C or Zone X (unshaded).

A review of the FIRMs indicated no regulated floodplains are mapped within the Project Area (FEMA 2021; **Appendix A: Figure 6**).

3.0 Results

3.1 Wetlands

During the site reconnaissance, six (6) wetlands (wetlands W1A, W2A, W3A, W4A, W5A, and W6A) were identified within the Project Area and are shown on the Wetland Delineation Map (**Appendix A: Figure 7**). USACE Midwest Region wetland data sheets are provided in **Appendix B**. Wetlands identified had a predominance of hydrophytic vegetation, hydric soils, and observed hydrological characteristics.

Sufficient reducing characteristics were observed within the upper 10 inches of soils, per guidelines set forth by the USDA-NRCS Field Indicators of Hydric Soils in the United States (USDA-NRCS 2018). All the wetlands met the conditions for the depleted matrix (F3) hydric soil indicator. Wetlands W1A, W3A, W4A, and W5A soils were light gray/brown to dark brown clay loam. Wetland W2A soil was light brown/brown clay. Other observed hydric soil indicators included depleted below dark surface (A11), and loamy mucky mineral (F1).

Hydrology indicators found within the identified wetlands included surface water (A1), high water table (A2), saturation (A3), drift deposits (B3), algal mat or crust (B4), drainage patterns (B10), saturation visible on aerial imagery (C9), geomorphic position (D2), and FAC-neutral test (D5).

Typical vegetative conditions noted in wetlands within the Project Area are described in the following paragraphs. The scientific names and wetland indicator status of vegetation (obligate wetland, OBL; facultative wetland, FACW; facultative, FAC; facultative upland, FACU; and obligate upland, UPL) noted during the delineation follow the common name the first time each plant species is referenced. **Appendix C** provides photographs depicting conditions at the time of the site investigation. **Table 3-1** provides details on the identified wetlands within the Project Area.

Tabl 3-1. Wetland Summary Data: Wetland Type and Potential Regulatory Status

Wetland ID	Lat/Long	Wetland Type[1]	Regulatory Status[2]	Hydrologic Connectivity[3]	Acres
W1A	42.2692109, -83.6307970	PEM	Regulated	Contiguous	0.20
W2A	42.2704990, -83.6264494	PEM	Regulated	Contiguous	0.08
W3A	42.2706055, -83.6268375	PEM	Regulated	Contiguous	0.04

Wetland ID	Lat/Long	Wetland Type[1]	Regulatory Status[2]	Hydrologic Connectivity[3]	Acres
W4A	42.2700699, -83.6261552	PSS	Regulated	Contiguous	0.27
W5A	42.2692637, -83.6236640	PEM	Non - Regulated	More than 500 feet from a stream Less than 5 acres	0.06
W6A	42.2678443, -83.6232091	PFO	Regulated	Contiguous	0.03
				Scrub/Shrub Total	**0.27**
				Emergent Total	**0.38**
				Forested Total	**0.03**
				Total	**0.68**

Source: ECT, 2021.

[1] Cowardin Classification: PEM = Palustrine Emergent Wetland; PSS = Palustrine Scrub-Shrub Wetland

[2] Final jurisdictional determination is made by EGLE during the permitting process.

[3] Contiguous = wetland is within 500 feet of, and/or has a direct connection to a regulating feature (stream, lake).

Wetland W1A is a palustrine emergent wetland located in the southwestern portion of the Project Area, adjacent to an agricultural field and approximately 38 feet south of Stream S1A (Snidecar Drain). Vegetation within W1A is dominated by brookweed (*Samolus parviflorus*; OBL) and interspersed with fragrant flatsedge (*Cyperus odoratus*; FACW), cinnamon willow-herb (*Epilobium coloratum*; OBL), and narrowleaf plantain (*Plantago lanceolata*; FACU). Hydric soils were determined based on the following indicators: depleted below dark surface (A11) and depleted matrix (F3). Visual indications of wetland hydrology included high water table (A2), saturation (A3), algal mat or crust (B4), as well as secondary indicators including saturation visible on aerial imagery (C9), and FAC-neutral test (D5).

Wetland W2A is a palustrine emergent wetland located in the northern portion of the Project Area, approximately 173 feet east of Stream S1A (Snidecar Drain). Vegetation within W2A is characterized by narrowleaf cattail (*Typha angustifolia*; OBL), interspersed with purple loosestrife (*Lythrum salicaria*; OBL), and an overstory of (*Populus deltoides*; FAC) and sandbar willow (*Salix interior*; FACW). Hydric soils were determined based on the following indicators: loamy mucky mineral (F1) and depleted matrix (F3). Visual indications of wetland hydrology included high water table (A2), saturation (A3), drift deposits (B3), algal mat or crust (B4), as well as many secondary indicators.

Wetland W3A, is a palustrine emergent wetland located in the northern portion of the Project Area, approximately 64 feet southeast of Stream S1A (Snidecar Drain). Vegetation within W3A is composed entirely of reed canary grass (*Pharlaris arundinacea*; FACW). Hydric soils were determined based on the presence of a depleted matrix (F3). Visual indications of wetland hydrology included drainage patterns (B10), geomorphic position (D2), and FAC-neutral test (D5).

Wetland W4A is a palustrine scrub-shrub wetland located in the north-central portion of the Project Area and connects with Stream S2A. Vegetation within this wetland is dominated by reed canary grass, sandbar willow, and is interspersed with small patches of American elm (*Ulmus americana*; FACW) and eastern American black walnut (*Juglans nigra*; FACU). Hydric soils were determined based on the presence of a depleted matrix (F3). Visual indications of wetland hydrology included high water table (A2), saturation (A3), geomorphic position (D2), and FAC-neutral test (D5).

Wetland W5A is a palustrine emergent wetland located in the eastern portion of the Project Area. Vegetation at W5A is dominated by narrlowleaf cattail, fox sedge (*Carex vulpinoidea*; FACW), and slender rush (*Juncus tenuis*; FAC). Hydric soils were determined based on the presence of a depleted matrix (F3). Visual indications of wetland hydrology included surface water (A1), high water table (A2), saturation (A3), algal mat or crust (B4), as well as several secondary indicators.

3.2 Streams

The field investigation completed by ECT identified one (1) perennial stream and one (1) ephemeral stream within the Project Area. The identified streams exhibited morphological features such as defined bed, bank, and evidence of water flow. Both streams are regulated (by EGLE) (**Appendix A: Figure 7,**). **Table 3-2** summarizes the stream characteristics. **Appendix C** presents copies of photographs depicting these streams.

Table 3-2. Stream Summary Data

Stream ID	Flow Regime	Regulatory Status[1]	OHWM (ft)	TOB Width (ft)	Culvert Circumference (ft)	Length within (Linear Feet)
S1A	Perennial	Regulated	10	14	NA	1,508
S2A	Ephemeral	Regulated	0.5	2	NA	122
					Total	**1,630**

Source: ECT, 2021.

[1] Final jurisdictional determination is made by EGLE through the permitting process.

3.3 Floodplains

There are no FEMA floodplains mapped within the Project Area, however, EGLE regulation of state floodplains would need to be determined through a drainage review and floodplain mapping.

3.4 Upland Conditions

Uplands adjacent to wetlands consisted predominantly of managed grasslands and forested areas. Vegetation in the uplands included autumn olive (*Elaeagnus umbellate*; UPL), eastern American walnut, white ash (*Fraxinus americana*; FACU), American elm, buckthorn (*Rhamnus cathartica*; FAC), boxelder (*Acer negundo*; FAC), rough bentgrass (*Agrostis scabra*; FAC), fall panicgrass (*Panicum dichotomiflorum*; FACW), red fescue (*Festuca rubra*; FACU), Virginia wild rye (*Elymus virginicus*; FACW), Canada thistle (*Circium arvense*; FACU), red clover (*Trifolium pratense*; FACU), white vervain (*Verbena urticifolia*; FAC), wild carrot (*Daucus carota*; UPL), wild teasel (*Dipsacus fullonum*; FACU), tall goldenrod (*Solidago altissima*; FACU), Morrow's honeysuckle (*Lonicera morrowii*; FACU), black raspberry (*Rubus occidentalis*; UPL), poison ivy (*Toxicodendron radicans*, FAC), Virginia creeper (*Parthenocissus quinquefolia*; FACU), calico aster (*Symphyotrichum lateriflorum*; FACW), stout wood reed, and multifora rose (*Rosa multiflora*; FACU). Upland areas are typically higher in elevation than wetlands, however, the Project Area is relatively flat with little elevational change. The soil in the uplands consisted of 0 to 18 inches of brown loamy/clayey soils. Soils lacked the redoximorphic features found in hydric soils. There was no indication of wetland hydrology in upland areas.

4.0 Permitting Consideration

4.1 Federal Considerations

Since 1984, the federal government has authorized the State of Michigan to administer the Clean Water Act (CWA) Section 404 program within its borders, allowing them to regulate impacts to wetlands and Waters of the U.S. (WOTUS). Because the program is administered by the State of Michigan, applicants for most wetland permits are required only to apply to the EGLE for approval under Part 303 of NREPA (State of Michigan 1994). However, there are exceptions where the USACE, maintains jurisdiction within Michigan. In these areas, a separate permit must be received from both the USACE and the EGLE. USACE jurisdiction over WOTUS is maintained under Section 10 of the federal Rivers and Harbors Act of 1899 (33 U.S.C. 403; Chapter 425, March 3, 1899; 30 Stat.1151):

1. Traditionally navigable waters:
    - Great Lakes;
    - Connecting channels to the Great Lakes;
    - Waters connected to the Great Lakes where navigational conditions are maintained; and
    - Wetlands that are directly adjacent to these waters.

Wetlands within the Project Area are not located in or adjacent to a Great Lake or their connecting navigable waters and therefore do not fall under USACE jurisdiction.

4.2 State Considerations

In Michigan, wetlands, streams, and floodplains are regulated by the EGLE in coordination with USACE and the United States Environmental Protection Agency (EPA) under NREPA. These agencies make permitting and compliance determinations regarding wetlands, streams, and floodplains in the State of Michigan, and have the final decision in matters of regulatory status. Under Section 404 of the CWA, WOTUS is regulated jointly by EGLE and USACE. USACE has regulatory authority over Section 10 Waters and tribal lands. The EPA oversees the State's 404 programs and will assist in permit review if the Project impacts exceed thresholds outlined in the EPA Memorandum of Understanding (MOU). A permit is required for activities such as, but not limited to, the placement of fill, dredging of material,

draining of surface water, or constructing a structure within a regulated wetland or stream. Wetlands are protected under Part 303, Wetland Protection, of the NREPA. EGLE assumes regulatory authority over wetlands that are 5 acres or greater in the total area; contiguous to (directly adjacent to, connected to) an inland lake, pond, or stream; within 500 feet of an inland lake, pond, or stream; or within 1,000 feet of a Great Lake, Lake Saint Clair, the Saint Mary's River, the Saint Clair River, or the Detroit River.

EGLE may also exert regulatory control over isolated wetlands less than five (5) acres in size "...if the department determines that protection of the area is essential to the preservation of the natural resources of the state from pollution, impairment, or destruction and the department has so notified the owner."

The following activities are prohibited within regulated wetlands without an EGLE permit:

1. The placement of fill material;
2. Dredging;
3. Construction within; and/or
4. The draining of surface water from a wetland.

Inland lakes, streams, and rivers are protected and regulated under Part 301, Inland Lakes and Streams, of the NREPA. EGLE assumes regulatory authority over natural or artificial inland lakes that are greater than five (5) acres in size and streams that have definite banks, a bed, and visible evidence of a continued flow or continued occurrence of water. There were two (2) regulated streams identified within the Project Area.

Under Part 31, Water Resources Protection, EGLE regulates development, grading, fill and cut in floodplains with a drainage area greater than two (2) squares miles. EGLE does not regulate floodplains of the Great Lakes. A person shall not alter a floodplain except as authorized by a floodplain permit issued by EGLE under NREPA, Part 13, Permits (all water resources permits are under Part 13). The purpose of Part 31 is to assure that the flow carrying capacity of a watercourse is not harmfully obstructed and that the floodway portion of the floodplain is not used for residential construction. There are no floodplains within the Project Area.

NREPA, Part 303, Wetlands Protection, defines a pond as a natural or permanent artificial pond that has more than one (1) acre but less than five (5) acres of permanent open water. This does not include ponds constructed by excavating or diking dry land and maintained for the sole purpose of cooling or storing water and does not include lagoons used for treating polluted water. NREPA, Part 301, does not regulate ponds that are less than five (5) acres in size.

The following activities are prohibited within regulated inland lakes and streams without an EGLE permit:

1. Dredging or filling bottomland;
2. Constructing, enlarging, extending, removing, or placing a structure on bottomland;
3. Erecting, maintaining, or operating a marina;
4. Creating, enlarging, or diminishing an inland lake or stream;
5. Structurally interfering with the natural flow of an inland lake or stream;
6. Constructing, dredging, commencing, extending, or enlarging an artificial canal, channel, ditch, lagoon, pond, lake, or similar waterway where the purpose is an ultimate connection with an existing inland lake or stream, or where any part of the artificial waterway is located within 500 feet of the ordinary high-water mark of an existing inland lake or stream; and
7. Connecting any natural or artificially constructed waterway, canal, channel, ditch, lagoon, pond, lake, or similar water with an existing inland lake or stream for navigation or any other purpose.

A total of six (6) wetlands were reviewed and delineated within the Project Area. It is ECT's professional opinion that five (5) of the wetlands fit the requirements to be regulated and therefore, will likely require a permit from EGLE to impact (**Appendix A: Figure 7**).

4.3 County Considerations

A county drain commissioner regulates activities within designated county drains and their easements following the Drain Code of 1956, PA 40 of 1956 (Michigan Drain Code). As used in the act, "commissioner", "drain commissioner", or "county drain commissioner" means the elected county drain commissioner or the person or persons designated to perform the duties of the elected county drain commissioner.

Streams that are regulated by EGLE may be named "drain" but are not always designated as a county drain by the county. Streams that are legally designated as a county drain have an easement regulated by the county or public service commission. According to the Michigan Drain Code, "The word 'drain', whenever used in this act, shall include the mainstream or trunk and all tributaries or branches of any creek or river, any watercourse or ditch, either open or closed, any covered drain, any sanitary or any combined sanitary and storm sewer or storm sewer or conduit composed of tile, brick, concrete, or other material, any structures or mechanical devices, that will properly purify the flow of such drains, any pumping equipment necessary to assist or relieve the flow of such drains and any levee, dike, barrier, or a combination of any or all of same constructed, or proposed to be constructed, for drainage or the purification of the flow of such drains, but shall not include any dam and flowage rights used in connection therewith which is used for the generation of power by a public utility subject to regulation by the public service commission."

The Washtenaw County Drain Commissioner has jurisdiction over all established drains within the county, all new drain construction, maintenance of existing drains, and the establishment of water management districts.

The Washtenaw County Drain Commissioner requires permits for activities within all county drain easements, including drain crossings and encroachment (utilities and driveways); they also review and issue soil erosion and sedimentation pollution control permits, site plans, and drainage plan reviews.

There are no designated county drains within the Project Area.

5.0 Conclusions

ECT conducted a wetland and stream delineation on the approximately 46-acre Project Area for the HMA STIL Facility Project in Washtenaw County, Michigan. During the assessment, ECT identified six (6) wetlands (W1A, W2A, W3A, W4A, W5A, and W6A) and two streams (S1A = Snidecar Drain, S2A = unnamed stream). Of the five (5) wetlands identified within the Study Area, five (5) of these wetlands (W1A, W2A, W3A, and W4A) are likely regulated by EGLE, amounting to 0.62 acres. In addition, both identified streams a likely regulated by EGLE.

It is ECT's professional opinion that wetland W5A is not likely to be regulated by EGLE, because the wetland is less than five (5) acres in size; is not contiguous to an inland lake, pond, or stream; and, is not located within 500 feet of an inland lake, pond, or stream.

It is unlawful to deposit fill or dredge material, drain surface water, or construct a structure in a regulated water resource without a permit from EGLE. EGLE has the final jurisdictional determination of wetlands and streams within the State of Michigan through the permitting process.

ECT's evaluation was performed following generally accepted procedures for conducting wetland and watercourse evaluations. ECT's conclusion reflects our professional opinion based on conditions present at the time of the evaluation.

6.0 References

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Common Wetland Definitions

100-year flood: A flood with a magnitude that has a 1% chance of occurring or being exceeded in any given year.

Floodplain: The area of land adjoining a river or steam that will be inundated by a 100-year flood.

Hydric soil: Soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part (1991 National Technical Committee on Hydric Soils definition).

Hydrophytes: Plant species that grow in water or on a substrate that is at least periodically deficient in oxygen because of excessive water content; plants typically found in wet habitats.

Intermittent Streams: have water intermittently throughout the year when upstream waters or groundwater provide enough streamflow. May not have flowing surface water during dry times of the year.

Isolated Wetland: "wetland that is not subject to regulation under the Federal Water Pollution Control Act" as described by MI part 303.

Palustrine Emergent Wetland (PEM): Vegetative classification of a wetland system based on the dominant vegetation, consisting of rooted herbaceous (non-woody) plant species that have parts extending above a water surface with at least 30% aerial coverage.

Palustrine Forested Wetland (PFO): Vegetative classification of a wetland system based on the dominant vegetation consisting of woody plants 3 inches in diameter or greater, regardless of height with at least 30% aerial coverage.

Palustrine Scrub-Shrub Wetland (PSS): Vegetative classification of a wetland system based on the dominant vegetation consisting of woody plants less than 3 inches in diameter but greater than 3 ft but less than 20 ft in height OR where trees and shrubs combined have an aerial coverage no greater than 30%.

Perennial Streams: year-round streams, typically have water year-round. Water comes from upstream tributaries or headwaters as well as precipitation.

Traditional Navigable Water: A water body that is presently used or has been previously used in the past for transport by interstate or foreign commerce vessels.

Wetland: Defined by USACE as "…areas that are inundated or saturated by surface or ground water…at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

Wetland hydrology: Hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface at some time during the growing season.

Wetland Indicator Status:

OBL: Obligate wetland plant that occurs almost always, 99% of the time, in wetlands under natural conditions, but which rarely occur in non-wetlands.

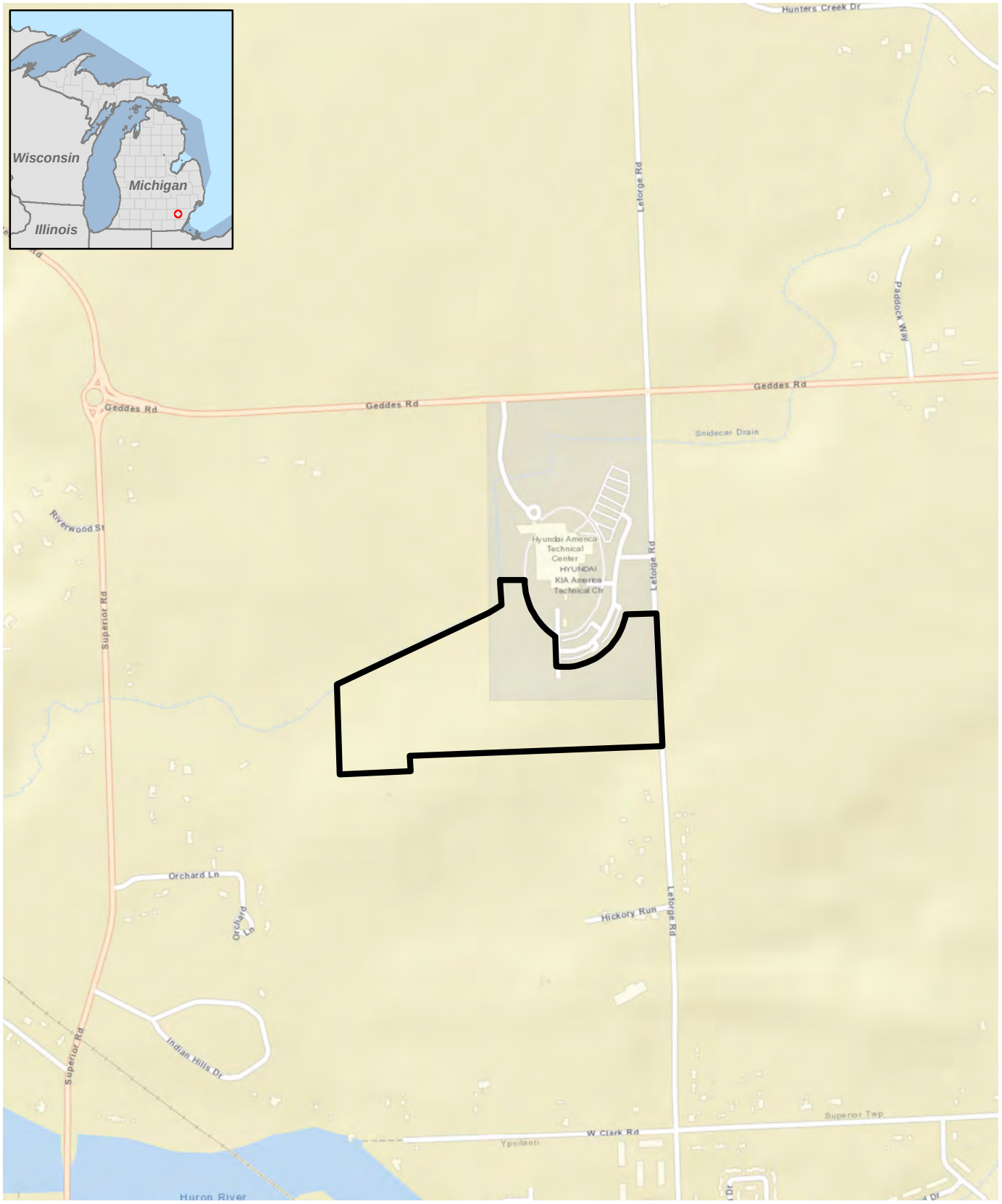
FACW: Facultative wetland plant that occurs usually, 67% to 99% of the time, in wetlands, but also occurs 1% to 33% of the time in non-wetlands.

FAC: Facultative plant that occurs in both wetlands and non-wetlands 33% to 67% of the time.

FACU: Plant that occurs sometimes, 1% to 33% of the time, in wetlands but occurs more often, 67% to 99% of the time, in non-wetlands.

UPL: Upland plant that occurs very rarely in wetlands, less than 1% of the time.

Appendix A Maps



Legend

Project Area

N

0 500 1,000

Feet

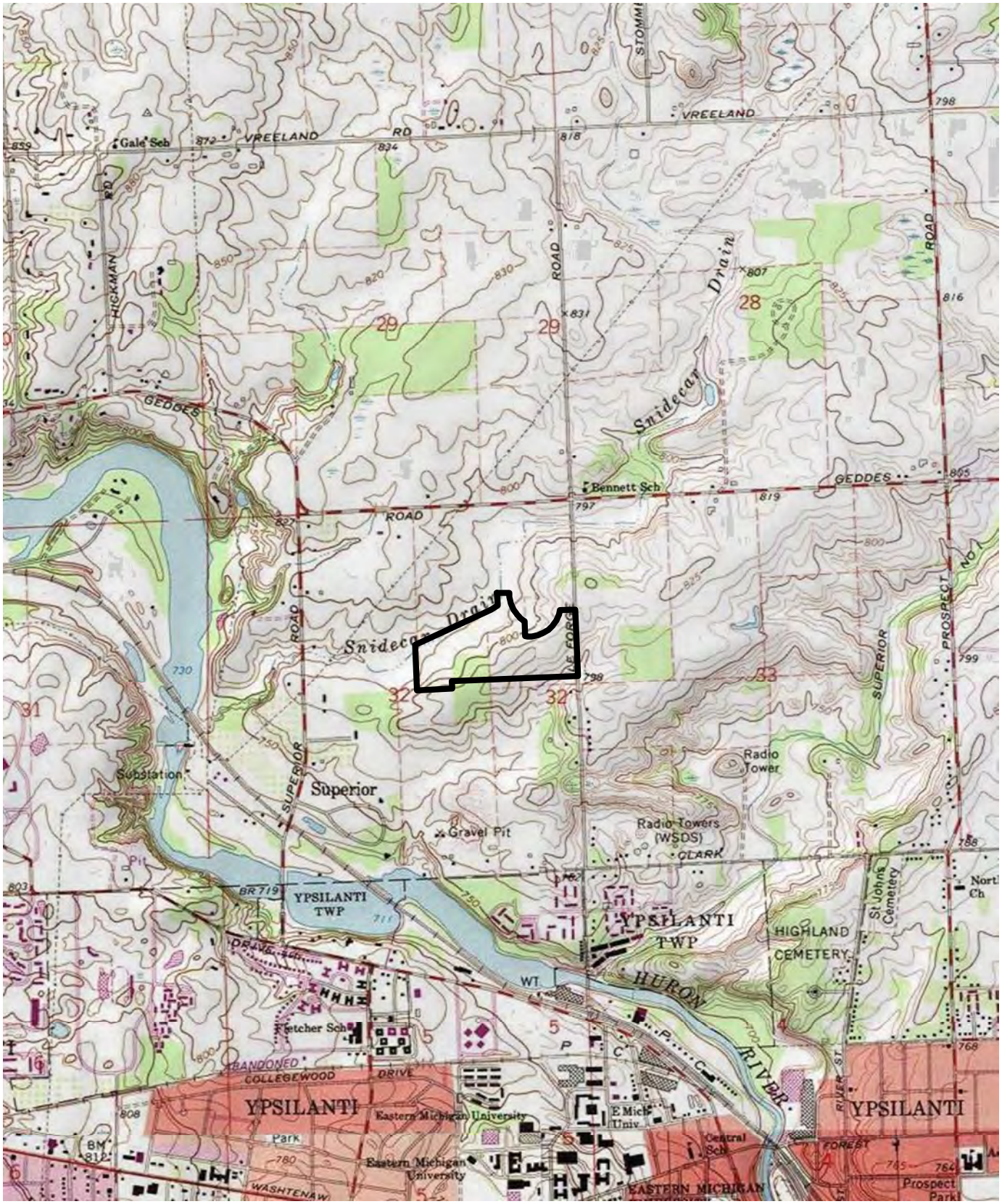
Sources: ECT, 2021.

Figure 1
Site Location

HMS STIL Facility
Washtenaw County, Michigan

Date: 10/27/2021

ECT



Legend

Study Area

N

0 1,000 2,000

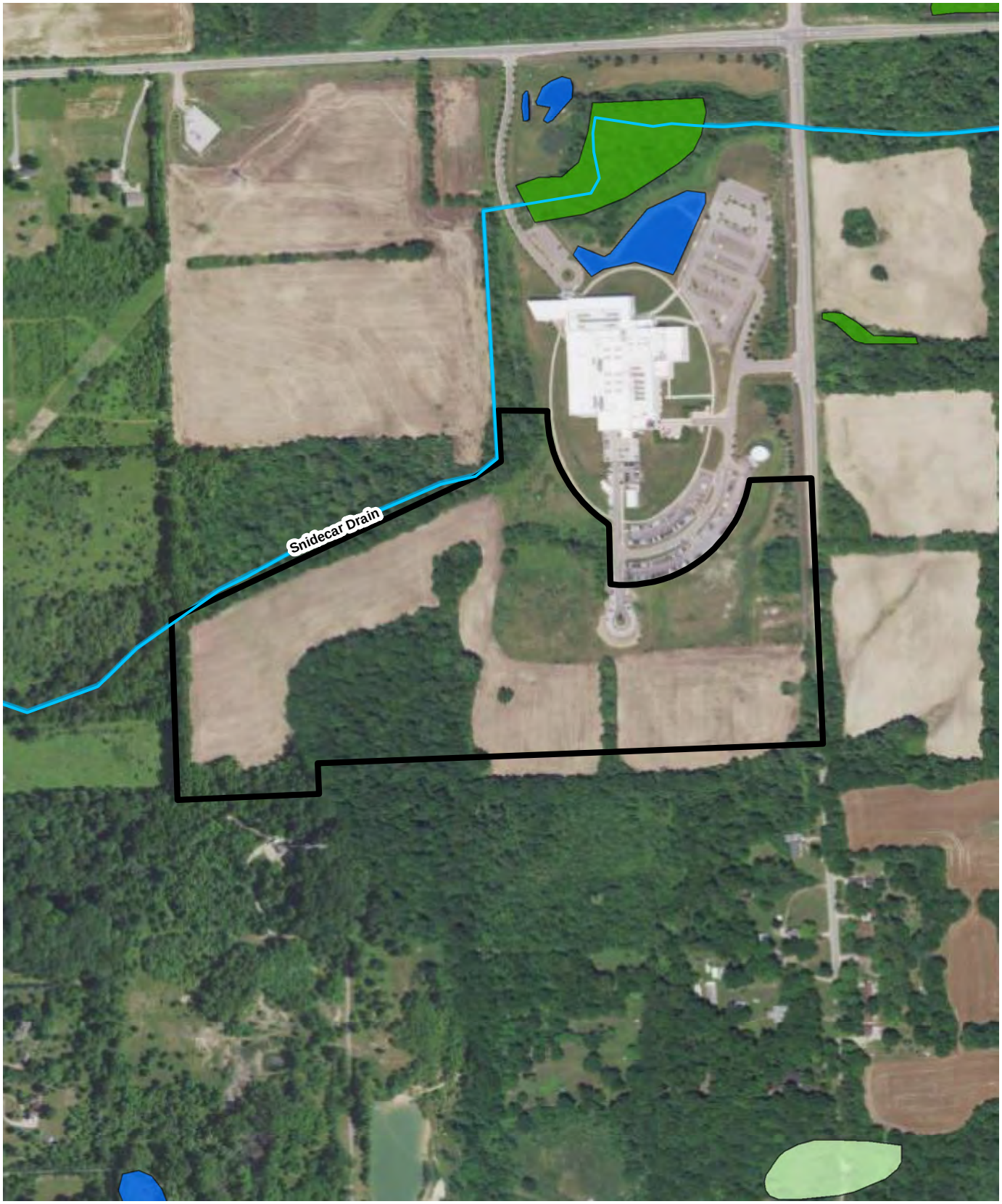
Feet

Sources: ECT, 2021.

Figure 2
Denton and Ann Arbor East USGS Topographic
HMS STIL Facility
Washtenaw County, Michigan

ECT

Date: 10/27/2021



Legend

- Canal or Ditch
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Riverine
- Project Area

N

0 250 500

Feet

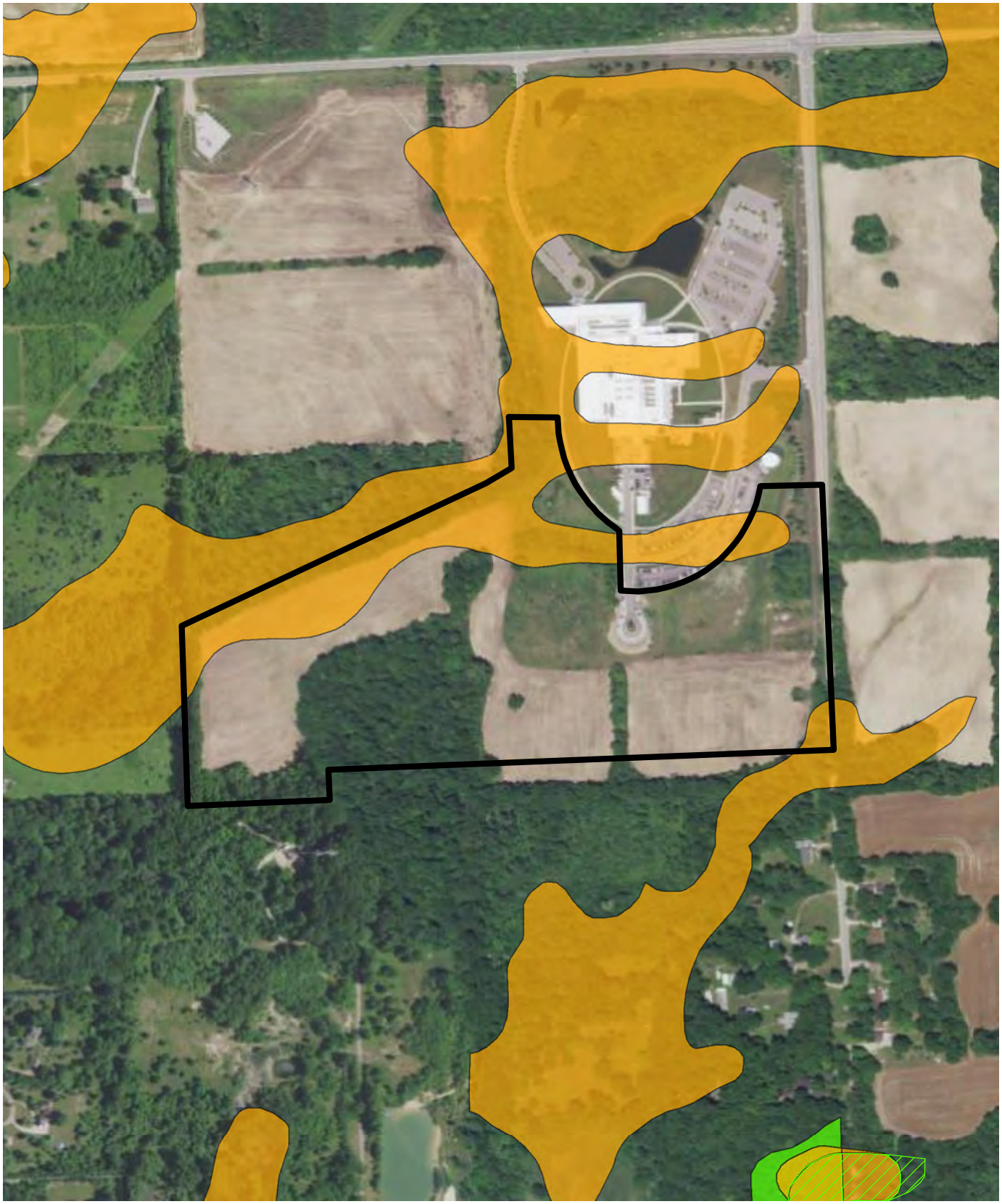
Sources: ECT, 2021.

Figure 2
NWI & NHD Features

HMS STIL Facility
Washtenaw County, Michigan

Date: 10/27/2021

ECT



Legend

- Project Area
- NWI
- Hydric Soils
- 1978 MIRIS Wetland Classes

N

0 250 500

Feet

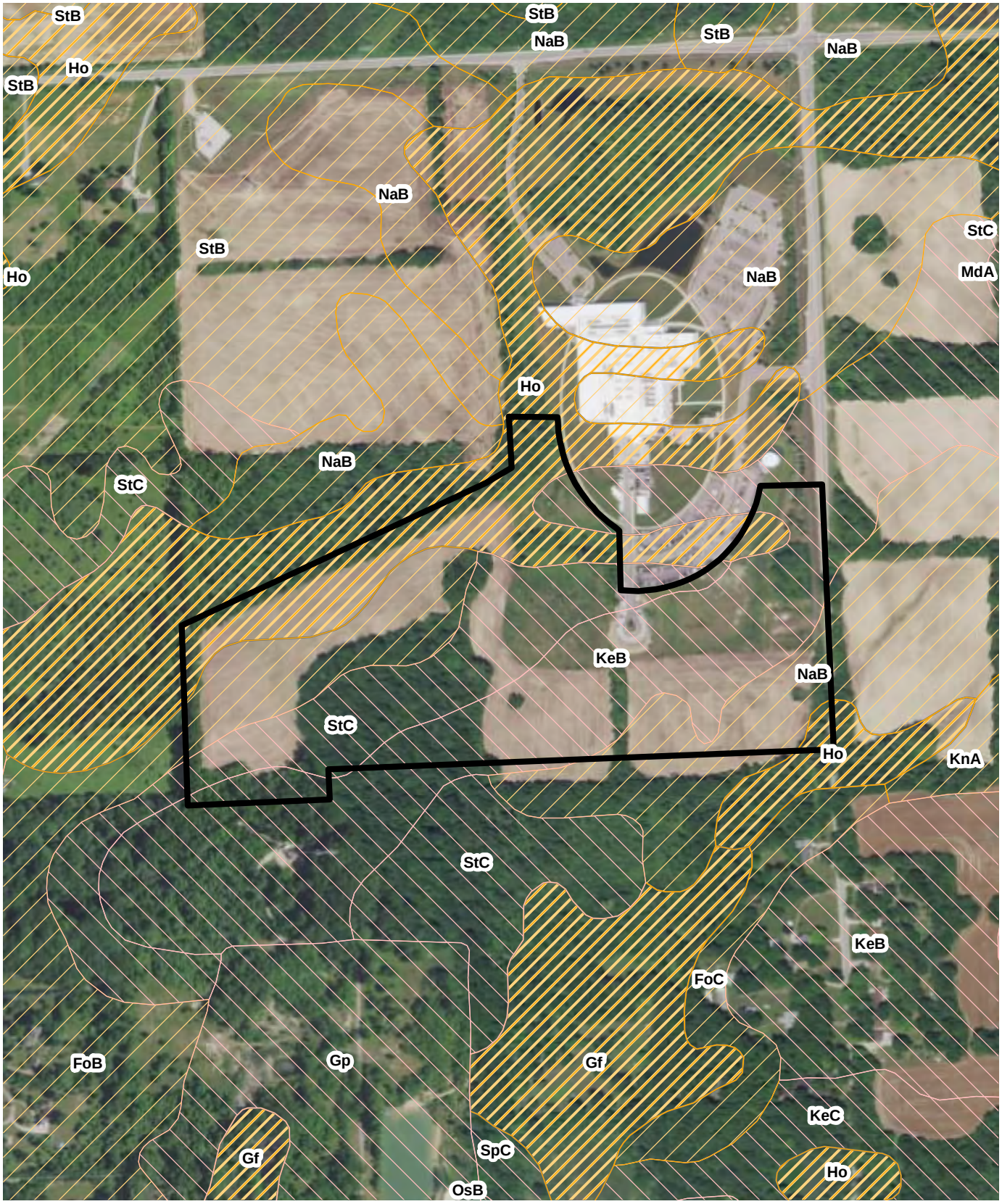
Sources: ECT, 2021.

Figure 4
MWI Features

HMS STIL Facility
Washtenaw County, Michigan

Date: 10/27/2021

ECT



Legend

- Nonhydric
- Predominantly Hydric
- Predominantly Nonhydric
- Project Area

N

0 250 500

Feet

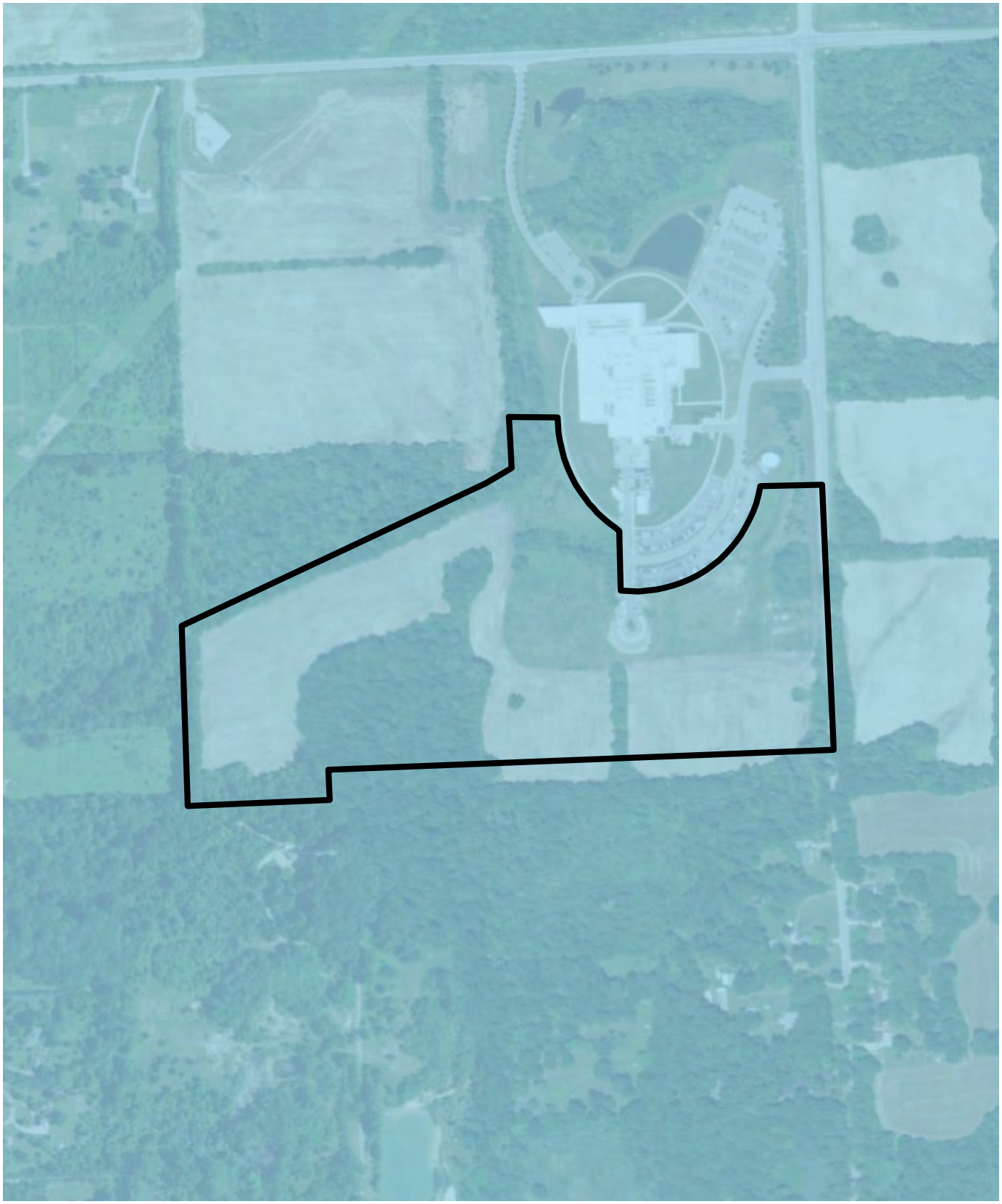
Sources: ECT, 2021.

Figure 5
NRCS Soils

HMS STIL Facility
Washtenaw County, Michigan

Date: 10/27/2021

ECT



Legend

Project Area

Zone X - Outside 100 and 500 Year Floodplain

N

0 250 500

Feet

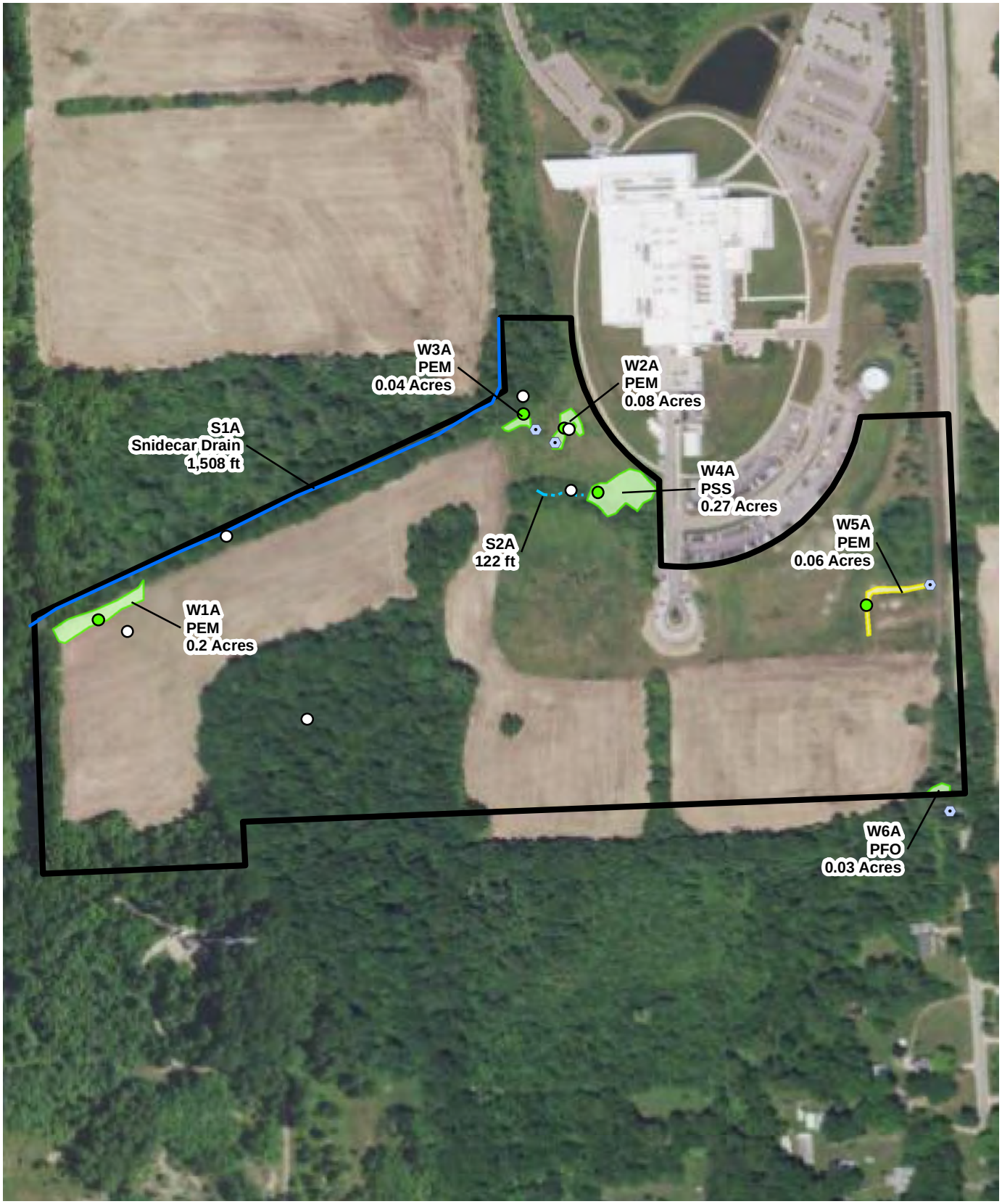
Sources: ECT, 2021.

Figure 6
FEMA Flood Zone

HMS STIL Facility
Washtenaw County, Michigan

Date: 10/27/2021

ECT



Boundary
Culvert
Upland Sample Point
Wetland Sample Point
Perennial Stream
Ephemeral Stream
Regulated EGLE Wetland
Non-Regulated EGLE Wetland

N

0 175 350
Feet

Sources: ECT, 2021.

Figure 7
Wetland and Stream Delineation
HMS STIL Facility
Washtenaw County, Michigan
Date: 10/26/2021

ECT

Appendix B USACE Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-06

Applicant/Owner: IBI Group State: Michigan Sampling Point: NW1A-SP

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 2 Lat: 42.2685080 Long: -83.6288568 Datum: WGS 84

Soil Map Unit Name: St. Clair clay loam, 6 to 12 percent slopes (StC) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tilia americana	30	✔	FACU
2. Carya ovata	25	✔	FACU
3. Prunus serotina	15		FACU
4. Quercus alba	10		FACU
5. Quercus rubra	10		FACU
	90%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
		= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	90 (A)		360 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

Additional Tree species in sample plot: Carpinus caroliniana 5%, Ulmus americana 5%

Additional plant species outside of sample plot: Acer saccharum, Berberis thunbergii, Lonicera maackii, Carex pensylvanica

SOIL

Sampling Point: NW1A-SP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 9	10YR 3/1	100					Clay Loam	
9 - 18	10YR 4/3	100					Clay Loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi | City/County: Superior Charter Twp, Washtenaw | Sampling Date: 2021-10-06

Applicant/Owner: IBI Group | State: Michigan | Sampling Point: NW2A-SP

Investigator(s): J. DeMoss | Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Floodplain | Local relief (concave, convex, none): None

Slope (%): 0 | Lat: 42.2697670 | Long: -83.6295771 | Datum: WGS 84

Soil Map Unit Name: Hoytville silty clay loam (Ho) | NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Juglans nigra	35	✔	FACU
2. Ulmus americana	5		FACW
3.			
4.			
5.			
	40%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Lonicera maackii	15	✔	UPL
2. Rhamnus cathartica	10	✔	FAC
3.			
4.			
5.			
	25%	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Elymus virginicus	50	✔	FACW
2. Festuca rubra	35	✔	FACU
3. Monarda fistulosa	10		FACU
4. Solidago gigantea	5		FACW
5.			
6.			
7.			
8.			
9.			
10.			
	100%	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1. Vitis riparia	10	✔	FACW
2.			
	10%	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	70	x 2 =	140
FAC species	10	x 3 =	30
FACU species	80	x 4 =	320
UPL species	15	x 5 =	75
Column Totals:	175 (A)		565 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

Other vegetation outside of sample plot: Rubus occidentalis, Setaria viridis, Hackelia virginiana, Morus alba, Acer negundo, Parthenocissus quinquefolia, Persicaria virginiana,

SOIL

Sampling Point: NW2A-SP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 12	10YR 4/1	100					Clay Loam	
12 - 18	10YR 5/1	70	7.5YR 5/8	30	C	M	Clay Loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-06

Applicant/Owner: IBI Group State: Michigan Sampling Point: W1A-SP

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Outwash, Flat Local relief (concave, convex, none): Undulating

Slope (%): 0 Lat: 42.2692109 Long: -83.6307970 Datum: WGS 84

Soil Map Unit Name: Hoytville silty clay loam (Ho) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes ✔ No _____	
Wetland Hydrology Present?	Yes ✔ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Samolus parviflorus	50	✔	OBL
2. Cyperus odoratus	15		FACW
3. Epilobium coloratum	10		OBL
4. Plantago lanceolata	10		FACU
5.			
6.			
7.			
8.			
9.			
10.			
	85% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x 1 =	60
FACW species	15	x 2 =	30
FAC species	0	x 3 =	0
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	85 (A)		130 (B)

Prevalence Index = B/A = 1.5

Hydrophytic Vegetation Indicators:

✔ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W1A-SP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 10	10YR 3/1	100					Clay Loam	
10 - 18	10YR 4/2	60	10YR 4/3	40	C	M	Clay Loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ✔ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ✔ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ✔ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✔ Depth (inches): _____

Water Table Present? Yes ✔ No ___ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes ✔ No ___ Depth (inches): 9

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-06

Applicant/Owner: IBI Group State: Michigan Sampling Point: W1A-UPL

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Upland, Flat Local relief (concave, convex, none): None

Slope (%): 0 Lat: 42.2691384 Long: -83.6305240 Datum: WGS 84

Soil Map Unit Name: Hoytville silty clay loam (Ho) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Agrostis scabra	55	✔	FAC
2. Cirsium arvense	35	✔	FACU
3. Panicum dichotomiflorum	15		FACW
4. Trifolium pratense	10		FACU
5. Verbena urticifolia	5		FAC
6.			
7.			
8.			
9.			
10.			
	120% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	15	x 2 =	30
FAC species	60	x 3 =	180
FACU species	45	x 4 =	180
UPL species	0	x 5 =	0
Column Totals:	120 (A)		390 (B)

Prevalence Index = B/A = 3.3

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

Additional vegetation seen outside of sample plot (field community): Abutilon theophrasti, Echinochloa crus-gali, Setaria pumila, Setaria viridis

SOIL

Sampling Point: W1A-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0 - 11	10YR 3/1	100					Clay Loam	
11 - 18	10YR 4/3	100					Clay Loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 5 cm Mucky Peat or Peat (S3)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ Coast Prairie Redox (A16)
___ Dark Surface (S7)
___ Iron-Manganese Masses (F12)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Gauge or Well Data (D9)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
✔ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi | City/County: Superior Charter Twp, Washtenaw | Sampling Date: 2021-10-06

Applicant/Owner: IBI Group | State: Michigan | Sampling Point: W2A-SP

Investigator(s): J. DeMoss | Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Basin | Local relief (concave, convex, none): Concave

Slope (%): 0 | Lat: 42.2704990 | Long: -83.6264494 | Datum: WGS 84

Soil Map Unit Name: Kendallville loam, 2 to 6 percent slopes (KeB) | NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes ✔ No _____	
Wetland Hydrology Present?	Yes ✔ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus deltoides	5	✔	FAC
2.			
3.			
4.			
5.			
	5% = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Salix interior	5	✔	FACW
2.			
3.			
4.			
5.			
	5% = Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Typha angustifolia	95	✔	OBL
2. Lythrum salicaria	5		OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x 1 =	100
FACW species	5	x 2 =	10
FAC species	5	x 3 =	15
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	110 (A)		125 (B)

Prevalence Index = B/A = 1.1

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W2A-SP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0 - 4	10YR 4/1	100					Mucky Loam/Clay	
4 - 18	10YR 5/2	95	10YR 5/8	5	C	M	Clay	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✔ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ✔ Drift Deposits (B3)
- ✔ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ✔ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ✔ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes ✔ No _____ Depth (inches): 6

Saturation Present? (includes capillary fringe) Yes ✔ No _____ Depth (inches): 2

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-06

Applicant/Owner: IBI Group State: Michigan Sampling Point: W2A-UPL

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 2 Lat: 42.2704873 Long: -83.6264185 Datum: WGS 84

Soil Map Unit Name: Kendallville loam, 2 to 6 percent slopes (KeB) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes ✔	No _____	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Elaeagnus umbellata	5	✔	UPL
2.			
3.			
4.			
5.			
	5% = Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Festuca rubra	90	✔	FACU
2. Daucus carota	5		UPL
3. Dipsacus fullonum	3		FACU
4. Solidago altissima	2		FACU
5.			
6.			
7.			
8.			
9.			
10.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	95	x 4 =	380
UPL species	10	x 5 =	50
Column Totals:	105 (A)		430 (B)

Prevalence Index = B/A = 4.1

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W2A-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 4	10YR 4/1	100					Clay Loam	
4 - 18	10YR 5/2	85	10YR 5/8	15	C	M	Clay Loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-06

Applicant/Owner: IBI Group State: Michigan Sampling Point: W3A-SP

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Outwash Local relief (concave, convex, none): None

Slope (%): 1 Lat: 42.2706055 Long: -83.6268375 Datum: WGS 84

Soil Map Unit Name: Hoytville silty clay loam (Ho) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes ✔ No _____	
Wetland Hydrology Present?	Yes ✔ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Phalaris arundinacea	100	✔	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A = 2.0

Hydrophytic Vegetation Indicators:

✔ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

Small amounts of Typha angustifolia present at stormwater outlet

SOIL

Sampling Point: W3A-SP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 5	10YR 4/2	95	10YR 5/8	5	C	M	Clay Loam	
5 - 15	10YR 4/1	100					Clay Loam	
15 - 18	10YR 5/1	60	10YR 5/4	40	C	M	Sandy Clay Loam	
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ✔ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✔ No _____ Depth (inches): 16

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✔ No _____ Depth (inches): 13

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-06

Applicant/Owner: IBI Group State: Michigan Sampling Point: W3A-UPL

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Outwash, Flat Local relief (concave, convex, none): None

Slope (%): 0 Lat: 42.2706938 Long: -83.6268705 Datum: WGS 84

Soil Map Unit Name: Hoytville silty clay loam (Ho) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Juglans nigra	35	✔	FACU
2. Fraxinus americana	10		FACU
3. Ulmus americana	10		FACW
4.			
5.			
	55%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Rhamnus cathartica	40	✔	FAC
2. Lonicera morrowii	10	✔	FACU
3.			
4.			
5.			
	50%	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Elymus virginicus	30	✔	FACW
2. Rubus occidentalis	25	✔	UPL
3. Toxicodendron radicans	15		FAC
4. Parthenocissus quinquefolia	10		FACU
5. Symphyotrichum lateriflorum	10		FACW
6. Cinna arundinacea	5		FACW
7. Rosa multiflora	5		FACU
8.			
9.			
10.			
	100%	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1. Vitis riparia	15	✔	FACW
2.			
	15%	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	70	x 2 =	140
FAC species	55	x 3 =	165
FACU species	70	x 4 =	280
UPL species	25	x 5 =	125
Column Totals:	220 (A)		710 (B)

Prevalence Index = B/A = 3.2

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W3A-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0 - 14	10YR 4/1	100					Clay Loam	
14 - 18	10YR 5/1	95	10YR 5/4	5	C	M	Clay Loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes ✔ No _____ Depth (inches): 16

Saturation Present? (includes capillary fringe) Yes ✔ No _____ Depth (inches): 13

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-06

Applicant/Owner: IBI Group State: Michigan Sampling Point: W4A-SP

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Basin Local relief (concave, convex, none): None

Slope (%): 0 Lat: 42.2700699 Long: -83.6261552 Datum: WGS 84

Soil Map Unit Name: Hoytville silty clay loam (Ho) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes ✔ No _____	
Wetland Hydrology Present?	Yes ✔ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Ulmus americana	10	✔	FACW
2. Juglans nigra	5	✔	FACU
3.			
4.			
5.			
	15%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Salix interior	40	✔	FACW
2.			
3.			
4.			
5.			
	40%	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Phalaris arundinacea	90	✔	FACW
2. Apocynum cannabinum	5		FAC
3. Carex stricta	5		OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100%	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	140	x 2 =	280
FAC species	5	x 3 =	15
FACU species	5	x 4 =	20
UPL species	0	x 5 =	0
Column Totals:	155 (A)		320 (B)

Prevalence Index = B/A = 2.1

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W4A-SP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 10	10YR 4/1	100					Clay Loam	
10 - 18	10YR 5/1	75	10YR 5/6	25	C	M	Clay Loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✔ Depth (inches): _____

Water Table Present? Yes ✔ No ___ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes ✔ No ___ Depth (inches): 9

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-06

Applicant/Owner: IBI Group State: Michigan Sampling Point: W4A-UPL

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 1 Lat: 42.2700680 Long: -83.6263776 Datum: WGS 84

Soil Map Unit Name: Hoytville silty clay loam (Ho) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Juglans nigra	20	✔	FACU
2. Acer negundo	5	✔	FAC
3.			
4.			
5.			
	25%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Rhamnus cathartica	40	✔	FAC
2. Lonicera maackii	25	✔	UPL
3.			
4.			
5.			
	65%	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Rubus occidentalis	20	✔	UPL
2. Lonicera maackii	10	✔	UPL
3. Geum canadense	5		FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	35%	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1. Vitis riparia	10	✔	FACW
2.			
	10%	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 43 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	50	x 3 =	150
FACU species	20	x 4 =	80
UPL species	55	x 5 =	275
Column Totals:	135 (A)		525 (B)

Prevalence Index = B/A = 3.9

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W4A-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 8	10YR 4/1	100					Clay Loam	
8 - 18	10YR 4/1	50	7.5YR 5/8	50	C	M	Clay Loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ✔ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-06

Applicant/Owner: IBI Group State: Michigan Sampling Point: W5A-SP

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Ditch Local relief (concave, convex, none): None

Slope (%): 0 Lat: 42.2692637 Long: -83.6236640 Datum: WGS 84

Soil Map Unit Name: Kendallville loam, 2 to 6 percent slopes (KeB) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes ✔ No _____	
Wetland Hydrology Present?	Yes ✔ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Typha angustifolia	30	✔	OBL
2. Carex vulpinoidea	25	✔	FACW
3. Juncus tenuis	25	✔	FAC
4. Lythrum salicaria	10		OBL
5. Dipsacus fullonum	5		FACU
6. Populus deltoides	5		FAC
7.			
8.			
9.			
10.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	25	x 2 =	50
FAC species	30	x 3 =	90
FACU species	5	x 4 =	20
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A = 2.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W5A-SP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 18	10YR 5/2	90	7.5YR 5/8	10	C	M	Clay Loam	
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ✔ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ✔ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✔ No ____ Depth (inches): 1

Water Table Present? Yes ✔ No ____ Depth (inches): 0

Saturation Present? (includes capillary fringe) Yes ✔ No ____ Depth (inches): 0

Wetland Hydrology Present? Yes ✔ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-06

Applicant/Owner: IBI Group State: Michigan Sampling Point: W5A-UPL

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 2 Lat: 42.2694654 Long: -83.6236170 Datum: WGS 84

Soil Map Unit Name: Kendallville loam, 2 to 6 percent slopes (KeB) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes _____	No ✔	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Elaeagnus umbellata	5	✔	UPL
2.			
3.			
4.			
5.			
	5% = Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Festuca rubra	90	✔	FACU
2. Cirsium arvense	5		FACU
3. Dipsacus fullonum	5		FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	100	x 4 =	400
UPL species	5	x 5 =	25
Column Totals:	105 (A)		425 (B)

Prevalence Index = B/A = 4.0

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W5A-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 6	10YR 4/2	100					Clay Loam	
6 - 8	10YR 4/2	25	7.5YR 5/6	75	C	M	Sandy Clay Loam	
8 - 18	10YR 4/1	50	10YR 5/3	50	C	M	Sandy Clay Loam	
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✔

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-22

Applicant/Owner: IBI Group State: Michigan Sampling Point: W6A-SP

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Outwash Local relief (concave, convex, none): None

Slope (%): 0 Lat: 42.2678443 Long: -83.6232091 Datum: WGS 84

Soil Map Unit Name: Hoytville silty clay loam (Ho) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No _____	**Is the Sampled Area within a Wetland?** Yes ✔ No _____
Hydric Soil Present?	Yes ✔ No _____	
Wetland Hydrology Present?	Yes ✔ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1. Rhamnus cathartica	20	✔	FAC
2. Acer negundo	15	✔	FAC
3. Salix X fragilis	15	✔	FAC
4.			
5.			
	50%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1. Rhamnus cathartica	10	✔	FAC
2.			
3.			
4.			
5.			
	10%	= Total Cover	
Herb Stratum (Plot size: 5 ft r)			
1. Symphyotrichum lanceolatum	15	✔	FAC
2. Toxicodendron radicans	15	✔	FAC
3. Glyceria striata	10	✔	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	40%	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft r)			
1. Vitis riparia	5	✔	FACW
2.			
	5%	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 8 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x 1 =	10
FACW species	5	x 2 =	10
FAC species	90	x 3 =	270
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	105 (A)		290 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

✔ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✔ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W6A-SP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 12	10YR 4/2	95	7.5YR 5/8	5	C	PL / M	Silty Clay Loam	
12 - 18	10YR 4/1	95	7.5YR 5/8	5	C	M	Silty Clay Loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ✔ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes ✔ No _____ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes ✔ No _____ Depth (inches): 10

Wetland Hydrology Present? Yes ✔ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Midwest Region

Project/Site: HATCHi City/County: Superior Charter Twp, Washtenaw Sampling Date: 2021-10-22

Applicant/Owner: IBI Group State: Michigan Sampling Point: W6A-UPL

Investigator(s): J. DeMoss Section, Township, Range: Section 32 T02S R07E

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None

Slope (%): 1 Lat: 42.2681175 Long: -83.6230184 Datum: WGS 84

Soil Map Unit Name: Hoytville silty clay loam (Ho) NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No ✔	**Is the Sampled Area within a Wetland?** Yes _____ No ✔
Hydric Soil Present?	Yes ✔	No _____	
Wetland Hydrology Present?	Yes _____	No ✔	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15 ft r)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 ft r)			
1. Solidago altissima	55	✔	FACU
2. Dipsacus fullonum	15		FACU
3. Alliaria petiolata	5		FAC
4. Cirsium arvense	5		FACU
5. Elymus virginicus	5		FACW
6. Euthamia graminifolia	5		FACW
7. Juncus tenuis	5		FAC
8. Epilobium ciliatum	3		FACW
9. Scirpus atrovirens	2		OBL
10.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 30 ft r)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	2	x 1 =	2
FACW species	13	x 2 =	26
FAC species	10	x 3 =	30
FACU species	75	x 4 =	300
UPL species	0	x 5 =	0
Column Totals:	100 (A)		358 (B)

Prevalence Index = B/A = 3.6

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes _____ No ✔

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: W6A-UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 4	10YR 3/2	80	10YR 5/4	20	C	M	Silty Clay Loam	
4 - 18	10YR 4/1	95	7.5YR 5/8	5	C	M	Silty Clay Loam	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ✔ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ Coast Prairie Redox (A16)
- ___ Dark Surface (S7)
- ___ Iron-Manganese Masses (F12)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✔ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✔ Depth (inches): _____

Water Table Present? Yes _____ No ✔ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✔ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C Photographic Log

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
IBI Group	Washtenaw County, Michigan	210731

Photo No.	Date:
1	10/06/2021

Direction Photo Taken:

East

Description:

The photo was taken within wetland W1A, situated in the northwest corner of the Project Area.

Photo No.	Date:
2	10/06/2021

Direction Photo Taken:

East

Description:

The photo was taken of the soil pit at wetland W1A.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
IBI Group	Washtenaw County, Michigan	210731

Photo No.	Date:
3	10/06/2021

Direction Photo Taken:

West

Description:

The photo is a view of wetland W2A, located in the north-central portion of the Project Area.

Photo No.	Date:
4	10/06/2021

Direction Photo Taken:

East

Description:

This photo was taken of wetland W3A, which is situated in the north-central portion of the Project Area.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
IBI Group	Washtenaw County, Michigan	210731

Photo No.	Date:
5	10/06/2021

Direction Photo Taken:

North

Description:

This photo was taken of wetland W4A.

Photo No.	Date:
6	10/06/2021

Direction Photo Taken:

South

Description:

This photo was taken of wetland W5A, looking south.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
IBI Group	Washtenaw County, Michigan	210731

Photo No.	Date:
7	10/06/2021

Direction Photo Taken:

West

Description:

This photo shows the upland area (W1A-UPL) near wetland W1A.

Photo No.	Date:
8	10/06/2021

Direction Photo Taken:

North

Description:

This photo was taken of the soil pit for upland point W1A-UPL.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
IBI Group	Washtenaw County, Michigan	210731

Photo No.	Date:
9	10/06/2021

Direction Photo Taken:

South

Description:

This photo was taken of the grassland upland area (W2A-UPL) near wetland W2A.

Photo No.	Date:
10	10/06/2021

Direction Photo Taken:

North

Description:

This photo shows the forested upland area (W3A-UPL) near wetland W3A.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
IBI Group	Washtenaw County, Michigan	210731

Photo No.	Date:
7	10/22/2021

Direction Photo Taken:

East

Description:

This photo was taken of wetland W6A.

Photo No.	Date:
8	10/06/2021

Direction Photo Taken:

-

Description:

This photo was taken of stream S1A.

PHOTOGRAPHIC LOG

Client Name:	Site Location:	Project No.
IBI Group	Washtenaw County, Michigan	210731

Photo No.	Date:
7	10/06/2021

Direction Photo Taken:

-

Description:

This photo was taken of stream S2A.

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Appendix D

Threatened and Endangered Species Memo

> memo

BUSINESS CONFIDENTIAL NOT FOR DISTRIBUTION

To: David Kassab, IBI Group

From: Elizabeth Theile, Environmental Consulting & Technology, Inc. (ECT)

Date: October 26, 2021

Re: Threatened and Endangered Species Memorandum
HMA STIL Facility Project
ECT Project No. 210731

1.0 INTRODUCTION

Environmental Consulting and Technology, Inc. (ECT) conducted a review of the Hyundai Moto American (HMA) Safety Test Investigation Laboratory (STIL) Facility Project (Project) located in Superior Township, Washtenaw County, Michigan (Project Site) for Federal or State threatened and endangered (T&E) species that could occur within the Project Site or 1-mile buffer of the Project Site. This summary is a review of publicly available sources, including the U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) tool (USFWS 2021), and the Michigan Natural Features Inventory (MNFI) database (MNFI 2021a) as well as a field visit of the Project Site conducted on October 6, 2021.

The USFWS IPaC system was used to determine whether the proposed Project Site is in range of USFWS managed resources, such as species proposed or listed under the Endangered Species Act (ESA) of 1973 (16 U.S.C §1531-1544), designated critical habitat, migratory birds, inter-jurisdictional fishes, etc., and generates a list of these resources. This list indicates the potential for federally listed T&E species to be present within a designated search area such as a Project and a 1-mile buffer. However, unlike the MNFI database, this list does not necessarily indicate the documented occurrence of T&E species within the designated search area. Conversely, T&E species not recorded in the MNFI database and not listed by the USFWS may be present at a specific Project Site. Additional habitat assessments and species-specific surveys may be required to further evaluate the potential presence of T&E species at a specific project site.

The MNFI continuously updates its database with information on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features referred to as element occurrences (EO). Records in the database indicate that a qualified observer has documented the presence of T&E species or special natural features. However, records within a query area do not guarantee the presence of T&E species at a Project Site. Likewise, the absence of records in the database for a particular query area does not preclude the potential presence of T&E species at a specific Project Site. Species listed as state-threatened or endangered are protected by the Michigan Natural Resources Department (MDNR).

The presence of T&E species may not preclude activities or development but may require alterations in the Project plan, permitting, and/or mitigation. Special concern species, natural communities, and federal candidate species are not protected under state or federal endangered species legislation and are therefore not covered within this memo.

2.0 SITE LOCATION

The Project Site encompasses approximately 46 acres of partially agricultural land, upland forest, maintained/mowed areas, emergent and scrub-shrub wetlands, and two (2) streams in Superior Township, Washtenaw County, Michigan. The area immediately surrounding the Project Site is industrially developed (manufacturing laboratory) to the north, forest to the south, west, and northwest, and Laforge Road and agricultural land to the east. The northwest boundary abuts a stream, Snidecar Drain. Although the Site is located entirely within Superior Township, the reviewed 1-mile buffer also extends into Ypsilanti Township and the City of Ypsilanti, Michigan (**Appendix A: Figure 1**).

3.0 THREATENED AND ENDANGERED SPECIES

ECT reviewed the Project Site and a 1-mile buffer (sections 28, 29, 30, 31, 32, and 33, within Superior Township (T2S R7E); sections 4, 5 in Ypsilanti Township (T3S R7E); and the City of Ypsilanti) in both the MNFI and IPaC databases. The MNFI does queries by sections of townships, whereas the IPaC information is gathered by drawing a polygon. The Project Site is entirely located within section 32, Superior Township, and the remaining sections cover the surrounding 1-mile buffer. The MNFI and IPaC were accessed on October 11, 2021. See **Appendix B** for a complete list of element occurrences generated by the MNFI database query and USFWS IPaC results.

2.1 Federal Threatened and Endangered Species

Federally listed T&E species are protected under federal law by the ESA of 1973. The act protects T&E species and some of their habitat. Listed wildlife species are protected from take and/or harm. ESA defines "take" as "…to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." A take permit may be required from USFWS if impacts to T&E species are unavoidable. However, a project may avoid the need for a permit through the implementation of avoidance measures or best management practices (BMPs). Exceptions allow for certain activities to take place during periods of inactivity (e.g., outside of nesting and breeding season), such as tree clearing in winter.

ECT reviewed the USFWS data to identify Federally-listed T&E species within the Site and a 1-mile buffer (**Table 1, Appendix B**).

Table 1: Federal Threatened and Endangered Species

Area of Review	Listed Species Present in County
Project and 1-Mile Buffer	Indiana Bat (*Myotis sodalis*) Northern Long-eared Bat (*Myotis septentrionalis*) Eastern Massasauga Rattlesnake (*Sistrurus catenatus*) Snuffbox Mussel (*Epioblasma triquetra*) Mitchell's Satyr Butterfly (*Neonympha mitchellii mitchellii*) Poweshiek Skipperling (*Oarisma poweshiek*) Eastern Prairie Fringed Orchid (*Platanthera leucophaea*)

Indiana Bat (Federally Endangered, State-Endangered)

The Indiana bat is federally and state-listed as endangered. Indiana bats roost and form maternity colonies under loose bark or in hollows and cavities of mature trees in floodplain forests. In Michigan, savanna habitats adjacent to riparian corridors may have been historically important for roost sites, as the bats are thought to prefer sun-exposed trees for maximum warmth at the northern limit of their range. In winter, Indiana bats primarily hibernate in caves in Kentucky, Indiana, and Missouri, although a new hibernacula site has been found in northern Michigan at a hydroelectric facility in Manistee County (MNFI 2021a; USFWS 2006; Rabe 2001a).

Approximately 2 acres of upland forests are located on the Project Site. Within these forested areas, there are mature tree species including shagbark hickory (*Carya ovata*) and black walnut (*Juglans nigra*), and a few dead snags present that could provide suitable habitat preferred by the Indiana bat. Additionally, there are streams located on the Project Site that would be suitable flight paths for the bats and connect to adjacent wooded areas. The Project Site is surrounded by development and could potentially provide a safe- haven for the Indiana bat if they are present within the area; therefore, the Project could affect the Indiana bat due to the presence of suitable habitat. Additionally, the MNFI database search for the Project indicated known occurrences of the Indiana bat within 1-mile of the Project Site.

Impacts to the Indiana bat may be avoided by avoiding or minimizing tree clearing. If trees need to be cleared for the Project, winter clearing from October 1 to March 31 when bats have left their summer roost trees can be a best management practice (BMP) to avoid a take permit from USFWS.

Northern Long-Eared Bat (Federally Threatened, State Special Concern)

The northern long-eared bat (NLEB) is a federally listed, threatened bat. The species is also listed as a special concern species in Michigan. The NLEB lives in areas dominated by a mix of hardwood coniferous and deciduous trees. The habitat desired revolves around forested areas with low understory cover. NLEB has been associated with the karst topography of small caves and crevices in limestone cliffs which are used as hibernacula. Upon emerging from hibernation, NLEB will roost in trees, bark crevices, and tree hollows. During summertime, this species will inhabit any forested areas with large trees that have loose bark or deep crevices to roost in. NLEB are not tied to a specific natural community type but they will rarely roost in human-made structures and do not show preference towards dead trees compared to other bat species (Bowman 2017; USFWS 2015).

Section 4(d) of the ESA allows USFWS to define protections for species listed as threatened. Unpermitted take of the NLEB is often exempt per the 4(d) Rule. “Take” is defined by the ESA as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect.” For the NLEB, incidental take is prohibited if it occurs within a hibernaculum, within 0.25 miles of a known hibernaculum, or if a maternity roost tree or other trees with a 150-foot radius of a maternity roost tree is cut or destroyed during the pupping season (June 1 through July 31). Outside of these prohibited activities, incidental take of the NLEB is not prohibited (USFWS 2019).

Although there are no karst topographic features, known hibernaculum, or known maternity roost trees within the Project Site, the Project Site contains a forested area containing trees with exfoliating bark which could support summertime roosting and streams that could provide suitable flight paths for the NLEB. Therefore, the Project could affect the NLEB due to the presence of a potentially suitable summer roosting habitat.

Potential impacts to bat species within the vicinity of the Project Site may be avoided or minimized by conducting tree cutting in the winter months (October 1 to March 31) while bats are no longer using summer roosting trees.

Eastern Massasauga Rattlesnake (Federally Threatened, State Special Concern)

The eastern massasauga rattlesnake (EMR) is federally listed as threatened and state-listed as a species of special concern. It is a small, thick-bodied rattlesnake that lives in shallow wetlands and adjacent uplands in portions of the Midwest region and Ontario, Canada. EMR has been found historically in a variety of wetland habitats, including bogs, fens, shrub swamps, wet meadows, marshes, moist grasslands, wet prairies, and floodplain forests. They will shift the habitats they use, depending on the season. Generally, they use wetlands in the spring, fall, and winter. In summer, snakes migrate to drier, upland sites, ranging from forest openings to old fields, agricultural lands, and prairies (USFWS 2016).

USFWS developed a set of voluntary BMPs for specific activities potentially affecting EMR in Michigan. Habitat may be considered Tier 1, Tier 2, or within the known range. Tier 1 habitats are those known to be occupied by EMR or highly likely to be occupied by EMR. Tier 2 habitats are those with a high potential habitat that may have EMR. Habitats within the known range category are areas that overlap with the known range of EMR within Michigan but are not designated Tier 1 or 2 habitats. The known range of EMR expands the entire lower peninsula of Michigan (USFWS 2017).

Except for a few small wetlands, the Project Site is dominated by maintained/mowed grasslands and upland forested areas. Of the identified wetlands on-site, most are dominated by invasive species (e.g., reed canary grass [*Phalaris arundinacea*] and narrowleaf cattail [*Typha angustifolia*]) and none contain the typical fen vegetation that the EMR prefers. Additionally, upland areas are limited due to surrounding development. The Project is unlikely to affect the EMR due to a lack of suitable habitat.

Snuffbox Mussel (Federally Endangered, State-Endangered)

The snuffbox is a federally listed and state-listed endangered mussel. The snuffbox mussel inhabits sand, gravel, or cobble substrates in swift small and medium-sized rivers. Individuals are often buried deep in the sediment (MNFI 2021a; Carman and Goforth 2000; USFWS 2012).

Although two (2) streams were identified within the Project Site, one (1) stream (S2A) has an ephemeral flow regime, meaning that it only exhibits waterflow after storm events and likely has a dry bed the rest of the year. Stream S2A would not provide suitable habitat for aquatic species. Additionally, the water quality of stream S1A (Snidecar Drain), which flows along the northern boundary of the Project Site, is likely influenced by the surrounding developed and agricultural properties. The snuffbox mussel has a low potential to occur on-site. The Project is unlikely to affect the snuffbox mussel due to a lack of suitable habitat. Additionally, if the Project does not impact the streambed of S1A (Snidecar Drain), then impacts to any aquatic species within this stream are not anticipated.

Mitchell's Satyr Butterfly (Federally Endangered, State-Endangered)

The Mitchell's satyr butterfly is a federally and state-listed endangered butterfly found in prairie fens dominated by sedges, grasses, and other graminoids, and rich in forb diversity. This butterfly may also occasionally be found in other natural communities including wet prairie, sedge meadow, tamarack swamps, and shrub-carr (Hyde 2000).

There are no prairie fens located within the Project Site. Possible suitable fen and prairie habitat was identified within the 1-mile buffer in Section 4 of Ypsilanti Township during the MNFI database search

(MNFI 2021b). However, Project impacts will not affect this site. The Project is unlikely to affect Mitchell's satyr butterfly due to the lack of suitable habitat on-site.

Poweshiek Skipperling (Federally Endangered, State-Threatened)

The Poweshiek skipperling is a federally endangered and state-threatened dark brown and orange butterfly. The Poweshiek skipperling prefers sedgy meadows, cinquefoil seeps, open fens, and high-quality tall grass prairie (USFWS 2014; Cuthrell and Slaughter 2012).

There are no prairies or fens within the Project Site. Possible suitable fen and prairie habitat was identified within the 1-mile buffer in Section 4 of Ypsilanti Township during the MNFI database search (MNFI 2021b). However, Project impacts will not affect this site. The Project is unlikely to affect the Poweshiek skipperling due to a lack of suitable habitat on-site.

Eastern Prairie Fringed Orchid (Federally Threatened, State-Endangered)

The eastern prairie fringed orchid is a federally threatened and state-endangered plant. The eastern prairie fringed orchid is a stout (up to 1 meter) plant found in wet prairies and bogs in moist alkaline and lacustrine soils. It is primarily found in moist prairie remnants, particularly those associated with lake plains, but it can also occur in open or semi-open bogs and peaty lakeshores. Though rare, this orchid can readily colonize highly disturbed sites like ditches, uncut old fields, and even the edges of golf courses as long as competition is not overly intense and proper soil fungi are present (Penskar and Higman 2000).

The Project Site is not located within a lake plain, along a lakeshore, nor are wet prairies or bogs present. Most of the Project Site is upland forest and maintained/mowed areas and does not contain the typical alkaline prairie/prairie fen habitat in which this plant is found. The Project is unlikely to affect the eastern prairie fringed orchid due to a lack of suitable habitat.

2.2 State Threatened and Endangered Species

Part 365, Endangered Species Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451 (NREPA), as amended, confers legal protection to state T&E species, including plants and animals in Michigan. The Michigan Department of Natural Resources (MDNR) is the regulatory agency that makes decisions on state-listed species and any permit requirements.

Additionally, documented occurrences of T&E species within wetlands may affect the jurisdictional status of these features such that they are subject to Clean Water Act Section 404 permitting through the Department of Environment, Great Lakes, and Energy (EGLE).

ECT reviewed the MNFI for known element occurrence (EO) of State-Listed species within sections 4 and 5 of Ypsilanti Township (T3S, R7E) and sections 28, 29, 30, 31, 32, 33 of Superior Township (T2S, R7E, **Table 2**).

Table 2: State Threatened and Endangered Species

Area of Review	Listed Species Present in County
T03S, R07E Sections 4, 5 and T02S, R07E	Canadian Burnet (*Sanguisorba canadensis*) Compass Plant (*Silphium laciniatum*) Cup Plant (*Silphium perfoliatum*) Edible Valerian (*Valeriana edulis var. ciliata*) Goldenseal (*Hydrastis canadensis*)

Sections 28, 29, 30, 31, 32, 33	Kirtland's Snake (*Clonophis kirtlandii*) Leiberg's Panic Grass (*Dichanthelium leibergii*) Peregrine Falcon (*Falco peregrinus*) Purple Wartyback (*Cyclonaias tuberculate*) Red Mulberry (*Morus rubra*) Side-oats Grama Grass (*Bouteloua curtipendula*) Southern Redbelly Dace (*Chrosomus erythrogaster*) Blanchard's Cricket Frog (*Acris blanchardi*) False Hop Sedge (*Carex lupuliformis*) Ginseng (*Panax quinquefolius*) Indiana Bat (*Myotis sodalis*) King Rail (*Rallus elegans*) Lambda Snaggletooth (*Gastrocopta holzingeri*)

Canadian Burnet (State-Endangered)

Canadian burnet is a state-endangered perennial forb with cylindrical white flowered heads. Canadian burnet is found in open, damp, calcareous sites like prairie fens (MNFI 2021a). The most recent reported Canadian burnet sighting within the vicinity of the Project Site was within a 1-mile buffer area in 2008 (MNFI 2021b).

Although suitable habitat and known occurrences for the Canadian burnet were identified in Highland Cemetery within portions of the 1-mile buffer, the Project Site itself does not contain any suitable prairie or fen habitats. The Project is unlikely to affect the Canadian burnet due to the lack of suitable habitat on-site.

Compass Plant (State-Threatened)

The state-threatened compass plant is a large, erect, tap-rooted perennial forb bearing yellow flowers and grows up to nearly 10 feet in height. The compass plant is characteristic of prairie habitats. In Michigan, all known populations of the species occur in degraded railroad rights-of-way (ROW) or along roadsides (Slaughter 2009). The most recent reported compass plant sighting near Project Site 1-mile was in 1928 in the 1-mile buffer.

The Project Site does not contain any suitable prairie habitat. Although the compass plant has the potential to occur along road ROW, the Project Site is surrounded by developed and agricultural properties that have likely removed or deteriorated the occurrence of remnant prairie habitat either through routine maintenance like mowing or the application of herbicides. The potential for the compass plant to occur on-site is low. The Project is unlikely to affect the compass plant due to lack of suitable habitat.

Cup Plant (State-Threatened)

The cup plant is a state-threatened plant species in the Asteraceae (aster or daisy) family. In Michigan, the cup plant is found on river floodplains in forest openings, swales and sloughs along river margins, and other wet edges (Penskar and Crispin 2010). The most recent reported cup plant sighting within the vicinity of the Project Site was in 1920 in the 1-mile buffer.

No river floodplains, swales, or margins are located within the Project Site. The Project is unlikely to affect the cup plant due to lack of suitable habitat.

Edible Valerian (State-Threatened)

Edible valerian is a state-threatened plant species known to occur in alkaline fens in southern lower Michigan (MNFI 2021a). The most recent reported edible valerian sighting within the 1-mile buffer area was in 2008.

Although suitable fen habitat was identified within the 1-mile buffer at Highland Cemetery, the Project Site itself does not contain any fen wetlands. The Project is unlikely to affect the edible valerian due to lack of suitable habitat.

Goldenseal (State-Threatened)

Goldenseal is a state-threatened perennial plant species that prefer shady, rich, mesic southern forests, usually under a canopy of beech-sugar maple or red oak-sugar maple. Goldenseal frequently occurs in moist microhabitats near vernal pools, along forested streams, and southern floodplain forests, often in moist sandy loam, clay loam, or even organic muck soils (Penskar, Choberka, and Higman 2001). The most recent reported goldenseal sighting within the 1-mile buffer area was in 2018.

Although forested habitat occurs within the Project Site, the majority of these areas were determined to be upland areas that lacked the goldenseal's preferred habitat of vernal pools and floodplain forests. The likelihood of goldenseal occurring within the Project Site is low.

Kirtland's Snake (State-Endangered)

Kirtland's snake is a state-endangered small, reddish to dark brown water snake with alternating dark blotches on the back and sides and a bright pink or orange belly. Kirtland's snakes inhabit wet or damp, open habitats, often near ponds, streams, and other water bodies, including wet meadows, wet prairies, fens, edges of marshes, creeks and canals, wet pastures and fields, and grassy openings in forested wetlands (Barton and Lee 2010). The most recent reported sighting of the Kirtland's snake within the 1-mile buffer area was in 1902.

The Project Site includes five (5) emergent wetlands that may provide limited suitable habitat for the Kirtland's snake. However, these areas are small (<1 acre), dominated by invasive species, and likely frequently disturbed by the mowing that occurs within the site. The likelihood for Kirtland's snake to occur within the Project Site is low.

Leiberg's Panic Grass (State-Threatened)

Leiberg's panic grass is a state-threatened plant species typically inhabiting a variety of dry to wet (but primarily mesic) prairie remnants, including dry sand prairies, hillside prairies, oak openings, and open woodlands (Penskar and Crispin 2004). The most recent reported observation of Leiberg's panic grass within the 1-mile buffer was from Highland Cemetery in 2008.

The Project Site does not contain any suitable prairie habitat for Leiberg's panic grass. The Project is unlikely to affect this species due to the lack of suitable habitat.

Peregrine Falcon (State-Endangered)

The state-endangered peregrine falcon is a medium to a large-sized falcon with historic nesting areas in Michigan occurring on sandstone or granite cliffs located above the Great Lakes shoreline. Peregrine falcons also commonly use artificial structures as nesting sites, such as buildings, bridges, and towers, and are known to use many terrestrial biomes and do not appear to have a specific habitat

preference (Monfils 2007). The most recent reported sighting of the peregrine falcon within the 1-mile buffer area was in 2018.

The Project Site is generally flat with no cliffs, ledges, or tall artificial structures for breeding peregrine falcons. Although falcons may forage within the open areas of the Project Site, impacts to these vegetation communities are unlikely to pose an adverse impact to populations of the peregrine falcon in the region.

Purple Wartyback (State-Threatened)

The state-threatened purple wartyback is a freshwater mussel with a circular, bumpy, yellowish-brown, or green-brown shell. Purple wartyback mussels are found in medium to large rivers with gravel or mixed sand and gravel substrates (Badra and Lee 2004). The most recent reported sighting of the purple warty back near the Project Site is from an occurrence in the Huron River in 1997 in the 1-mile buffer.

Although two (2) streams were identified within the Project Site, neither were identified as having suitable habitats for aquatic species including the purple warty back. The Project is unlikely to affect the purple wartyback mussel due to a lack of suitable habitat. Additionally, if the Project does not impact the streambed of S1A (Snidecar Drain), then impacts to any aquatic species within this stream are not anticipated.

Red Mulberry (State-Threatened)

The red mulberry is a state-threatened tree species and within Michigan, it is almost always found within or near riparian areas, typically in floodplain forest communities or in mesic to dry-mesic forests near river and stream drainages, especially along fertile slopes (Penskar 2009). The most recent reported sighting of the red mulberry within the vicinity of the Project Site was along the Huron River in the 1-mile buffer in 1880.

The Project Site does contain upland forested areas and a small riparian corridor along Snidecar Drain. Although no individuals or red mulberry were observed during the field visit on October 6, 2021, the Project Site does contain limited suitable habitat for this species.

Side-oats Gama Grass (State-Endangered)

Side-oats grama grass is a state endangered medium-sized grass often found in dry prairies, savannas, and hillsides, although its native habitat in Michigan has been mainly limited to oak barrens and hillside prairies (MNFI 2021a). The most recent reported sighting of side-oats grama grass within the vicinity of Project Site was in 1980 in the 1-mile buffer.

The Project Site does not contain any prairie, savanna, or hillside habitats. The Project is unlikely to affect the side-oats grama grass due to the lack of suitable habitat.

Southern Redbelly Dace (State-Endangered)

The Southern redbelly dace is a state-endangered fish species. The northern limits of its range are in the southeastern corner of Michigan, where it is restricted to two (2) Lake Erie drainages, the River Raisin and the Huron River (Washtenaw and Lenawee Counties). A relatively small minnow, the southern redbelly dace typically occurs in clear cool permanent headwaters of river systems, preferring spring-fed brooks and clear, wooded streams intermixed with small pools (Stagliano 2001).

The most recent reported sighting of the southern redbelly dace was recorded in the 1-mile buffer in 1973.

Neither the Huron River nor the River Raisin is located within the Project Site. Additionally, only one (1) stream identified within the Project Site was observed to have perennial (year-round) waterflow capable of supporting fish species like the redbelly dace. However, this stream, Snidecar Drain, is heavily impacted by the surrounding agricultural and developed landscape. The likelihood of the redbelly dace occurring on-site is low. The Project is unlikely to affect the redbelly dace due to the lack of suitable habitat.

Blanchard's Cricket Frog (State-Threatened)

The Blanchard's cricket frog is a state-threatened amphibian species. The Blanchard's cricket frog is a tiny (0.6 to 1.5 inches) non-climbing member of the treefrog family that inhabits the open edges of permanent ponds, lakes, floodplains, bogs, seeps, and slow-moving streams and rivers (Badra 2009). They prefer open or partially vegetated mudflats, muddy or sandy shorelines, and mats of emergent aquatic vegetation in shallow water. In Michigan, many known cricket frog sites are located near ponds and lakes that are alkaline often with fen habitat along the shoreline. The most recent reported sighting of the Blanchard's cricket frog within the 1-mile buffer was in 1950.

The Project Site includes five (5) emergent wetlands, two (2) of which (W1A and W3A) are hydrologically connected to the Snidecar Drain which has perennial (year-round) flow. While these wetlands may offer limited potential habitat for the Blanchard's cricket frog on-site of the Project, these areas are dominated by invasive species and are likely frequently disturbed due to mowing/clearing within the Project Site. The likelihood for the Blanchard's cricket frog to occur on-site is low.

False Hop Sedge (State-Threatened)

The false hop sedge is a state threatened plant species. A few Michigan records supply little habitat information, noting that the false hop sedge was collected from marshes, swamps, wet woods, shallow depressions in oak woods, swales, low wet ground, and vernal ponds in floodplains and other wooded wetlands (Penskar 2010). Through its range, false hop sedge inhabits wet forests, openings along with forest ponds, riverine wetlands, marshes, and wet thickets (efloras 2021). The most recent reported sighting of false hop sedge within the 1-mile buffer area was in 2008.

No forested floodplains, forested wetlands, or vernal pools were identified within the Project Site. The potential for the false hop sedge to occur within the Project Site is low. The Project is unlikely to affect the false hop sedge.

Ginseng (State-Threatened)

Ginseng is a state-threatened plant species predominantly found in rich hardwoods, often on north-facing slopes or ravines, ranging even into swampy portions. It also occurs in wooded dune hollows and leeward slopes along the Lake Michigan shoreline (Penskar and Higman 1996). The most recent reported sighting of the ginseng plant within the 1-mile buffer area was in 2012.

The Project Site is generally flat with no ravines, slopes, or cliffs. The Project is unlikely to affect ginseng due to lack of suitable habitat.

King Rail (State Endangered)

The king rail is a state endangered marsh bird. The largest North American rail, the king rail is large, slender, and rust-colored with a long bill and long toes, and a short, uplifted tail. The king rail prefers permanent freshwater marshes in the Midwest, utilizing grasses, sedges, rushes, and cattails for cover; expansive stands of marshy herbaceous vegetation are typically considered preferred habitats (Rabe 2001b). The most recent reported sighting of the king rail within the 1-mile buffer area was in 1948.

Although the Project Site includes emergent wetlands, these areas are generally small (<1 acre) and are dominated by invasive vegetation. The Project is unlikely to affect the King rail due to lack of suitable habitat.

Lambda Snaggletooth (State-Endangered)

The lambda snaggletooth is a state-endangered tiny land snail with a cylindrical, glassy-white shell that is 1.7 mm in length. This tiny snail is found in calcareous wooded cliffs (MNFI 2021a). The most recent reported observation within the 1-mile buffer was in 1942.

There are no calcareous wooded cliffs present within the Project Site. Due to the lack of suitable habitat and the reported nearby sighting of the lambda snaggletooth being approximately 80 years ago, it is unlikely the lambda snaggletooth is present within the Project Site.

4.0 FIELD HABITAT ASSESSMENT

On October 6, 2021, ECT conducted a field assessment to review the Project Site for T&E species or their suitable habitats within the Project. The Project Site is dominated by maintained/mowed areas with upland forested areas some of which may be connected off-site, emergent, and scrub-shrub wetlands, and two (2) streams. The Project is approximately 37 miles from the shoreline of Lake St. Clair and 28 miles from the shoreline of Lake Erie. This excludes the potential T&E species reliant on the dune lakeshore to thrive.

5.0 SUMMARY

This *Threatened and Endangered Species Memorandum* identified one potential constraint, specific to the potential presence of Indiana bats and northern long-eared bats and their suitable habitat, that should be considered during the planning and design of the proposed Project.

6.0 REFERENCES

Badra, PJ. 2009. “Special Animal Abstract for Acris Crepitans Blanchardi (Blanchard’s Cricket Frog).” Michigan Natural Features Inventory.

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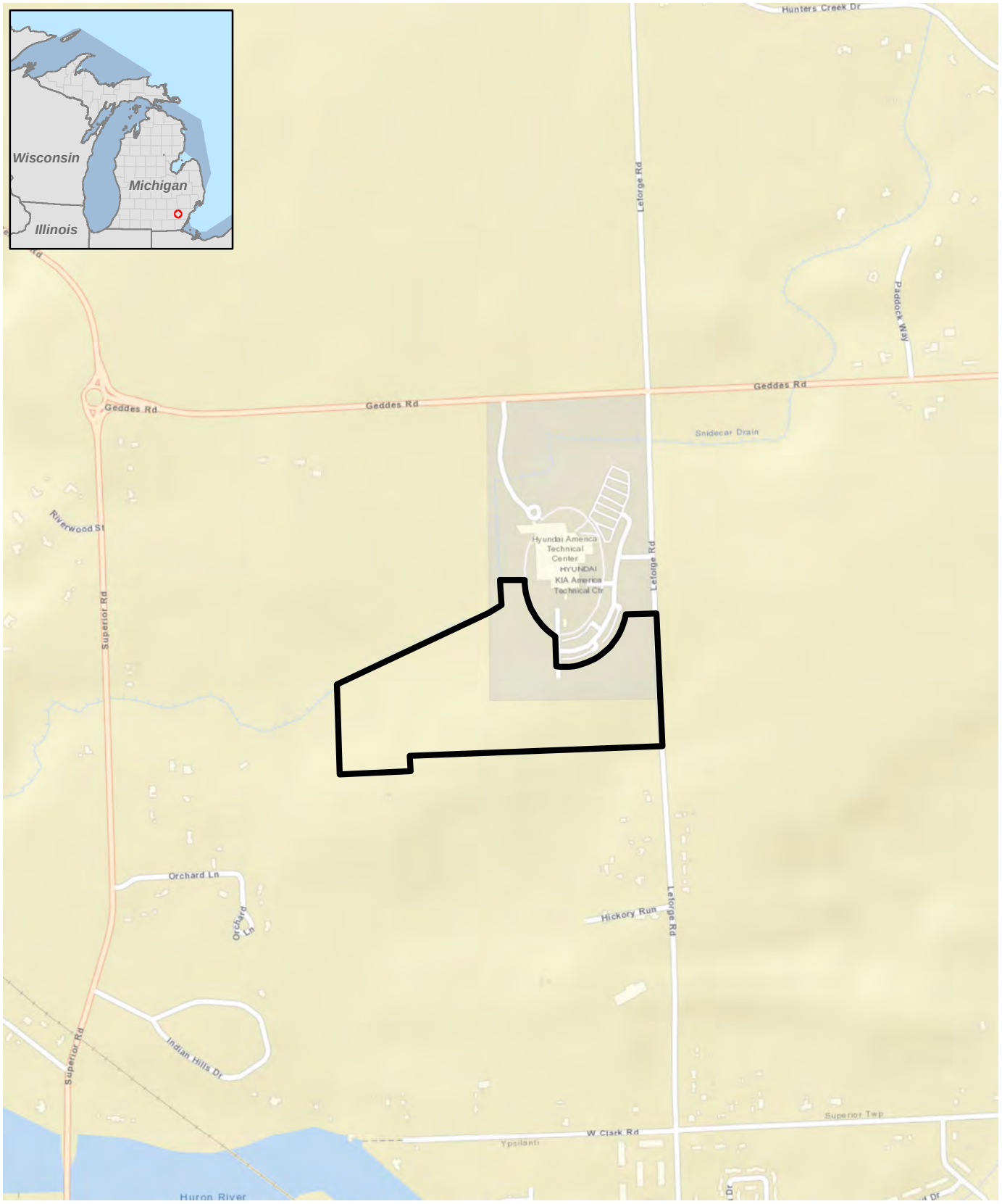
Appendix A



Legend

Project Area

N

0 500 1,000

Feet

Sources: ECT, 2021.

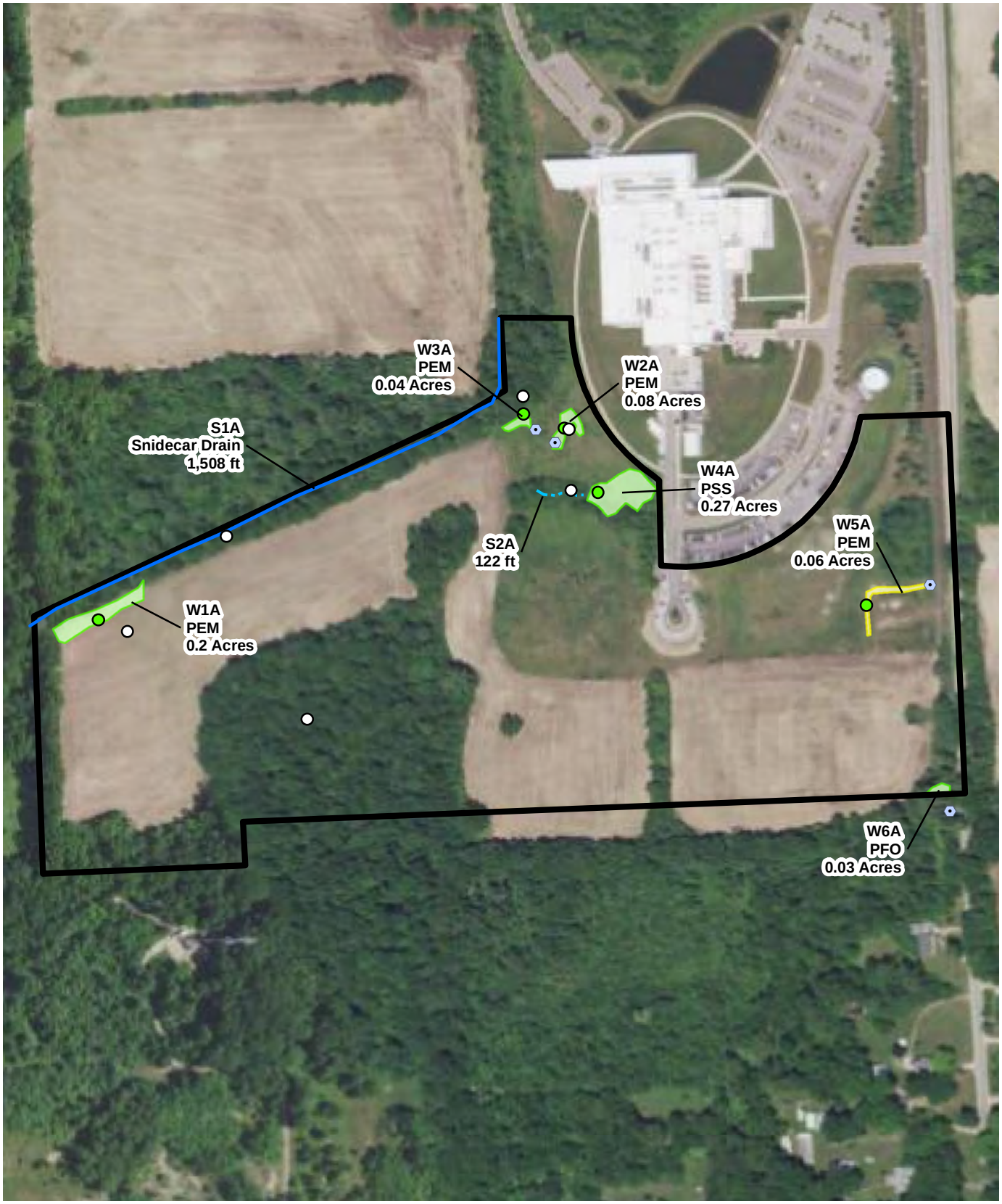
Figure 1
Site Location

HMS STIL Facility
Washtenaw County, Michigan

Date: 10/27/2021

ECT

Appendix B



Boundary
Culvert
Upland Sample Point
Wetland Sample Point
Perennial Stream
Ephemeral Stream
Regulated EGLE Wetland
Non-Regulated EGLE Wetland

N

0 175 350
Feet

Sources: ECT, 2021.

Figure 2
Wetland and Stream Delineation

HMS STIL Facility
Washtenaw County, Michigan
Date: 10/26/2021

ECT

IBI GROUP
25200 Telegraph Road – Suite 300
Southfield MI 48033 USA
Tel: 248 936 8000 fax: 248 936 8111
ibigroup.com

Appendix E

Tree Survey Memo

To: David Kassab
IBI Group

From: Elizabeth Theile
Environmental Consulting & Technology, Inc.

Date: November 8, 2021

Re: Tree Survey Results
HMA STIL Facility Project
ECT Project No. 210731

1.0 INTRODUCTION AND METHODOLOGY

Environmental Consulting and Technology, Inc. (ECT) conducted a tree survey for the Hyundai Motor American (HMA) Safety Test Investigation Laboratory (STIL) Facility Project (Project) located in Superior Township, Washtenaw County, Michigan (Project Site). This summary presents the results of the tree survey completed on the Project Site on October 18, 22, 26, 27, 28; and November 1, 2, and 4, 2021.

The Project Site was reviewed for the presence of *regulated trees*, as defined in the Superior Township Zoning Ordinance, *Article 14, Section 14.05 (F): Woodlands and Tree Preservation*.

These trees included:

- All coniferous trees 10.0 feet or greater in height.
- All deciduous trees 8.0 inches or greater in diameter at breast height (DBH).
- All American chestnut (*Castanea dentata*) and butternut (*Juglans cinerea*) tree 6 inches or greater in DBH.
- All observed box elder (*Acer negundo*), silver maple (*Acer saccharinum*), eastern cottonwood (*Populus deltoides*), and eastern red cedar (*Juniperus virginiana*) trees of suitable size were included in the inventory, as well as non-native suitably sized buckthorn (*Rhamnus cathartica* and *Frangula alnus*), Eurasian honeysuckles (*Lonicera spp*.), autumn olive (*Elaegnus umbellata*), and multiflora rose (*Rosa multiflora*). However, these species do not require replacement per the township ordinance.

Regulated trees were tagged in the field, using non-corrosive uniquely numbered metal tags (each tag containing a different number). For each documented tree, the GPS location, species, diameter at breast height (DBH), and condition were recorded. Height was also recorded for conifer trees. Tree locations were mapped using a sub-meter Trimble® R1 global positioning system (GPS) unit. Tree species were identified by flowers, leaves, bark, twigs, stems, fruits, and habits.

When an individual tree has two or more trunks emanating from a point that is 4.5 feet (DBH) or closer to the ground surface, that tree qualifies as a *multitrunk* tree. When multitrunk trees bifurcated at a height of greater than 1 foot above the ground, they were assessed with a single trunk measurement just below the bifurcation point. In contrast, multitrunk trees that bifurcated at a height of less than 1 foot from the ground were assessed with two or more trunk measurements at DBH height, recorded separately, and affixed with two or more unique tags.

Each tree's aggregate condition was assessed and categorized as *Excellent*, *Good*, *Fair*, *Poor*, or *Dead/Dying*. The aggregate condition of an individual tree is essentially a scale denoting its esthetic and habitat value combined with likely longevity. Factors positively affecting condition rating for a given tree include vertical growth, symmetry, undamaged and living trunks and limbs, and a full canopy. Factors negatively affecting condition rating for a given tree include unilateral growth, asymmetry, damaged or partially dead trunks and limbs, and a small canopy.

Tree ratings can generally be interpreted according to the following:

- *Excellent* trees usually have no growth defects or just minor defects. They tend to have high esthetic value. Barring an introduced disease or catastrophic event such as a tornado, such trees are generally expected to live at least 100 more years beyond ECT's survey date. When they are mature *Excellent* trees often provide ample food (nuts, berries, etc.) and staging areas for wildlife.
- *Good* trees may have minor defects or competitive challenges that could eventually limit their survival to less than 100 years into the future. Depending on size and location *Good* trees often provide ample food and cover for wildlife, and are often of high esthetic valuable.
- *Fair* trees may have one or more significant defects or competitive challenges that could limit their lifespan to 40 years or less from the time of the tree survey. Depending on size and location *Fair* trees may still hold significant esthetic value, and depending on the defects present (e.g. if trunk rot is starting to occur) they may provide a valuable environment for insects, fungi, nesting birds, and other wildlife.
- *Poor* trees generally have one or more quite significant defects or competitive challenges that are likely to cause the death of the tree within the next 20 years. *Poor* trees may have trunk rot or cavities that provide a valuable home for insects, fungi, nesting birds, and other wildlife.
- *Dead/Dying* trees were observed to be alive at the time of the survey but due to disease or other major defects are approaching death within the next 5 years. Issues such as Dutch elm disease, severe basal trunk rot, severe lean, and competitive light starvation can all cause a tree to be classified as *Dead/Dying*. Such trees generally have low esthetic value but often provide a valuable home for insects, fungi, nesting birds, and other wildlife.

2.0 SITE LOCATION

The Project Site contains approximately 46 acres of agricultural, forested, shrubby, or scrubby, and old field terrain in Superior Township (T2S R7E, Sec 32), Washtenaw County, Michigan. Lands immediately surrounding the Project Site are industrially developed (manufacturing laboratory) to the north, forested to the south, west, and northwest, and with Leforge Road and agricultural land to the east. The northwest boundary of the surveyed parcel contains a stream known as *Snidecar Drain* (**Appendix A: Figure 1**).

3.0 TREE SURVEY RESULTS

ECT completed the tree inventory over eight days between October 18 to November 4, 2021.

See **Appendix A; Figure 2** for a map showing all trees documented within the Project Site. See **Appendix B** for a table of attributes for all trees recorded within the Project Site.

Most trees within the Project Site occur within a natural forest on the site's west half, and in property boundary tree lines and hedgerows. A minority of the trees at the Project Site are isolated in fields or occur in landscaped areas. A total of 1284 trees, comprised of 36 tree species, were surveyed within the Project Site (see Table 1 below). Overall dominant tree species included shagbark hickory (*Carya ovata*), pignut hickory (*Carya glabra*), and bitternut hickory (*Carya cordiformis*); red oak (*Quercus rubra*),

white oak (*Quercus alba*), scarlet oak (*Quercus coccinea*), and bur oak (*Quercus macrocarpa*); black walnut (*Juglans nigra*); and basswood (*Tilia americana*). The DBH of trees ranged from 1.5 inches to 57.1 inches.

Table 1: Tree Survey – Overall Survey Results

Total Number of Trees	1284
Total Number of Tree Species	36
DBH Range	1.5 to 57.1 inches
Landmark Trees	230
Sovereign Trees	1

3.1 Site Conditions

The Project Site encompasses approximately 46 acres of agricultural, forested, scrubby, and old field lands. The agricultural fields are relatively weedy and dominated by annual species, which is an outfall of ongoing farming activity. The terrain is gently hilly, owing to the site's glacial moraine origin. Soils appeared to be loams (mainly silt-loams and clay-loams with limited infiltration capacities, a partial result of many years of farming activity).

A majority of the township-regulated trees documented in the tree survey occur in a forest patch on the western side of the Project Site. This forest patch is an *oak-hickory forest*, which is the natural community type that dominated this portion of Section 32 before the advent of land clearing for agricultural usage in the 1800s (Albert, Comer, and Enander 2008). Because this forest patch has never been plowed or otherwise fully cleared, it contains a relatively intact and diverse assemblage of native trees and shrubs. This forest is dominated by shagbark, pignut, and bitternut hickories; red, white, scarlet, and bur oaks; black walnut; and basswood. Other tree species such as slippery and American elm (*Ulmus rubra* & *U. americana*); red, sugar, and black maple (*Acer rubrum*, *saccharum*, & *nigrum*); ironwood (*Ostrya virginiana*), cottonwood (*Populus deltoides*), hackberry (*Celtis occidentalis*), and black cherry (*Prunus serotina*) also occur in this forest, but these species are not dominant in terms of frequency. Trees within this forest patch are relatively old (typical tree age is estimated between 50 and 200 years) and are mostly in very good condition—trees are generally straight, with large canopies, and few defects. This forested patch contains some decaying stumps, along with a relatively low density of fallen logs, suggesting that a selective logging event occurred in this forest sometime between 1975 and 2000. Also, a scattering of non-native shrubs in the forest understory suggests that it may have been lightly utilized for livestock grazing at some distant time in the agricultural era. Oak-hickory forests are fire-dependent systems, and owing to the lack of recent fires there is a slightly increasing component of cherry, maple, and elm within this forest.

Most of the remaining trees on the Project Site occur along property borders, old field borders, hedgerows, or the roadside (Leforge Road). Trees in these locations tend to be a combination of remnant oak-hickory forest species (grown after acorns and hickory nuts are carried in as seed by squirrels and birds) and species that are adept at establishing in grassy field edges, such as black walnut and box elder.

Tree conditions tended to vary from tree to tree although some trends were evident. The trees in the best condition tended to be oaks, hickories, and walnuts, whereas trees in the worst condition tended to be box elder and white mulberry (the latter a non-native species). Owing to open-grown conditions with high light levels, the biggest trees on the Project Site tended to grow along hedgerows and

borders. However, even if not the largest, the oldest trees are likely to occur within the Project Site's previously described remnant forest patch.

In general, invasive shrub content, including buckthorn, autumn olive, honeysuckle, and multiflora rose, was minor within the interior of the forested patch, but often heavy along property borders, old fields, and field borders, hedgerows, and the roadside. No common reeds were incidentally observed within the Project Site, however other invasive herbaceous plants such as teasel (*Dipsacus fullonum*) were locally heavy within old field settings.

3.1 Landmark and Sovereign Trees

The Superior Township Zoning Ordinance, *Article 14, Section 14.05 (F): Woodlands and Tree Preservation* define a landmark tree as any tree that has a DBH of 24 inches or greater, or that meets the species and DBH conditions listed in Table 2 below. A sovereign tree is defined as "*any tree that is registered on the National Big Tree Registry or a similar national or state registry accepted by the Planning Commission; that has been documented by the Township, a historian, or other means accepted by the Planning Commission to be closely associated with an event, person, or place of historical significance to the Township*", or that meets the species and DBH conditions listed in Table 2 below. A total of 230 landmark trees and 1 sovereign tree were documented within the Project Site (Table 2).

Table 2: Landmark and Sovereign Trees – Survey Results

Common Name	Species	Landmark Tree DBH (minimum)	Total # Landmark within Project Site	Sovereign Tree DBH (minimum)	Total # Sovereign within Project Site
Any tree species that have a DBH of at least:		24 inches	49	-	**- -**
Basswood	*Tilia americana*	18 inches	32	54 inches	0
Beech	*Fagus grandifolia*	18 inches	- -	45 inches	- -
Buckeye, Ohio	*Aesculus glabra*	18 inches	- -	-	- -
Catalpa	*Catalpa* spp.	18 inches	- -	45 inches	- -
Cherry, Black	*Prunus serotina*	18 inches	9	54 inches	0
Elm, American	*Ulmus americana*	18 inches	6	50 inches	0
Fir	*Abies* spp.	18 inches	- -	-	- -
Fir, Douglas	*Pseudotsuga menziesii*	18 inches	- -	-	- -
Kentucky Coffee Tree	*Gymnocladus dioicus*	18 inches	- -	40 inches	- -
Pine	*Pinus* spp.	18 inches	0	-	--
Sycamore or London Plane	*Platanus* spp.	18 inches	- -	54 inches	- -
Spruce	*Picea* spp.	18 inches	0	-	0
Tulip-tree	*Liriodendron tulipifera*	18 inches	- -	54 inches	- -
Walnut, Black	*Juglans nigra*	18 inches	43	54 inches	0
Hickory, various	*Carya* spp.	16 inches	50	35 inches	0
Maple	*Acer* spp.	16 inches	7	48 inches	0
Oak	*Quercus* spp.	16 inches	81	48 inches	1
Birch	*Betula* spp.	12 inches	- -	36 inches	- -

Cherry	*Prunus* spp.	12 inches	2	36 inches	0
American Chestnut	*Castanea dentata*	6 inches	0	18 inches	0
Butternut	*Juglans cinerea*	6 inches	0	18 inches	0

- - = species not present on site

3.2 Standards for Tree Preservation Replacement

Under the Superior Township Zoning Ordinance, *Article 14, Section 14.05 (F): Woodlands and Tree Preservation*. Regulated trees must be replaced at a ratio in accordance with the type and size of the trees being removed. Table 3 below provides the required replacement ratio for regulated trees that are removed.

Table 3: Tree Preservation Replacement – Standards and Survey Results

Regulated Trees	**Replacement Ratio** (number of replacement trees per removed tree)
Coniferous (height)	
10.0 to 15.0 feet	One to one (1:1)
15.01 to 30.0 feet	Three to one (3:1)
More than 30.0 feet	Six to one (6:1)
Landmark coniferous trees	One (1) tree per inch of removed tree DBH
Deciduous (DBH)	
8.0 to 12.0 inches	One to one (1:1)
12.01 to 16.0 inches	Three to one (3:1)
More than 16.0 inches	Six to one (6:1)
Landmark deciduous tree	One (1) tree per inch of removed tree DBH
Sovereign (DBH)	
Sovereign tree	Two (2) trees per inch of removed tree DBH

4.0 SUMMARY

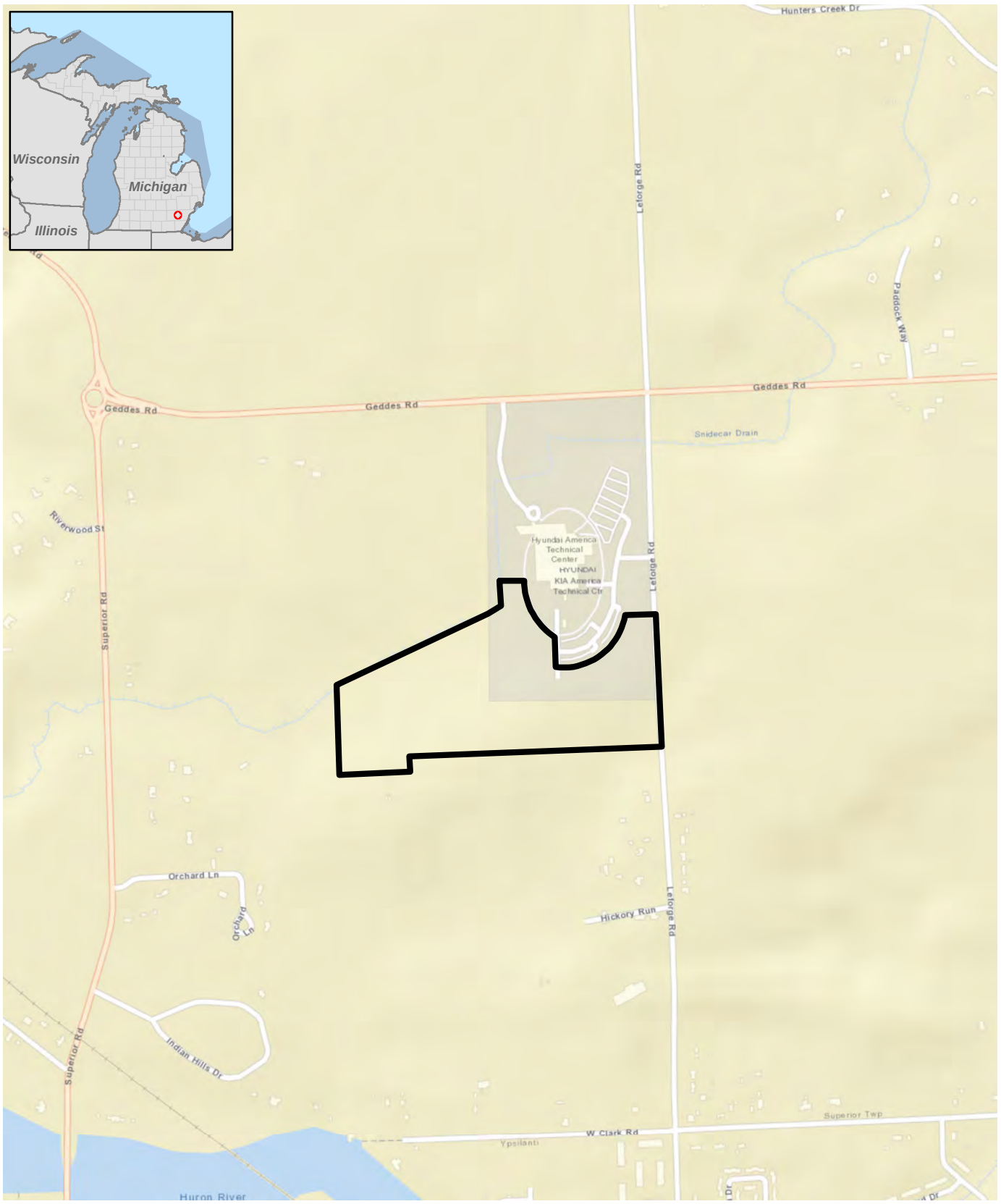
This *Tree Survey Memorandum* identified 1,182 regulated trees within the Project Site, including 230 landmark trees and 1 sovereign tree. The type and size of these surveyed trees fall within a range of tree replacement standards (Table 3). Once the area of disturbance and/or proposed tree removals are known, the proposed tree impacts and the subsequent replacement requirements under the Superior Township Zoning Ordinance, *Article 14, Section F: Woodlands and Tree Preservation* can be determined.

5.0 REFERENCES

Albert, D.A., P.J. Comer, and H. Enander. 2008. "An Atlas of Early Michigan's Forests, Grasslands, and Wetlands." East Lansing, MI: Michigan State University Press.

"Superior Township Zoning Ordinance, Article 14, Section 14.05 (F): Woodlands and Tree Preservation) Located at This Website." n.d. https://superiortownship.org/planning-commission/zoning-ordinance/.

Appendix A



Legend

Project Area

N

0 500 1,000

Feet

Sources: ECT, 2021.

Figure 1
Site Location

HMS STIL Facility
Washtenaw County, Michigan

Date: 10/27/2021

ECT

Study Area
Surveyed Tree
- american elm
- colorado blue spruce
- scotch pine
- siberian elm
- basswood
- bigtooth aspen
- bird cherry
- bitternut hickory
- black maple
- black walnut
- black willow
- box elder
- bur oak
- common buckthorn
- cottonwood
- green ash
- hackberry
- hawthorn
- ironwood
- peach-leaved willow
- pignut hickory
- red cedar
- red maple
- red oak
- redbud
- sassafras
- scarlet oak
- shagbark hickory
- slippery elm
- sugar maple
- swamp white oak
- white ash
- white cedar
- white mulberry
- white oak
- wild black cherry

Approximate Crown Spread

N

0 100 200
Feet

Tree Survey

IBI Group - HATCI
Washtenaw County, Michigan

Date: 11/8/2021

ECT

Appendix B

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
63	Thuja occidentalis	white cedar	2.8	10	fair		
64	Thuja occidentalis	white cedar	2.7	11	good		
65	Thuja occidentalis	white cedar	3.0	13	good		
66	Thuja occidentalis	white cedar	2.6	13	good		
67	Thuja occidentalis	white cedar	2.6	13	good		
68	Thuja occidentalis	white cedar	2.2	11	good		
69	Thuja occidentalis	white cedar	2.9	14	good		
70	Thuja occidentalis	white cedar	3.0	13	good		
71	Thuja occidentalis	white cedar	1.9	11	good		
72	Thuja occidentalis	white cedar	3.6	15	good		
73	Thuja occidentalis	white cedar	2.1	11	good		
74	Thuja occidentalis	white cedar	3.2	14	good		
75	Thuja occidentalis	white cedar	2.0	14	good		
76	Thuja occidentalis	white cedar	2.4	10	good		
77	Thuja occidentalis	white cedar	2.0	12	good		
78	Thuja occidentalis	white cedar	2.4	12	good		
79	Thuja occidentalis	white cedar	3.1	15	good		
80	Thuja occidentalis	white cedar	2.5	10	good		
81	Thuja occidentalis	white cedar	3.4	14	good		
82	Thuja occidentalis	white cedar	2.6	11	good		
83	Thuja occidentalis	white cedar	3.5	12	good		
84	Thuja occidentalis	white cedar	2.9	13	good		
85	Thuja occidentalis	white cedar	2.6	12	good		
86	Thuja occidentalis	white cedar	2.9	11	good		
87	Thuja occidentalis	white cedar	3.0	13	good		
88	Thuja occidentalis	white cedar	2.8	11	good		
89	Thuja occidentalis	white cedar	2.8	11	good		
90	Thuja occidentalis	white cedar	2.4	12	good		
91	Thuja occidentalis	white cedar	3.2	12	good		
92	Thuja occidentalis	white cedar	3.3	13	good		
93	Thuja occidentalis	white cedar	3.5	10	good		
94	Thuja occidentalis	white cedar	3.0	10	good		
95	Thuja occidentalis	white cedar	3.5	12	good		
96	Thuja occidentalis	white cedar	3.0	11	good		
97	Thuja occidentalis	white cedar	3.2	11	good		
98	Thuja occidentalis	white cedar	3.0	11	good		
99	Thuja occidentalis	white cedar	3.4	12	good		
100	Thuja occidentalis	white cedar	2.4	10	good		
101	Thuja occidentalis	white cedar	3.5	12	good		
102	Thuja occidentalis	white cedar	3.6	11	good		
103	Thuja occidentalis	white cedar	3.5	12	good		
104	Thuja occidentalis	white cedar	3.0	12	good		
105	Thuja occidentalis	white cedar	2.9	13	good		
106	Thuja occidentalis	white cedar	2.9	13	good		
107	Thuja occidentalis	white cedar	2.7	12	good		
108	Thuja occidentalis	white cedar	2.0	13	good		
109	Thuja occidentalis	white cedar	3.0	10	good		
110	Thuja occidentalis	white cedar	1.5	11	good		
111	Thuja occidentalis	white cedar	2.2	12	good		
112	Thuja occidentalis	white cedar	2.3	10	good		
113	Thuja occidentalis	white cedar	2.8	11	good		
114	Thuja occidentalis	white cedar	2.8	13	good		
115	Thuja occidentalis	white cedar	3.1	13	good		
116	Thuja occidentalis	white cedar	2.3	10	good		
117	Thuja occidentalis	white cedar	2.5	14	good		
118	Thuja occidentalis	white cedar	2.4	13	good		
119	Thuja occidentalis	white cedar	4.6	11	good		
120	Acer negundo	box elder	8.7		poor		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
121	Acer negundo	box elder	9.7		poor		
122	Acer negundo	box elder	19.9		excellent	Y	
123	Juglans nigra	black walnut	16.0		good		
124	Fraxinus americana	white ash	8.3		good		
125	Juglans nigra	black walnut	8.5		excellent		
126	Salix nigra	black willow	17.4		fair		
127	Salix nigra	black willow	16.2		good		
128	Salix nigra	black willow	14.3		good		
129	Populus deltoides	cottonwood	9.4		excellent		
130	Acer negundo	box elder	8.4		dead or dying		
131	Juglans nigra	black walnut	9.8		good		
132	Fraxinus americana	white ash	8.5		good		
133	Juglans nigra	black walnut	8.9		good		
134	Acer negundo	box elder	9.0		poor		
135	Acer negundo	box elder	9.0		dead or dying		
136	Juglans nigra	black walnut	23.7		excellent	Y	
137	Acer negundo	box elder	15.2		dead or dying		
138	Ulmus rubra	slippery elm	8.0		excellent		
139	Acer negundo	box elder	9.4		poor		
140	Juglans nigra	black walnut	8.9		good		
141	Acer negundo	box elder	10.7		dead or dying		
142	Salix nigra	black willow	12.4		fair		
143	Salix nigra	black willow	9.6		poor		
144	Salix nigra	black willow	10.4		poor		
145	Salix nigra	black willow	13.9		fair		
146	Salix nigra	black willow	13.8		good		
147	Salix nigra	black willow	10.8		fair		
148	Fraxinus americana	white ash	8.6		fair		
149	Juglans nigra	black walnut	8.0		fair		
150	Crataegus sp.	hawthorn	9.1		fair		
151	Fraxinus americana	white ash	8.9		good		
152	Juglans nigra	black walnut	24.1		excellent	Y	
153	Ulmus americana	American elm	17.3		good		
154	Juglans nigra	black walnut	12.1		good		
155	Juglans nigra	black walnut	8.5		good		
156	Ulmus americana	American elm	8.9		good		
157	Juglans nigra	black walnut	21.4		excellent	Y	
158	Acer negundo	box elder	15.2		dead or dying		
159	Juglans nigra	black walnut	16.7		fair		
160	Juglans nigra	black walnut	21.8		excellent	Y	
161	Carya cordiformis	bitternut hickory	8.8		good		
162	Morus alba	white mulberry	9.4		fair		
163	Salix nigra	black willow	20.8		good		
164	Juglans nigra	black walnut	12.2		good		
165	Acer negundo	box elder	10.5		dead or dying		
166	Ulmus americana	American elm	30.9		good	Y	
167	Juglans nigra	black walnut	17.7		good		
168	Morus alba	white mulberry	9.8		fair		
169	Acer negundo	box elder	12.4		poor		
170	Acer negundo	box elder	10.8		poor		
171	Acer negundo	box elder	9.8		fair		
172	Juglans nigra	black walnut	17.3		good		
173	Acer negundo	box elder	9.0		poor		
174	Prunus serotina	wild black cherry	12.8		poor		
175	Acer negundo	box elder	20.5		fair	Y	
176	Acer negundo	box elder	8.0		poor		
177	Juglans nigra	black walnut	11.6		excellent		
178	Acer negundo	box elder	8.7		fair		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
179	Celtis occidentalis	hackberry	14.1		excellent		
180	Ulmus americana	American elm	8.0		good		
181	Acer negundo	box elder	9.0		fair		
182	Juglans nigra	black walnut	22.2		excellent	Y	
183	Juglans nigra	black walnut	10.7		excellent		
184	Juglans nigra	black walnut	8.3		excellent		
185	Juglans nigra	black walnut	11.1		good		
186	Ulmus americana	American elm	11.4		good		
187	Juglans nigra	black walnut	10.6		good		
188	Juglans nigra	black walnut	10.2		good		
189	Juglans nigra	black walnut	9.3		good		
190	Juglans nigra	black walnut	11.1		fair		
191	Juglans nigra	black walnut	17.0		excellent		
192	Juglans nigra	black walnut	11.5		good		
193	Juglans nigra	black walnut	10.2		good		
194	Juglans nigra	black walnut	11.7		excellent		
195	Ulmus pumila	Siberian elm	10.7		fair		
196	Juglans nigra	black walnut	11.6		excellent		
197	Juglans nigra	black walnut	11.7		excellent		
198	Juglans nigra	black walnut	13.8		excellent		
199	Juglans nigra	black walnut	9.6		excellent		
200	Ulmus americana	American elm	8.1		good		
201	Juglans nigra	black walnut	8.5		excellent		
202	Juglans nigra	black walnut	14.7		excellent		
203	Juglans nigra	black walnut	12.6		excellent		
204	Acer negundo	box elder	10.2		dead or dying		
205	Juglans nigra	black walnut	8.6		good		
206	Juglans nigra	black walnut	15.7		excellent		
207	Ulmus americana	American elm	8.3		excellent		
208	Juglans nigra	black walnut	14.6		good		
209	Juglans nigra	black walnut	13.3		excellent		
210	Juglans nigra	black walnut	18.8		excellent	Y	
211	Juglans nigra	black walnut	10.8		excellent		
212	Acer negundo	box elder	8.7		fair		
213	Acer negundo	box elder	9.6		fair		
214	Ulmus rubra	slippery elm	16.5		good		
215	Juglans nigra	black walnut	8.7		excellent		
216	Juglans nigra	black walnut	22.4		good	Y	
217	Juglans nigra	black walnut	10.0		excellent		
218	Juglans nigra	black walnut	19.9		excellent	Y	
219	Juglans nigra	black walnut	8.0		good		
220	Juglans nigra	black walnut	20.0		good	Y	
221	Salix nigra	black willow	21.3		good		
222	Juglans nigra	black walnut	11.5		fair		
223	Juglans nigra	black walnut	28.3		good	Y	
224	Fraxinus americana	white ash	8.3		fair		
225	Juglans nigra	black walnut	9.1		good		
226	Juglans nigra	black walnut	16.4		good		
227	Juglans nigra	black walnut	11.6		good		
228	Juglans nigra	black walnut	8.5		good		
229	Juglans nigra	black walnut	9.5		good		
230	Juglans nigra	black walnut	9.1		good		
231	Juglans nigra	black walnut	17.6		good		
232	Juglans nigra	black walnut	20.7		excellent	Y	
233	Juglans nigra	black walnut	9.4		excellent		
234	Juglans nigra	black walnut	9.1		excellent		
235	Juglans nigra	black walnut	13.1		fair		
236	Juglans nigra	black walnut	23.8		excellent	Y	

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
237	Juglans nigra	black walnut	18.1		good	Y	
238	Juglans nigra	black walnut	12.5		fair		
239	Juglans nigra	black walnut	22.9		good	Y	
240	Juglans nigra	black walnut	11.7		good		
241	Juglans nigra	black walnut	11.6		good		
242	Juglans nigra	black walnut	25.6		good	Y	
243	Juglans nigra	black walnut	10.4		good		
244	Juglans nigra	black walnut	24.8		excellent	Y	
245	Juglans nigra	black walnut	17.0		good		
246	Juglans nigra	black walnut	8.1		good		
247	Ulmus rubra	slippery elm	12.5		good		
248	Juglans nigra	black walnut	14.6		excellent		
249	Juglans nigra	black walnut	9.4		good		
250	Juglans nigra	black walnut	12.2		good		
251	Juglans nigra	black walnut	15.6		excellent		
252	Juglans nigra	black walnut	20.1		good	Y	
253	Tilia americana	basswood	11.0		excellent		
254	Juglans nigra	black walnut	12.1		fair		
255	Juglans nigra	black walnut	24.9		excellent	Y	
256	Juglans nigra	black walnut	8.9		fair		
257	Tilia americana	basswood	21.0		good	Y	
258	Juglans nigra	black walnut	52.8		fair	Y	
259	Juglans nigra	black walnut	22.9		excellent	Y	
260	Juglans nigra	black walnut	25.0		good	Y	
261	Carya cordiformis	bitternut hickory	9.5		excellent		
262	Juglans nigra	black walnut	8.4		good		
263	Juglans nigra	black walnut	10.2		good		
264	Ulmus rubra	slippery elm	11.2		good		
265	Juglans nigra	black walnut	13.6		good		
266	Juglans nigra	black walnut	11.8		fair		
267	Prunus serotina	wild black cherry	11.1		fair		
268	Juglans nigra	black walnut	17.5		excellent		
269	Juglans nigra	black walnut	11.3		good		
270	Juglans nigra	black walnut	20.6		good	Y	
271	Juglans nigra	black walnut	10.2		good		
272	Juglans nigra	black walnut	14.0		good		
273	Juglans nigra	black walnut	12.2		excellent		
274	Juglans nigra	black walnut	8.3		excellent		
275	Ulmus rubra	slippery elm	8.0		good		
276	Juglans nigra	black walnut	33.2		good	Y	
277	Ulmus rubra	slippery elm	11.8		good		
278	Juglans nigra	black walnut	16.3		fair		
279	Juglans nigra	black walnut	24.6		good	Y	
280	Ulmus rubra	slippery elm	9.6		good		
281	Juglans nigra	black walnut	22.6		good	Y	
282	Celtis occidentalis	hackberry	10.3		excellent		
283	Juglans nigra	black walnut	22.3		good	Y	
284	Juglans nigra	black walnut	13.6		excellent		
285	Juglans nigra	black walnut	11.1		excellent		
286	Juglans nigra	black walnut	16.1		excellent		
287	Ulmus rubra	slippery elm	8.6		excellent		
288	Prunus serotina	wild black cherry	18.3		fair	Y	
289	Prunus serotina	wild black cherry	23.6		fair	Y	
290	Prunus serotina	wild black cherry	30.7		fair	Y	
291	Ulmus rubra	slippery elm	8.7		fair		
292	Quercus coccinea	scarlet oak	20.4		excellent	Y	
293	Quercus rubra	red oak	10.6		excellent		
294	Prunus serotina	wild black cherry	29.5		poor	Y	

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
295	Ulmus americana	American elm	8.7		good		
296	Prunus serotina	wild black cherry	15.2		fair		
297	Juglans nigra	black walnut	16.2		fair		
298	Juglans nigra	black walnut	14.9		excellent		
299	Fraxinus americana	white ash	8.3		fair		
300	Ulmus rubra	slippery elm	19.6		good		
301	Juglans nigra	black walnut	34.6		fair	Y	
302	Prunus serotina	wild black cherry	10.6		fair		
303	Prunus serotina	wild black cherry	10.4		fair		
304	Carya glabra	pignut hickory	8.0		excellent		
305	Carya glabra	pignut hickory	16.3		excellent	Y	
306	Prunus serotina	wild black cherry	8.0		fair		
307	Carya glabra	pignut hickory	26.3		excellent	Y	
308	Prunus serotina	wild black cherry	10.9		good		
309	Carya glabra	pignut hickory	8.1		excellent		
310	Carya glabra	pignut hickory	8.1		excellent		
311	Quercus rubra	red oak	9.8		excellent		
312	Quercus coccinea	scarlet oak	8.3		excellent		
313	Quercus rubra	red oak	11.5		excellent		
314	Fraxinus americana	white ash	8.3		good		
315	Ulmus americana	American elm	14.4		good		
316	Ulmus americana	American elm	9.3		good		
317	Juniperus virginiana	red cedar	7.1	20	excellent		
318	Fraxinus americana	white ash	8.3		fair		
319	Quercus coccinea	scarlet oak	10.2		good		
320	Quercus coccinea	scarlet oak	15.0		excellent		
321	Carya glabra	pignut hickory	8.2		excellent		
322	Carya glabra	pignut hickory	14.6		excellent		
323	Quercus coccinea	scarlet oak	9.3		excellent		
324	Carya glabra	pignut hickory	9.3		excellent		
325	Quercus coccinea	scarlet oak	12.7		excellent		
326	Quercus coccinea	scarlet oak	11.3		excellent		
327	Fraxinus americana	white ash	8.6		fair		
328	Quercus coccinea	scarlet oak	16.3		excellent	Y	
329	Juglans nigra	black walnut	8.0		excellent		
330	Acer rubrum	red maple	9.4		poor		
331	Quercus coccinea	scarlet oak	11.9		excellent		
332	Quercus coccinea	scarlet oak	10.1		excellent		
333	Juglans nigra	black walnut	16.3		excellent		
334	Juglans nigra	black walnut	10.5		excellent		
335	Juglans nigra	black walnut	8.3		excellent		
336	Juglans nigra	black walnut	15.6		excellent		
337	Juglans nigra	black walnut	8.5		excellent		
338	Juglans nigra	black walnut	11.4		good		
339	Juglans nigra	black walnut	15.0		excellent		
340	Juglans nigra	black walnut	10.8		good		
341	Ulmus americana	American elm	17.4		good		
342	Juglans nigra	black walnut	12.5		excellent		
343	Juglans nigra	black walnut	15.6		good		
344	Juglans nigra	black walnut	11.0		good		
345	Fraxinus americana	white ash	8.9		fair		
346	Fraxinus americana	white ash	8.1		fair		
347	Juglans nigra	black walnut	12.9		excellent		
348	Juglans nigra	black walnut	14.8		excellent		
349	Ulmus americana	American elm	8.3		good		
350	Juglans nigra	black walnut	9.4		excellent		
351	Juglans nigra	black walnut	10.7		good		
352	Juglans nigra	black walnut	8.1		excellent		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
353	Fraxinus americana	white ash	8.9		poor		
354	Fraxinus americana	white ash	8.5		fair		
355	Fraxinus americana	white ash	9.4		fair		
356	Juglans nigra	black walnut	12.3		excellent		
357	Juglans nigra	black walnut	13.7		excellent		
358	Fraxinus americana	white ash	10.0		fair		
359	Fraxinus americana	white ash	8.0		fair		
360	Prunus serotina	wild black cherry	8.6		good		
361	Quercus coccinea	scarlet oak	9.2		excellent		
362	Prunus serotina	wild black cherry	9.3		good		
363	Fraxinus americana	white ash	8.3		dead or dying		
364	Prunus serotina	wild black cherry	9.4		fair		
365	Prunus serotina	wild black cherry	8.2		good		
366	Quercus coccinea	scarlet oak	18.5		excellent	Y	
367	Ulmus americana	American elm	12.4		good		
368	Fraxinus americana	white ash	11.9		poor		
369	Quercus coccinea	scarlet oak	9.4		excellent		
501	Picea pungens	Colorado blue spr	8.7	20	good		
502	Picea pungens	Colorado blue spr	5.7	16	excellent		
503	Picea pungens	Colorado blue spr	5.9	18	excellent		
504	Picea pungens	Colorado blue spr	5.5	14	good		
505	Quercus bicolor	swamp white oak	9.3		good		
506	Quercus bicolor	swamp white oak	8.5		good		
507	Quercus rubra	red oak	8.1		excellent		
508	Populus deltoides	cottonwood	8.8		excellent		
509	Populus deltoides	cottonwood	8.5		good		
510	Ulmus americana	American elm	9.6		good		
511	Carya ovata	shagbark hickory	24.0		good	Y	
512	Carya ovata	shagbark hickory	9.8		excellent		
513	Carya ovata	shagbark hickory	9.0		excellent		
514	Carya ovata	shagbark hickory	8.9		excellent		
515	Carya ovata	shagbark hickory	8.2		excellent		
516	Ulmus americana	American elm	9.4		fair		
517	Juglans nigra	black walnut	18.3		good	Y	
518	Ulmus americana	American elm	8.5		good		
519	Juglans nigra	black walnut	9.2		excellent		
520	Juglans nigra	black walnut	8.2		good		
521	Rhamnus cathartica	common buckthor	9.6		good		
522	Juglans nigra	black walnut	9.4		good		
523	Acer negundo	box elder	8.5		poor		
524	Juglans nigra	black walnut	9.6		fair		
525	Cercis canadensis	redbud	8.1		fair		
526	Juglans nigra	black walnut	12.2		fair		
527	Prunus serotina	wild black cherry	13.5		poor		
528	Juglans nigra	black walnut	15.2		fair		
529	Ulmus pumila	Siberian elm	10.6		fair		
530	Morus alba	white mulberry	12.0		fair		
531	Rhamnus cathartica	common buckthor	8.3		fair		
532	Juglans nigra	black walnut	8.0		good		
533	Juglans nigra	black walnut	8.0		fair		
534	Quercus macrocarpa	burr oak	12.8		fair		
535	Quercus macrocarpa	burr oak	19.9		excellent	Y	
536	Rhamnus cathartica	common buckthor	15.7		fair		
537	Quercus macrocarpa	burr oak	21.1		good	Y	
538	Ulmus americana	American elm	12.5		fair		
539	Quercus macrocarpa	burr oak	16.1		good	Y	
540	Quercus macrocarpa	burr oak	57.1		excellent		Y
541	Carya cordiformis	bitternut hickory	11.3		excellent		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
542	Quercus macrocarpa	burr oak	13.3		good		
543	Ulmus americana	American elm	8.2		fair		
544	Acer negundo	box elder	16.5		poor	Y	
545	Juglans nigra	black walnut	11.5		good		
546	Populus deltoides	cottonwood	16.3		good		
547	Carya cordiformis	bitternut hickory	14.6		good		
548	Populus deltoides	cottonwood	9.4		good		
549	Acer negundo	box elder	8.9		fair		
550	Acer negundo	box elder	8.3		fair		
551	Acer negundo	box elder	10.5		fair		
552	Ulmus americana	American elm	8.3		good		
553	Populus deltoides	cottonwood	19.6		good		
568	Acer negundo	box elder	13.3		poor		
569	Juglans nigra	black walnut	8.9		good		
629	Juglans nigra	black walnut	11.5		excellent		
630	Juglans nigra	black walnut	17.9		excellent		
631	Acer negundo	box elder	12.4		fair		
632	Morus alba	white mulberry	10.4		fair		
633	Ulmus americana	American elm	13.7		excellent		
634	Prunus serotina	wild black cherry	9.9		fair		
635	Acer negundo	box elder	8.2		fair		
636	Ulmus americana	American elm	11.1		good		
637	Acer negundo	box elder	14.0		fair		
638	Prunus serotina	wild black cherry	9.8		fair		
639	Prunus serotina	wild black cherry	26.4		fair	Y	
640	Ulmus americana	American elm	8.5		good		
641	Prunus serotina	wild black cherry	20.0		poor	Y	
642	Morus alba	white mulberry	12.7		fair		
643	Rhamnus cathartica	common buckthor	8.6		fair		
644	Morus alba	white mulberry	12.0		good		
645	Ulmus americana	American elm	8.0		good		
702	Carya glabra	pignut hickory	14.0		excellent		
703	Carya glabra	pignut hickory	16.0		good	Y	
704	Quercus alba	white oak	27.2		good	Y	
705	Quercus coccinea	scarlet oak	8.9		good		
706	Quercus alba	white oak	21.8		good	Y	
707	Quercus rubra	red oak	14.2		excellent		
708	Prunus serotina	wild black cherry	12.0		poor		
709	Prunus serotina	wild black cherry	12.6		fair		
710	Carya glabra	pignut hickory	12.2		fair		
711	Carya glabra	pignut hickory	10.6		excellent		
712	Ulmus americana	American elm	8.2		excellent		
713	Quercus rubra	red oak	9.4		excellent		
714	Quercus rubra	red oak	10.6		excellent		
715	Quercus rubra	red oak	10.3		excellent		
716	Populus grandidentata	bigtooth aspen	9.5		excellent		
717	Quercus rubra	red oak	19.9		excellent	Y	
718	Quercus rubra	red oak	12.0		excellent		
719	Prunus serotina	wild black cherry	11.3		good		
720	Prunus serotina	wild black cherry	9.3		good		
759	Juglans nigra	black walnut	18.9		excellent	Y	
760	Ulmus rubra	slippery elm	15.3		fair		
761	Juglans nigra	black walnut	13.9		good		
762	Prunus serotina	wild black cherry	11.3		good		
763	Juglans nigra	black walnut	27.8		good	Y	
764	Juglans nigra	black walnut	16.7		fair		
765	Juglans nigra	black walnut	21.9		fair	Y	
767	Juglans nigra	black walnut	10.0		excellent		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
768	Juglans nigra	black walnut	12.9		excellent		
769	Juglans nigra	black walnut	9.0		good		
770	Juglans nigra	black walnut	11.7		fair		
782	Prunus serotina	wild black cherry	9.1		fair		
783	Prunus avium	bird cherry	10.9		fair		
784	Quercus rubra	red oak	16.9		good	Y	
785	Carya glabra	pignut hickory	20.5		excellent	Y	
786	Quercus rubra	red oak	13.4		excellent		
787	Quercus rubra	red oak	10.6		good		
788	Quercus rubra	red oak	17.4		excellent	Y	
789	Tilia americana	basswood	16.1		good		
790	Carya cordiformis	bitternut hickory	15.0		excellent		
791	Juglans nigra	black walnut	9.1		fair		
792	Juglans nigra	black walnut	9.1		good		
793	Acer negundo	box elder	8.5		poor		
794	Juglans nigra	black walnut	9.5		excellent		
795	Juglans nigra	black walnut	10.7		excellent		
796	Acer negundo	box elder	8.5		poor		
797	Prunus serotina	wild black cherry	18.7		fair	Y	
798	Carya cordiformis	bitternut hickory	10.0		good		
799	Tilia americana	basswood	18.2		excellent	Y	
800	Quercus rubra	red oak	12.5		good		
801	Carya glabra	pignut hickory	26.0		excellent	Y	
802	Ulmus americana	American elm	8.5		good		
803	Carya glabra	pignut hickory	13.5		good		
804	Carya glabra	pignut hickory	14.0		good		
805	Prunus serotina	wild black cherry	8.2		dead or dying		
806	Ulmus americana	American elm	8.5		good		
807	Carya glabra	pignut hickory	17.0		fair	Y	
808	Prunus serotina	wild black cherry	9.0		poor		
814	Quercus alba	white oak	17.5		good	Y	
837	Carya glabra	pignut hickory	8.4		excellent		
839	Prunus serotina	wild black cherry	8.0		good		
840	Quercus rubra	red oak	18.8		good	Y	
841	Prunus serotina	wild black cherry	13.0		dead or dying		
842	Quercus rubra	red oak	17.2		excellent	Y	
843	Prunus serotina	wild black cherry	10.5		poor		
844	Quercus rubra	red oak	17.5		good	Y	
845	Ulmus americana	American elm	11.5		poor		
846	Quercus rubra	red oak	9.7		fair		
847	Quercus rubra	red oak	12.2		good		
848	Quercus rubra	red oak	8.4		good		
849	Carya glabra	pignut hickory	8.2		fair		
850	Prunus serotina	wild black cherry	14.5		poor		
851	Carya cordiformis	bitternut hickory	9.2		good		
852	Quercus rubra	red oak	20.1		excellent	Y	
853	Quercus rubra	red oak	20.1		excellent	Y	
854	Tilia americana	basswood	9.1		excellent		
856	Quercus rubra	red oak	18.6		excellent	Y	
857	Quercus rubra	red oak	17.2		good	Y	
858	Quercus rubra	red oak	17.1		excellent	Y	
859	Quercus rubra	red oak	17.0		good	Y	
860	Quercus rubra	red oak	21.0		good	Y	
861	Quercus rubra	red oak	12.8		poor		
862	Quercus rubra	red oak	11.2		good		
863	Quercus rubra	red oak	15.6		good		
864	Ulmus americana	American elm	17.4		good		
865	Ulmus americana	American elm	10.5		fair		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
866	Ulmus americana	American elm	8.3		fair		
867	Ulmus americana	American elm	9.5		fair		
868	Carya cordiformis	bitternut hickory	8.4		good		
869	Quercus rubra	red oak	10.1		excellent		
870	Ulmus americana	American elm	12.3		fair		
871	Carya ovata	shagbark hickory	9.1		excellent		
872	Quercus rubra	red oak	17.2		excellent	Y	
873	Quercus rubra	red oak	16.3		excellent	Y	
874	Quercus rubra	red oak	17.1		excellent	Y	
876	Quercus rubra	red oak	9.4		excellent		
880	Quercus rubra	red oak	39.3		excellent	Y	
881	Quercus rubra	red oak	33.4		excellent	Y	
882	Acer saccharum	sugar maple	12.5		excellent		
883	Quercus rubra	red oak	23.5		excellent	Y	
884	Tilia americana	basswood	11.8		excellent		
885	Carya glabra	pignut hickory	18.6		good	Y	
886	Ostrya virginiana	ironwood	8.0		good		
888	Tilia americana	basswood	18.9		excellent	Y	
891	Sassafras albidum	sassafras	8.4		good		
892	Ulmus americana	American elm	10.5		fair		
893	Tilia americana	basswood	17.0		excellent		
894	Prunus serotina	wild black cherry	8.8		good		
895	Carya ovata	shagbark hickory	22.5		excellent	Y	
896	Ulmus americana	American elm	10.4		good		
897	Carya ovata	shagbark hickory	16.1		good	Y	
898	Carya ovata	shagbark hickory	12.8		excellent		
899	Carya ovata	shagbark hickory	15.3		excellent		
900	Acer saccharum	sugar maple	8.7		excellent		
901	Carya ovata	shagbark hickory	15.5		excellent		
902	Carya glabra	pignut hickory	15.7		excellent		
903	Quercus alba	white oak	20.0		excellent	Y	
904	Tilia americana	basswood	9.6		good		
905	Prunus serotina	wild black cherry	14.4		fair		
906	Tilia americana	basswood	29.9		excellent	Y	
907	Prunus serotina	wild black cherry	15.5		fair		
908	Prunus serotina	wild black cherry	11.6		good		
909	Tilia americana	basswood	11.2		good		
912	Prunus serotina	wild black cherry	9.8		good		
913	Prunus avium	bird cherry	14.0		poor	Y	
914	Ulmus americana	American elm	8.0		fair		
915	Carya glabra	pignut hickory	17.8		excellent	Y	
916	Carya glabra	pignut hickory	22.0		excellent	Y	
917	Ulmus americana	American elm	14.2		poor		
918	Ulmus americana	American elm	8.5		poor		
919	Carya ovata	shagbark hickory	21.0		excellent	Y	
920	Ulmus americana	American elm	8.2		good		
921	Carya ovata	shagbark hickory	16.0		good	Y	
922	Carya cordiformis	bitternut hickory	11.5		excellent		
923	Ulmus americana	American elm	16.5		good		
924	Prunus serotina	wild black cherry	13.0		good		
925	Tilia americana	basswood	22.0		excellent	Y	
926	Quercus rubra	red oak	19.5		excellent	Y	
927	Prunus serotina	wild black cherry	13.4		poor		
928	Ulmus americana	American elm	16.0		good		
929	Juglans nigra	black walnut	19.0		good	Y	
930	Ulmus americana	American elm	10.5		good		
931	Ulmus americana	American elm	8.2		good		
932	Juglans nigra	black walnut	10.3		good		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
933	Tilia americana	basswood	16.2		excellent		
934	Tilia americana	basswood	10.2		excellent		
935	Quercus rubra	red oak	18.3		excellent	Y	
936	Prunus serotina	wild black cherry	9.5		good		
937	Quercus alba	white oak	18.2		excellent	Y	
938	Carya glabra	pignut hickory	15.0		excellent		
939	Carya ovata	shagbark hickory	12.5		good		
940	Carya glabra	pignut hickory	23.5		excellent	Y	
941	Carya glabra	pignut hickory	22.0		excellent	Y	
942	Ulmus americana	American elm	10.9		good		
943	Carya glabra	pignut hickory	16.3		good	Y	
944	Carya ovata	shagbark hickory	18.2		good	Y	
945	Quercus rubra	red oak	10.2		good		
946	Carya glabra	pignut hickory	15.5		good		
947	Prunus serotina	wild black cherry	8.5		poor		
948	Prunus avium	bird cherry	14.0		excellent	Y	
949	Acer saccharum	sugar maple	18.5		good	Y	
950	Quercus rubra	red oak	11.3		excellent		
951	Tilia americana	basswood	8.1		excellent		
952	Prunus serotina	wild black cherry	15.8		fair		
953	Tilia americana	basswood	19.7		excellent	Y	
954	Tilia americana	basswood	15.5		good		
955	Tilia americana	basswood	16.5		good		
956	Prunus serotina	wild black cherry	9.7		fair		
957	Ulmus americana	American elm	10.0		fair		
958	Quercus rubra	red oak	9.0		good		
959	Ulmus americana	American elm	12.8		good		
960	Quercus alba	white oak	16.8		excellent	Y	
961	Carya glabra	pignut hickory	23.5		excellent	Y	
962	Ulmus americana	American elm	14.6		good		
963	Tilia americana	basswood	13.2		excellent		
964	Tilia americana	basswood	12.0		excellent		
965	Tilia americana	basswood	12.0		excellent		
966	Tilia americana	basswood	9.3		excellent		
967	Ostrya virginiana	ironwood	8.0		excellent		
968	Ulmus americana	American elm	9.2		good		
969	Quercus rubra	red oak	17.5		excellent	Y	
970	Quercus alba	white oak	11.9		excellent		
971	Carya cordiformis	bitternut hickory	11.3		excellent		
972	Carya glabra	pignut hickory	8.2		excellent		
973	Quercus alba	white oak	8.2		excellent		
974	Quercus alba	white oak	19.3		good	Y	
975	Quercus rubra	red oak	14.5		good		
976	Quercus rubra	red oak	15.3		excellent		
977	Quercus rubra	red oak	17.5		excellent	Y	
978	Carya ovata	shagbark hickory	8.1		good		
979	Carya ovata	shagbark hickory	8.8		excellent		
980	Ulmus americana	American elm	9.2		good		
981	Quercus rubra	red oak	15.9		good		
982	Quercus rubra	red oak	9.7		good		
983	Quercus alba	white oak	27.9		excellent	Y	
984	Tilia americana	basswood	8.3		poor		
985	Quercus rubra	red oak	13.0		good		
986	Quercus rubra	red oak	11.0		excellent		
987	Quercus alba	white oak	16.8		good	Y	
988	Quercus rubra	red oak	9.0		good		
989	Quercus rubra	red oak	17.5		good	Y	
990	Tilia americana	basswood	15.4		excellent		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
991	Tilia americana	basswood	12.0		excellent		
992	Quercus alba	white oak	16.2		good	Y	
993	Tilia americana	basswood	15.5		excellent		
994	Tilia americana	basswood	18.0		good	Y	
995	Tilia americana	basswood	12.0		good		
996	Carya glabra	pignut hickory	9.0		good		
997	Tilia americana	basswood	12.5		excellent		
998	Carya ovata	shagbark hickory	8.0		good		
999	Tilia americana	basswood	9.0		good		
1000	Tilia americana	basswood	8.0		excellent		
1302	Carya ovata	shagbark hickory	12.0		excellent		
1303	Tilia americana	basswood	9.2		good		
1304	Acer saccharum	sugar maple	9.2		excellent		
1305	Tilia americana	basswood	10.4		good		
1306	Tilia americana	basswood	11.0		good		
1307	Acer saccharum	sugar maple	9.5		excellent		
1308	Tilia americana	basswood	12.0		excellent		
1309	Prunus serotina	wild black cherry	9.5		poor		
1310	Tilia americana	basswood	8.5		fair		
1311	Tilia americana	basswood	16.5		good		
1312	Ulmus americana	American elm	9.5		fair		
1313	Tilia americana	basswood	15.2		excellent		
1314	Prunus serotina	wild black cherry	9.2		good		
1315	Prunus serotina	wild black cherry	8.5		poor		
1316	Carya cordiformis	bitternut hickory	9.8		good		
1317	Tilia americana	basswood	11.8		good		
1318	Tilia americana	basswood	10.3		fair		
1319	Tilia americana	basswood	10.8		good		
1320	Carya glabra	pignut hickory	16.8		excellent	Y	
1321	Celtis occidentalis	hackberry	17.3		good		
1322	Tilia americana	basswood	10.8		excellent		
1323	Carya glabra	pignut hickory	15.6		good		
1324	Quercus rubra	red oak	11.3		excellent		
1325	Quercus rubra	red oak	8.5		excellent		
1326	Quercus rubra	red oak	17.6		excellent	Y	
1327	Juglans nigra	black walnut	19.5		excellent	Y	
1328	Ulmus americana	American elm	9.5		good		
1329	Ulmus americana	American elm	8.0		poor		
1330	Ulmus americana	American elm	9.5		fair		
1331	Ulmus americana	American elm	11.0		good		
1332	Morus alba	white mulberry	8.5		good		
1333	Morus alba	white mulberry	8.5		good		
1334	Morus alba	white mulberry	9.3		good		
1335	Carya cordiformis	bitternut hickory	8.8		excellent		
1336	Ulmus americana	American elm	15.2		good		
1337	Quercus rubra	red oak	12.0		fair		
1338	Prunus serotina	wild black cherry	13.5		fair		
1339	Prunus serotina	wild black cherry	10.8		poor		
1340	Quercus rubra	red oak	9.5		fair		
1341	Prunus serotina	wild black cherry	24.0		poor	Y	
1342	Tilia americana	basswood	15.2		excellent		
1343	Tilia americana	basswood	16.5		excellent		
1344	Prunus serotina	wild black cherry	8.2		poor		
1345	Quercus alba	white oak	20.8		excellent	Y	
1346	Carya cordiformis	bitternut hickory	15.5		good		
1347	Carya glabra	pignut hickory	15.2		good		
1348	Tilia americana	basswood	10.0		good		
1349	Tilia americana	basswood	18.4		good	Y	

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1350	Prunus serotina	wild black cherry	10.0		poor		
1351	Carya cordiformis	bitternut hickory	9.3		excellent		
1352	Tilia americana	basswood	8.8		good		
1353	Prunus serotina	wild black cherry	8.8		fair		
1354	Prunus serotina	wild black cherry	8.3		fair		
1355	Prunus serotina	wild black cherry	13.0		fair		
1356	Ulmus americana	American elm	8.7		fair		
1357	Acer saccharum	sugar maple	16.7		excellent	Y	
1358	Tilia americana	basswood	11.5		good		
1359	Tilia americana	basswood	17.8		good		
1360	Carya ovata	shagbark hickory	25.0		excellent	Y	
1361	Tilia americana	basswood	21.5		excellent	Y	
1362	Tilia americana	basswood	16.3		excellent		
1363	Tilia americana	basswood	9.0		excellent		
1364	Carya glabra	pignut hickory	18.9		excellent	Y	
1365	Ulmus americana	American elm	12.5		excellent		
1366	Carya cordiformis	bitternut hickory	17.5		excellent	Y	
1367	Tilia americana	basswood	19.5		good	Y	
1368	Acer rubrum	red maple	8.5		excellent		
1369	Tilia americana	basswood	14.5		excellent		
1370	Tilia americana	basswood	15.0		excellent		
1371	Carya cordiformis	bitternut hickory	10.0		excellent		
1372	Tilia americana	basswood	8.8		fair		
1373	Quercus rubra	red oak	13.7		good		
1374	Quercus rubra	red oak	14.9		excellent		
1375	Quercus rubra	red oak	16.7		fair	Y	
1376	Quercus rubra	red oak	16.7		good	Y	
1377	Quercus rubra	red oak	23.0		excellent	Y	
1378	Acer saccharum	sugar maple	14.8		excellent		
1379	Quercus rubra	red oak	28.0		excellent	Y	
1380	Carya cordiformis	bitternut hickory	11.5		fair		
1381	Prunus serotina	wild black cherry	11.5		poor		
1382	Carya cordiformis	bitternut hickory	15.0		poor		
1383	Ulmus americana	American elm	21.0		fair	Y	
1384	Carya glabra	pignut hickory	11.8		excellent		
1385	Quercus alba	white oak	31.8		excellent	Y	
1386	Ulmus americana	American elm	8.0		excellent		
1387	Carya glabra	pignut hickory	14.5		excellent		
1388	Quercus rubra	red oak	9.0		excellent		
1389	Tilia americana	basswood	19.0		good	Y	
1390	Quercus rubra	red oak	20.2		excellent	Y	
1391	Prunus serotina	wild black cherry	10.2		poor		
1392	Quercus rubra	red oak	14.2		good		
1393	Tilia americana	basswood	11.5		excellent		
1395	Carya cordiformis	bitternut hickory	10.5		good		
1396	Carya cordiformis	bitternut hickory	10.2		good		
1397	Tilia americana	basswood	8.2		fair		
1401	Tilia americana	basswood	15.8		fair		
1402	Tilia americana	basswood	8.5		good		
1403	Tilia americana	basswood	9.0		good		
1404	Ulmus americana	American elm	8.0		fair		
1405	Ulmus americana	American elm	11.0		good		
1406	Carya ovata	shagbark hickory	21.6		excellent	Y	
1407	Tilia americana	basswood	17.0		excellent		
1408	Tilia americana	basswood	8.5		excellent		
1409	Tilia americana	basswood	15.8		good		
1410	Acer saccharum	sugar maple	11.0		excellent		
1411	Tilia americana	basswood	11.5		good		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1412	Acer saccharum	sugar maple	8.1		good		
1413	Tilia americana	basswood	12.6		fair		
1414	Tilia americana	basswood	13.7		good		
1415	Prunus serotina	wild black cherry	10.5		fair		
1416	Acer saccharum	sugar maple	9.8		excellent		
1417	Acer saccharum	sugar maple	10.3		good		
1418	Acer saccharum	sugar maple	9.5		excellent		
1419	Acer rubrum	red maple	16.8		good	Y	
1420	Acer rubrum	red maple	8.2		excellent		
1421	Tilia americana	basswood	13.5		poor		
1422	Tilia americana	basswood	17.3		good		
1423	Tilia americana	basswood	15.5		good		
1424	Tilia americana	basswood	9.8		good		
1425	Tilia americana	basswood	10.8		good		
1426	Quercus rubra	red oak	14.3		good		
1427	Prunus serotina	wild black cherry	8.8		good		
1428	Carya glabra	pignut hickory	21.3		excellent	Y	
1429	Carya cordiformis	bitternut hickory	13.8		good		
1430	Quercus rubra	red oak	10.0		good		
1431	Quercus rubra	red oak	14.0		poor		
1432	Tilia americana	basswood	16.2		fair		
1433	Tilia americana	basswood	23.0		excellent	Y	
1434	Ulmus americana	American elm	8.5		fair		
1435	Quercus rubra	red oak	13.0		good		
1436	Juglans nigra	black walnut	12.0		good		
1437	Fraxinus pennsylvanica	green ash	9.0		poor		
1438	Juglans nigra	black walnut	9.5		fair		
1439	Juglans nigra	black walnut	11.0		good		
1440	Ulmus americana	American elm	9.0		good		
1441	Carya cordiformis	bitternut hickory	9.0		good		
1442	Carya cordiformis	bitternut hickory	9.0		good		
1443	Carya cordiformis	bitternut hickory	8.1		good		
1444	Tilia americana	basswood	8.0		good		
1445	Ulmus americana	American elm	11.6		fair		
1446	Prunus serotina	wild black cherry	16.3		good		
1447	Tilia americana	basswood	16.2		fair		
1448	Tilia americana	basswood	11.0		fair		
1449	Carya glabra	pignut hickory	20.0		excellent	Y	
1450	Quercus rubra	red oak	8.0		excellent		
1451	Quercus rubra	red oak	14.0		good		
1452	Quercus rubra	red oak	14.5		good		
1453	Tilia americana	basswood	14.5		good		
1454	Ulmus americana	American elm	10.1		good		
1455	Juglans nigra	black walnut	16.0		good		
1456	Juglans nigra	black walnut	13.1		good		
1457	Tilia americana	basswood	17.5		good		
1458	Tilia americana	basswood	18.5		fair	Y	
1459	Carya ovata	shagbark hickory	20.5		excellent	Y	
1460	Carya ovata	shagbark hickory	17.6		excellent	Y	
1461	Tilia americana	basswood	17.6		good		
1462	Carya ovata	shagbark hickory	17.0		excellent	Y	
1463	Tilia americana	basswood	13.8		good		
1464	Tilia americana	basswood	12.0		good		
1465	Tilia americana	basswood	8.0		good		
1466	Tilia americana	basswood	11.6		good		
1467	Tilia americana	basswood	15.5		good		
1468	Ulmus americana	American elm	15.0		good		
1469	Tilia americana	basswood	25.0		good	Y	

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1470	Tilia americana	basswood	12.8		good		
1471	Tilia americana	basswood	12.9		good		
1472	Tilia americana	basswood	17.0		good		
1473	Acer rubrum	red maple	13.8		good		
1474	Acer rubrum	red maple	8.2		good		
1475	Tilia americana	basswood	15.0		good		
1476	Prunus serotina	wild black cherry	17.5		fair		
1477	Tilia americana	basswood	15.1		fair		
1478	Tilia americana	basswood	11.3		good		
1479	Tilia americana	basswood	17.2		good		
1480	Acer nigrum	black maple	8.0		good		
1481	Prunus serotina	wild black cherry	10.5		good		
1482	Prunus serotina	wild black cherry	8.5		good		
1483	Acer rubrum	red maple	14.0		fair		
1484	Tilia americana	basswood	11.3		fair		
1485	Prunus serotina	wild black cherry	9.0		good		
1486	Ulmus americana	American elm	9.5		good		
1487	Ulmus americana	American elm	8.0		good		
1488	Tilia americana	basswood	15.7		good		
1489	Carya cordiformis	bitternut hickory	12.2		good		
1490	Acer rubrum	red maple	9.0		good		
1491	Acer rubrum	red maple	15.0		good		
1492	Acer rubrum	red maple	9.2		excellent		
1493	Tilia americana	basswood	12.5		excellent		
1494	Carya cordiformis	bitternut hickory	10.0		excellent		
1495	Tilia americana	basswood	8.8		good		
1496	Carya cordiformis	bitternut hickory	9.9		good		
1497	Tilia americana	basswood	11.2		good		
1498	Tilia americana	basswood	11.1		good		
1499	Tilia americana	basswood	10.2		good		
1501	Tilia americana	basswood	12.0		good		
1502	Tilia americana	basswood	16.2		good		
1503	Quercus alba	white oak	13.1		good		
1504	Tilia americana	basswood	12.8		good		
1505	Tilia americana	basswood	13.3		good		
1506	Tilia americana	basswood	13.5		good		
1507	Tilia americana	basswood	13.6		good		
1508	Tilia americana	basswood	11.2		good		
1509	Carya cordiformis	bitternut hickory	8.0		good		
1510	Tilia americana	basswood	10.4		good		
1511	Tilia americana	basswood	12.5		good		
1512	Tilia americana	basswood	14.2		good		
1513	Tilia americana	basswood	12.6		fair		
1514	Quercus alba	white oak	22.5		excellent	Y	
1515	Carya ovata	shagbark hickory	13.2		excellent		
1516	Quercus alba	white oak	17.0		excellent	Y	
1517	Tilia americana	basswood	11.5		good		
1518	Tilia americana	basswood	17.8		good		
1519	Tilia americana	basswood	8.8		good		
1520	Tilia americana	basswood	8.7		fair		
1521	Quercus macrocarpa	burr oak	23.5		excellent	Y	
1522	Quercus macrocarpa	burr oak	34.0		excellent	Y	
1523	Quercus macrocarpa	burr oak	13.1		good		
1524	Quercus macrocarpa	burr oak	25.6		fair	Y	
1525	Tilia americana	basswood	16.0		good		
1526	Tilia americana	basswood	9.9		poor		
1527	Tilia americana	basswood	9.5		fair		
1528	Ulmus americana	American elm	13.7		poor		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1529	Ulmus americana	American elm	19.8		excellent	Y	
1530	Tilia americana	basswood	18.0		good	Y	
1531	Tilia americana	basswood	8.0		fair		
1532	Prunus serotina	wild black cherry	8.0		fair		
1533	Carya cordiformis	bitternut hickory	21.5		good	Y	
1534	Quercus rubra	red oak	23.1		excellent	Y	
1535	Carya ovata	shagbark hickory	8.0		excellent		
1536	Quercus alba	white oak	12.7		good		
1537	Tilia americana	basswood	9.0		fair		
1538	Carya glabra	pignut hickory	11.2		good		
1539	Carya cordiformis	bitternut hickory	11.3		good		
1540	Carya cordiformis	bitternut hickory	9.4		fair		
1541	Prunus serotina	wild black cherry	12.4		good		
1542	Tilia americana	basswood	11.0		good		
1543	Quercus rubra	red oak	23.5		good	Y	
1544	Tilia americana	basswood	14.1		good		
1545	Tilia americana	basswood	22.2		fair	Y	
1546	Prunus serotina	wild black cherry	10.0		poor		
1547	Carya cordiformis	bitternut hickory	10.7		excellent		
1548	Tilia americana	basswood	9.8		good		
1549	Tilia americana	basswood	12.8		excellent		
1550	Carya cordiformis	bitternut hickory	17.9		excellent	Y	
1551	Quercus alba	white oak	28.1		good	Y	
1552	Tilia americana	basswood	9.6		excellent		
1553	Quercus macrocarpa	burr oak	11.3		good		
1554	Tilia americana	basswood	15.2		good		
1555	Tilia americana	basswood	9.7		good		
1556	Tilia americana	basswood	11.4		fair		
1557	Tilia americana	basswood	13.7		excellent		
1558	Tilia americana	basswood	9.9		good		
1559	Carya glabra	pignut hickory	20.1		good	Y	
1560	Quercus alba	white oak	14.8		excellent		
1561	Tilia americana	basswood	9.4		good		
1562	Carya glabra	pignut hickory	14.3		poor		
1563	Tilia americana	basswood	8.1		good		
1564	Tilia americana	basswood	9.9		excellent		
1565	Quercus rubra	red oak	20.2		good	Y	
1566	Tilia americana	basswood	8.0		good		
1567	Quercus rubra	red oak	16.9		good	Y	
1568	Tilia americana	basswood	8.7		poor		
1569	Tilia americana	basswood	20.1		good	Y	
1570	Tilia americana	basswood	14.3		poor		
1571	Tilia americana	basswood	10.1		fair		
1572	Carya ovata	shagbark hickory	22.8		excellent	Y	
1573	Tilia americana	basswood	16.9		fair		
1574	Quercus rubra	red oak	25.6		good	Y	
1575	Tilia americana	basswood	10.2		good		
1576	Tilia americana	basswood	11.3		good		
1577	Carya ovata	shagbark hickory	20.5		good	Y	
1578	Carya cordiformis	bitternut hickory	13.4		excellent		
1579	Tilia americana	basswood	11.3		fair		
1580	Tilia americana	basswood	10.5		good		
1581	Ulmus rubra	slippery elm	8.7		fair		
1582	Tilia americana	basswood	8.3		fair		
1583	Tilia americana	basswood	8.6		fair		
1584	Carya cordiformis	bitternut hickory	10.6		excellent		
1585	Tilia americana	basswood	8.7		good		
1586	Carya ovata	shagbark hickory	19.3		excellent	Y	

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1587	Tilia americana	basswood	9.7		good		
1588	Ulmus rubra	slippery elm	16.9		excellent		
1589	Carya cordiformis	bitternut hickory	15.0		excellent		
1590	Tilia americana	basswood	28.0		good	Y	
1591	Tilia americana	basswood	10.6		poor		
1592	Tilia americana	basswood	12.2		fair		
1593	Tilia americana	basswood	16.4		good		
1594	Fraxinus americana	white ash	9.1		good		
1595	Juglans nigra	black walnut	12.0		good		
1596	Tilia americana	basswood	8.0		fair		
1597	Ulmus americana	American elm	11.2		good		
1598	Tilia americana	basswood	9.3		excellent		
1599	Populus deltoides	cottonwood	41.3		excellent		
1600	Carya cordiformis	bitternut hickory	8.5		excellent		
1601	Quercus rubra	red oak	25.2		good	Y	
1602	Ulmus americana	American elm	9.8		good		
1603	Quercus rubra	red oak	17.4		good	Y	
1604	Carya cordiformis	bitternut hickory	10.9		good		
1605	Quercus rubra	red oak	9.2		good		
1606	Carya glabra	pignut hickory	12.8		good		
1607	Juglans nigra	black walnut	10.0		excellent		
1608	Tilia americana	basswood	9.4		good		
1609	Tilia americana	basswood	9.8		good		
1610	Tilia americana	basswood	11.3		fair		
1611	Tilia americana	basswood	12.6		fair		
1612	Tilia americana	basswood	11.9		good		
1613	Carya glabra	pignut hickory	17.7		excellent	Y	
1614	Ulmus rubra	slippery elm	9.8		good		
1615	Tilia americana	basswood	12.8		good		
1616	Tilia americana	basswood	8.9		good		
1617	Carya cordiformis	bitternut hickory	14.2		good		
1618	Tilia americana	basswood	17.7		excellent		
1619	Tilia americana	basswood	13.0		good		
1620	Carya glabra	pignut hickory	16.9		good	Y	
1621	Carya ovata	shagbark hickory	23.9		excellent	Y	
1622	Tilia americana	basswood	10.4		fair		
1623	Tilia americana	basswood	12.2		excellent		
1624	Quercus rubra	red oak	11.3		excellent		
1625	Ulmus americana	American elm	11.1		good		
1626	Carya ovata	shagbark hickory	21.3		excellent	Y	
1627	Tilia americana	basswood	8.3		good		
1628	Quercus alba	white oak	12.8		excellent		
1629	Carya ovata	shagbark hickory	20.9		excellent	Y	
1630	Tilia americana	basswood	20.8		good	Y	
1631	Tilia americana	basswood	10.2		good		
1632	Tilia americana	basswood	13.1		excellent		
1633	Tilia americana	basswood	10.8		good		
1634	Tilia americana	basswood	15.0		excellent		
1635	Tilia americana	basswood	8.6		good		
1636	Tilia americana	basswood	14.4		excellent		
1637	Tilia americana	basswood	25.3		good	Y	
1638	Tilia americana	basswood	9.4		good		
1639	Tilia americana	basswood	11.0		fair		
1640	Tilia americana	basswood	14.7		excellent		
1641	Tilia americana	basswood	8.6		good		
1642	Tilia americana	basswood	12.8		excellent		
1643	Quercus rubra	red oak	15.6		excellent		
1644	Tilia americana	basswood	18.1		excellent	Y	

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1645	Tilia americana	basswood	15.9		fair		
1646	Ulmus americana	American elm	9.3		good		
1647	Ulmus americana	American elm	21.1		good	Y	
1648	Carya cordiformis	bitternut hickory	8.0		good		
1649	Quercus rubra	red oak	23.8		excellent	Y	
1650	Carya glabra	pignut hickory	9.7		good		
1651	Tilia americana	basswood	13.5		good		
1652	Carya ovata	shagbark hickory	13.2		good		
1653	Carya glabra	pignut hickory	10.4		good		
1654	Quercus rubra	red oak	25.0		good	Y	
1655	Ulmus americana	American elm	11.4		fair		
1656	Prunus serotina	wild black cherry	10.6		fair		
1657	Quercus rubra	red oak	11.1		good		
1658	Tilia americana	basswood	14.3		fair		
1659	Tilia americana	basswood	18.0		good	Y	
1660	Carya cordiformis	bitternut hickory	9.7		excellent		
1661	Tilia americana	basswood	19.3		excellent	Y	
1662	Tilia americana	basswood	16.7		excellent		
1663	Tilia americana	basswood	10.8		excellent		
1664	Tilia americana	basswood	9.1		excellent		
1665	Tilia americana	basswood	14.2		excellent		
1666	Tilia americana	basswood	9.1		poor		
1667	Tilia americana	basswood	8.3		good		
1668	Tilia americana	basswood	15.6		excellent		
1669	Tilia americana	basswood	11.0		good		
1670	Prunus serotina	wild black cherry	9.2		fair		
1671	Prunus serotina	wild black cherry	9.0		excellent		
1672	Carya ovata	shagbark hickory	25.1		excellent	Y	
1673	Tilia americana	basswood	17.8		excellent		
1674	Tilia americana	basswood	8.6		fair		
1675	Ostrya virginiana	ironwood	9.1		good		
1676	Tilia americana	basswood	9.6		good		
1677	Tilia americana	basswood	16.9		good		
1678	Tilia americana	basswood	11.0		good		
1679	Tilia americana	basswood	9.8		excellent		
1680	Carya cordiformis	bitternut hickory	11.7		excellent		
1681	Quercus rubra	red oak	12.8		excellent		
1682	Prunus serotina	wild black cherry	8.3		poor		
1683	Ulmus americana	American elm	8.5		good		
1684	Quercus rubra	red oak	10.1		excellent		
1685	Tilia americana	basswood	12.3		good		
1686	Carya ovata	shagbark hickory	15.0		good		
1687	Quercus alba	white oak	15.9		good		
1688	Quercus rubra	red oak	10.9		good		
1689	Ulmus americana	American elm	14.1		excellent		
1690	Juglans nigra	black walnut	19.0		excellent	Y	
1691	Ulmus americana	American elm	10.3		excellent		
1692	Carya cordiformis	bitternut hickory	17.4		excellent	Y	
1693	Carya ovata	shagbark hickory	10.6		good		
1694	Quercus rubra	red oak	16.7		excellent	Y	
1695	Tilia americana	basswood	15.1		excellent		
1696	Quercus macrocarpa	burr oak	9.5		good		
1697	Carya cordiformis	bitternut hickory	11.8		excellent		
1698	Quercus rubra	red oak	9.3		excellent		
1699	Juglans nigra	black walnut	15.6		excellent		
1700	Quercus rubra	red oak	24.3		excellent	Y	
1701	Ulmus americana	American elm	8.1		good		
1702	Quercus rubra	red oak	18.3		good	Y	

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1703	Quercus rubra	red oak	14.8		excellent		
1704	Ulmus americana	American elm	11.6		excellent		
1705	Juglans nigra	black walnut	11.2		good		
1706	Quercus rubra	red oak	20.9		good	Y	
1707	Quercus rubra	red oak	11.2		excellent		
1708	Carya cordiformis	bitternut hickory	8.7		excellent		
1709	Quercus rubra	red oak	12.8		excellent		
1710	Quercus macrocarpa	burr oak	11.7		excellent		
1711	Juglans nigra	black walnut	12.1		excellent		
1712	Carya cordiformis	bitternut hickory	11.8		excellent		
1713	Carya cordiformis	bitternut hickory	9.5		good		
1714	Quercus macrocarpa	burr oak	18.4		excellent	Y	
1715	Tilia americana	basswood	22.8		good	Y	
1716	Tilia americana	basswood	10.6		good		
1717	Tilia americana	basswood	9.2		fair		
1718	Carya cordiformis	bitternut hickory	10.8		excellent		
1719	Quercus macrocarpa	burr oak	9.8		good		
1720	Tilia americana	basswood	14.1		good		
1721	Ulmus americana	American elm	8.5		good		
1722	Carya cordiformis	bitternut hickory	10.4		excellent		
1723	Carya cordiformis	bitternut hickory	9.1		excellent		
1724	Carya cordiformis	bitternut hickory	10.0		good		
1725	Ulmus americana	American elm	10.5		excellent		
1726	Ulmus americana	American elm	8.3		excellent		
1727	Carya glabra	pignut hickory	18.3		good	Y	
1728	Carya glabra	pignut hickory	11.9		excellent		
1729	Quercus rubra	red oak	9.1		excellent		
1730	Carya ovata	shagbark hickory	22.4		excellent	Y	
1731	Carya ovata	shagbark hickory	22.4		excellent	Y	
1732	Ulmus americana	American elm	15.4		excellent		
1733	Carya ovata	shagbark hickory	17.7		good	Y	
1734	Carya ovata	shagbark hickory	13.5		excellent		
1735	Tilia americana	basswood	13.8		good		
1736	Tilia americana	basswood	12.8		good		
1737	Carya ovata	shagbark hickory	21.8		excellent	Y	
1738	Tilia americana	basswood	9.9		fair		
1739	Tilia americana	basswood	10.4		excellent		
1740	Tilia americana	basswood	10.8		fair		
1741	Carya ovata	shagbark hickory	18.9		excellent	Y	
1742	Prunus serotina	wild black cherry	8.1		excellent		
1743	Ostrya virginiana	ironwood	8.2		excellent		
1744	Tilia americana	basswood	10.7		excellent		
1745	Carya glabra	pignut hickory	13.4		excellent		
1746	Ostrya virginiana	ironwood	8.3		excellent		
1747	Ostrya virginiana	ironwood	9.9		excellent		
1748	Acer rubrum	red maple	13.9		good		
1749	Tilia americana	basswood	11.9		good		
1750	Tilia americana	basswood	8.5		good		
1751	Tilia americana	basswood	9.4		good		
1752	Prunus serotina	wild black cherry	17.3		excellent		
1753	Quercus rubra	red oak	20.2		excellent	Y	
1754	Prunus serotina	wild black cherry	10.3		good		
1755	Tilia americana	basswood	14.8		excellent		
1756	Tilia americana	basswood	13.1		excellent		
1757	Tilia americana	basswood	10.5		excellent		
1758	Sassafras albidum	sassafras	19.3		good		
1759	Tilia americana	basswood	16.7		excellent		
1760	Tilia americana	basswood	19.2		good	Y	

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1761	Tilia americana	basswood	10.8		excellent		
1762	Quercus rubra	red oak	18.5		excellent	Y	
1763	Tilia americana	basswood	8.9		good		
1764	Quercus rubra	red oak	23.4		excellent	Y	
1765	Tilia americana	basswood	9.8		good		
1766	Tilia americana	basswood	29.5		good	Y	
1767	Quercus rubra	red oak	13.4		good		
1768	Tilia americana	basswood	9.8		good		
1769	Tilia americana	basswood	12.2		good		
1770	Quercus rubra	red oak	12.2		good		
1771	Prunus serotina	wild black cherry	15.3		poor		
1772	Quercus rubra	red oak	14.3		excellent		
1773	Prunus serotina	wild black cherry	8.1		excellent		
1774	Prunus serotina	wild black cherry	16.1		excellent		
1775	Tilia americana	basswood	8.5		good		
1776	Tilia americana	basswood	8.8		good		
1777	Quercus rubra	red oak	25.2		good	Y	
1778	Quercus rubra	red oak	9.1		excellent		
1779	Quercus rubra	red oak	18.8		good	Y	
1780	Tilia americana	basswood	15.1		good		
1781	Tilia americana	basswood	9.4		good		
1782	Tilia americana	basswood	21.5		excellent	Y	
1783	Carya ovata	shagbark hickory	16.5		excellent	Y	
1784	Tilia americana	basswood	11.0		good		
1785	Carya glabra	pignut hickory	12.8		excellent		
1786	Quercus rubra	red oak	22.2		good	Y	
1787	Tilia americana	basswood	17.6		good		
1788	Tilia americana	basswood	19.6		excellent	Y	
1789	Ulmus americana	American elm	20.3		poor	Y	
1790	Tilia americana	basswood	12.7		excellent		
1791	Quercus rubra	red oak	9.6		good		
1792	Tilia americana	basswood	10.7		good		
1793	Tilia americana	basswood	11.4		good		
1794	Prunus serotina	wild black cherry	8.3		good		
1795	Tilia americana	basswood	15.0		good		
1796	Tilia americana	basswood	16.6		excellent		
1797	Tilia americana	basswood	8.0		good		
1798	Tilia americana	basswood	17.4		excellent		
1799	Tilia americana	basswood	21.8		excellent	Y	
1800	Ulmus americana	American elm	10.0		good		
1801	Tilia americana	basswood	9.6		excellent		
1802	Tilia americana	basswood	11.1		good		
1803	Acer negundo	box elder	11.7		poor		
1804	Tilia americana	basswood	9.8		excellent		
1805	Tilia americana	basswood	11.7		fair		
1806	Tilia americana	basswood	18.1		excellent	Y	
1807	Tilia americana	basswood	13.4		excellent		
1808	Acer rubrum	red maple	33.5		poor	Y	
1809	Tilia americana	basswood	23.8		good	Y	
1810	Tilia americana	basswood	18.5		fair	Y	
1811	Tilia americana	basswood	11.4		fair		
1812	Tilia americana	basswood	14.2		good		
1813	Acer rubrum	red maple	8.4		excellent		
1814	Tilia americana	basswood	13.5		good		
1815	Tilia americana	basswood	11.0		good		
1816	Tilia americana	basswood	11.4		excellent		
1817	Tilia americana	basswood	9.9		good		
1818	Tilia americana	basswood	8.7		excellent		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1819	Tilia americana	basswood	8.1		good		
1820	Tilia americana	basswood	8.3		good		
1821	Ulmus americana	American elm	21.2		good	Y	
1822	Quercus rubra	red oak	9.6		excellent		
1823	Quercus rubra	red oak	22.4		good	Y	
1824	Tilia americana	basswood	10.4		good		
1825	Tilia americana	basswood	12.1		good		
1826	Quercus rubra	red oak	15.5		good		
1827	Quercus rubra	red oak	16.2		excellent	Y	
1828	Quercus rubra	red oak	15.6		good		
1829	Quercus rubra	red oak	17.7		excellent	Y	
1830	Tilia americana	basswood	9.1		excellent		
1831	Tilia americana	basswood	8.0		excellent		
1832	Acer rubrum	red maple	10.5		fair		
1833	Acer rubrum	red maple	11.0		good		
1834	Ulmus americana	American elm	8.0		good		
1835	Prunus serotina	wild black cherry	8.8		good		
1836	Quercus coccinea	scarlet oak	13.0		good		
1837	Quercus rubra	red oak	18.7		good	Y	
1838	Carya ovata	shagbark hickory	10.9		excellent		
1839	Quercus rubra	red oak	10.2		excellent		
1840	Quercus rubra	red oak	24.0		good	Y	
1841	Quercus rubra	red oak	12.8		good		
1842	Acer rubrum	red maple	10.2		good		
1843	Quercus rubra	red oak	10.2		good		
1844	Quercus rubra	red oak	15.0		good		
1845	Carya ovata	shagbark hickory	10.0		excellent		
1846	Carya cordiformis	bitternut hickory	9.8		excellent		
1847	Carya ovata	shagbark hickory	12.7		good		
1848	Acer rubrum	red maple	8.9		poor		
1849	Tilia americana	basswood	8.5		good		
1850	Prunus serotina	wild black cherry	12.1		good		
1851	Ulmus americana	American elm	12.4		fair		
1852	Quercus rubra	red oak	16.5		excellent	Y	
1853	Carya cordiformis	bitternut hickory	13.0		excellent		
1854	Quercus macrocarpa	burr oak	10.5		good		
1855	Quercus rubra	red oak	8.1		excellent		
1856	Carya cordiformis	bitternut hickory	12.0		excellent		
1857	Quercus rubra	red oak	22.5		excellent	Y	
1858	Ulmus americana	American elm	12.2		excellent		
1859	Quercus rubra	red oak	12.6		excellent		
1860	Quercus macrocarpa	burr oak	13.1		excellent		
1861	Ulmus americana	American elm	8.5		good		
1862	Carya ovata	shagbark hickory	11.0		good		
1863	Juglans nigra	black walnut	8.1		good		
1864	Juglans nigra	black walnut	12.0		good		
1865	Juglans nigra	black walnut	9.1		good		
1866	Juniperus virginiana	red cedar	2.4	12	good		
1867	Acer negundo	box elder	11.4		poor		
1868	Ulmus americana	American elm	13.8		good		
1869	Juniperus virginiana	red cedar	2.6	14	good		
1870	Juglans nigra	black walnut	13.4		good		
1871	Juglans nigra	black walnut	8.2		good		
1872	Juniperus virginiana	red cedar	3.1	14	good		
1873	Juglans nigra	black walnut	9.5		good		
1874	Juglans nigra	black walnut	9.1		good		
1875	Morus alba	white mulberry	9.6		fair		
1876	Ulmus rubra	slippery elm	10.7		good		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1877	Acer negundo	box elder	8.0		poor		
1878	Acer negundo	box elder	13.4		poor		
1879	Prunus serotina	wild black cherry	11.1		good		
1880	Crataegus sp.	hawthorn	8.3		good		
1881	Acer negundo	box elder	9.1		poor		
1882	Prunus serotina	wild black cherry	10.9		excellent		
1883	Morus alba	white mulberry	14.6		fair		
1884	Juglans nigra	black walnut	8.7		good		
1885	Juglans nigra	black walnut	8.6		good		
1886	Acer negundo	box elder	11.0		fair		
1887	Prunus serotina	wild black cherry	8.7		excellent		
1888	Acer negundo	box elder	9.5		dead or dying		
1889	Fraxinus americana	white ash	10.8		good		
1890	Juglans nigra	black walnut	10.0		good		
1891	Juglans nigra	black walnut	14.0		good		
1892	Acer negundo	box elder	8.3		poor		
1893	Prunus serotina	wild black cherry	10.6		fair		
1894	Juglans nigra	black walnut	12.2		good		
1895	Juglans nigra	black walnut	8.9		good		
1896	Fraxinus americana	white ash	9.1		good		
1897	Juglans nigra	black walnut	15.9		good		
1898	Acer negundo	box elder	9.1		poor		
1899	Juglans nigra	black walnut	21.1		excellent	Y	
1900	Acer negundo	box elder	15.2		poor		
1901	Crataegus sp.	hawthorn	14.4		fair		
1902	Celtis occidentalis	hackberry	12.8		good		
1903	Juglans nigra	black walnut	34.2		good	Y	
1904	Juglans nigra	black walnut	13.5		excellent		
1905	Tilia americana	basswood	11.5		good		
1906	Acer negundo	box elder	11.5		fair		
1907	Acer negundo	box elder	8.5		dead or dying		
1908	Acer negundo	box elder	9.8		dead or dying		
1909	Carya cordiformis	bitternut hickory	9.4		excellent		
1910	Juglans nigra	black walnut	8.7		good		
1911	Acer negundo	box elder	15.4		poor		
1912	Acer negundo	box elder	13.3		poor		
1913	Juglans nigra	black walnut	18.9		excellent	Y	
1914	Juglans nigra	black walnut	16.7		excellent		
1915	Carya cordiformis	bitternut hickory	17.5		excellent	Y	
1916	Ulmus americana	American elm	11.0		good		
1917	Acer negundo	box elder	9.3		poor		
1918	Carya cordiformis	bitternut hickory	15.2		excellent		
1919	Juglans nigra	black walnut	16.0		good		
1920	Tilia americana	basswood	8.0		good		
1921	Juglans nigra	black walnut	9.9		excellent		
1922	Juglans nigra	black walnut	9.1		good		
1923	Juglans nigra	black walnut	15.2		good		
1924	Juglans nigra	black walnut	9.2		excellent		
1925	Juglans nigra	black walnut	31.9		fair	Y	
1926	Juniperus virginiana	red cedar	4.0	13	good		
1927	Juniperus virginiana	red cedar	1.8	12	good		
1928	Juniperus virginiana	red cedar	2.9	12	good		
1929	Juniperus virginiana	red cedar	3.9	14	excellent		
1930	Pinus sylvestris	Scotch pine	11.5	32	excellent		
1931	Juglans nigra	black walnut	17.9		good		
1932	Juglans nigra	black walnut	17.0		good		
1933	Juglans nigra	black walnut	8.9		good		
1934	Juglans nigra	black walnut	10.9		good		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1935	Juglans nigra	black walnut	8.1		good		
1936	Juglans nigra	black walnut	10.4		good		
1937	Juglans nigra	black walnut	19.1		good	Y	
1938	Juglans nigra	black walnut	26.8		fair	Y	
1939	Juglans nigra	black walnut	11.1		good		
1940	Juglans nigra	black walnut	12.6		fair		
1941	Juglans nigra	black walnut	21.3		fair	Y	
1942	Juglans nigra	black walnut	15.5		good		
1943	Morus alba	white mulberry	8.0		good		
1944	Juglans nigra	black walnut	12.7		fair		
1945	Juglans nigra	black walnut	8.1		fair		
1946	Acer negundo	box elder	9.3		dead or dying		
1947	Acer negundo	box elder	9.0		fair		
1948	Juglans nigra	black walnut	10.9		good		
1949	Acer negundo	box elder	13.6		fair		
1950	Salix nigra	black willow	8.6		good		
1951	Acer negundo	box elder	9.3		poor		
1952	Juglans nigra	black walnut	20.9		fair	Y	
1953	Acer negundo	box elder	10.0		poor		
1954	Juglans nigra	black walnut	9.1		excellent		
1955	Acer negundo	box elder	8.2		poor		
1956	Juglans nigra	black walnut	10.2		excellent		
1957	Salix nigra	black willow	17.1		fair		
1958	Salix nigra	black willow	15.6		good		
1959	Juglans nigra	black walnut	23.1		fair	Y	
1960	Populus deltoides	cottonwood	17.7		good		
1961	Juglans nigra	black walnut	8.1		good		
1962	Populus deltoides	cottonwood	42.1		good		
1963	Juglans nigra	black walnut	8.0		good		
1964	Juglans nigra	black walnut	9.0		excellent		
1965	Juglans nigra	black walnut	11.5		excellent		
1966	Juglans nigra	black walnut	9.1		good		
1967	Juglans nigra	black walnut	8.3		excellent		
1968	Acer negundo	box elder	8.3		poor		
1969	Juglans nigra	black walnut	11.7		good		
1970	Juglans nigra	black walnut	8.8		excellent		
1971	Juglans nigra	black walnut	13.9		good		
1972	Juglans nigra	black walnut	16.6		excellent		
1973	Juglans nigra	black walnut	11.7		excellent		
1974	Morus alba	white mulberry	8.0		fair		
1975	Juglans nigra	black walnut	10.3		excellent		
1976	Prunus serotina	wild black cherry	19.7		fair	Y	
1977	Prunus serotina	wild black cherry	8.4		excellent		
1978	Juglans nigra	black walnut	12.0		good		
1979	Juglans nigra	black walnut	9.5		good		
1980	Ulmus americana	American elm	10.7		excellent		
1981	Juglans nigra	black walnut	8.0		excellent		
1982	Juglans nigra	black walnut	8.5		good		
1983	Populus deltoides	cottonwood	32.8		excellent		
1984	Juglans nigra	black walnut	15.2		good		
1985	Salix amygdaloides	peach-leaved willo	8.5		good		
1986	Juglans nigra	black walnut	10.1		excellent		
1987	Juglans nigra	black walnut	15.2		excellent		
1988	Ulmus americana	American elm	11.2		excellent		
1989	Ulmus americana	American elm	9.4		good		
1990	Ulmus americana	American elm	8.4		good		
1991	Ulmus americana	American elm	9.0		excellent		
1992	Juglans nigra	black walnut	15.9		excellent		

Tag No.	Scientific Name	Common Name	DBH (inches)	Height (feet)	Condition	Landmark	Sovereign
1993	Juglans nigra	black walnut	17.8		excellent		
1994	Acer negundo	box elder	8.2		poor		
1995	Juglans nigra	black walnut	11.0		excellent		
1996	Juglans nigra	black walnut	8.7		excellent		
1997	Juglans nigra	black walnut	16.7		excellent		
1998	Juglans nigra	black walnut	15.6		good		
1999	Acer negundo	box elder	8.7		poor		
2000	Juglans nigra	black walnut	8.1		good		

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Appendix F

Topographic Survey

TOPOGRAPHIC SURVEY OF HATCI

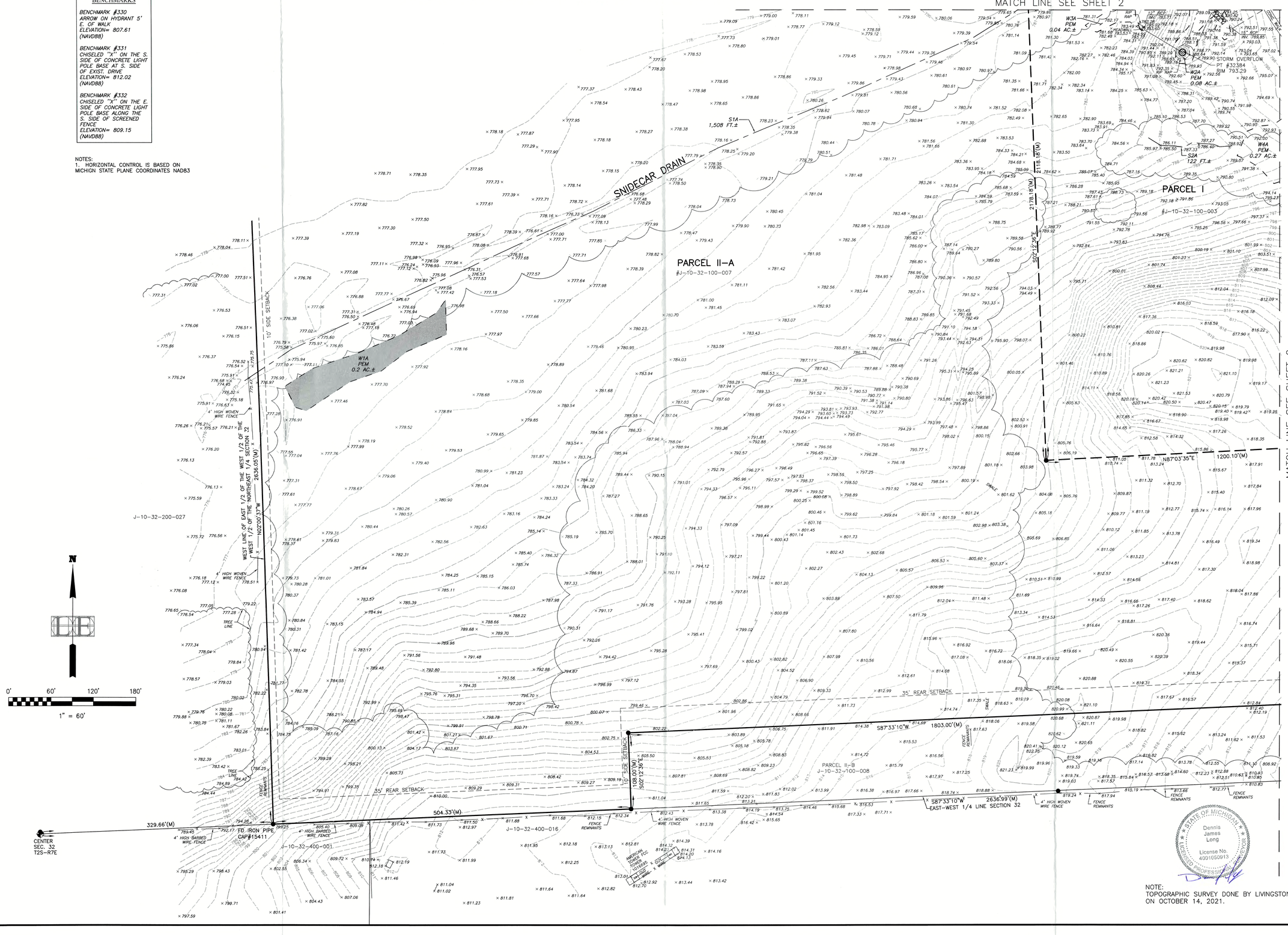
BENCHMARKS

BENCHMARK #330
ARROW ON HYDRANT 5' E. OF WALK
ELEVATION= 807.61
(NAVD88)

BENCHMARK #331
CHISELED "X" ON THE S. SIDE OF CONCRETE LIGHT POLE BASE AT S. SIDE OF EXIST. DRIVE
ELEVATION= 812.02
(NAVD88)

BENCHMARK #332
CHISELED "X" ON THE E. SIDE OF CONCRETE LIGHT POLE BASE ALONG THE S. SIDE OF SCREENED FENCE.
ELEVATION= 809.15
(NAVD88)

NOTES:
1. HORIZONTAL CONTROL IS BASED ON MICHIGN STATE PLANE COORDINATES NAD83



NOTE:
TOPOGRAPHIC SURVEY DONE BY LIVINGSTON ENGINEERING ON OCTOBER 14, 2021.

Dennis James Long
License No. 4001050913
REGISTERED PROFESSIONAL SURVEYOR
STATE OF MICHIGAN

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IBI GROUP
25200 TELEGRAPH RD.,
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TOPOGRAPHIC SURVEY
HATCI
SUPERIOR TOWNSHIP, MICHIGAN

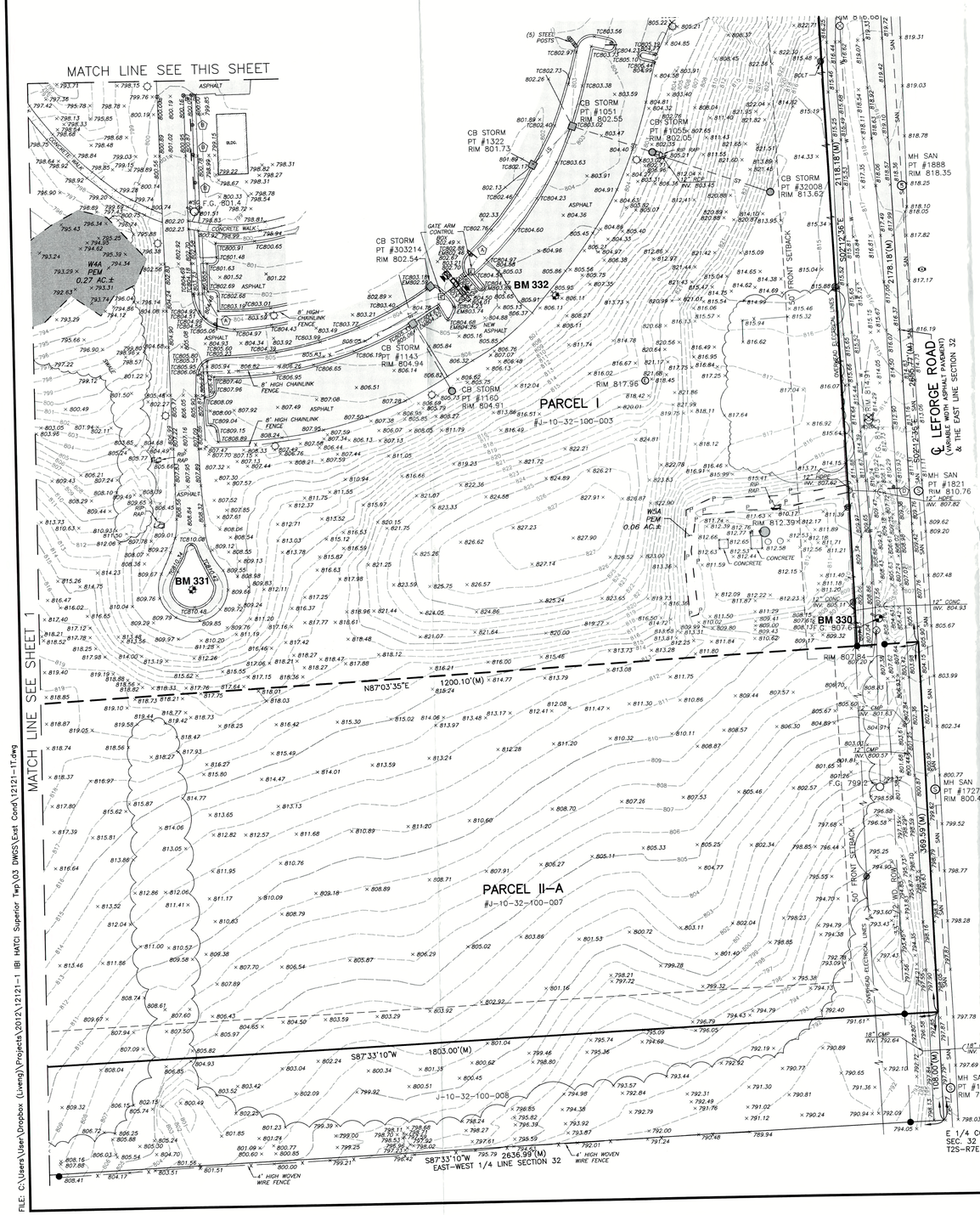
REVISIONS	DATE

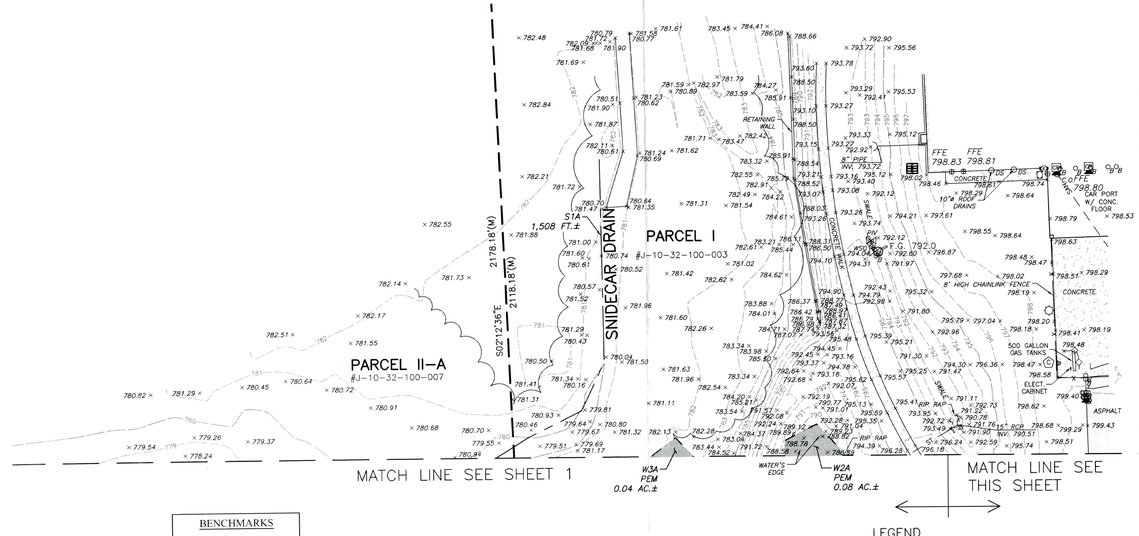
Drawn: N. LEMONS
Checked:
Approved:
Date: 2021-10-20

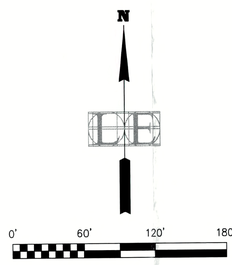
Job. no: 12121-1
Scale:
Vertical:
Horizontal: 1" = 60'

FILE: C:\Users\User\Dropbox (Living)\Projects\2012\12121-1 IBI HATCI Superior Twp\03 DWGS\East Cond\12121-1T.dwg

TOPOGRAPHIC SURVEY OF HATCI







BENCHMARKS

BENCHMARK #330
ARROW ON HYDRANT 5' E. OF WALK
ELEVATION= 807.61
(NAVD88)

BENCHMARK #331
CHISELED "X" ON THE S. SIDE OF CONCRETE LIGHT POLE BASE AT S. SIDE OF EXIST. DRIVE
ELEVATION= 812.02
(NAVD88)

BENCHMARK #332
CHISELED "X" ON THE E. SIDE OF CONCRETE LIGHT POLE BASE ALONG THE S. SIDE OF SCREENED FENCE
ELEVATION= 809.15
(NAVD88)

SIGN TABLE

- (A) STOP
- (B) NO PARKING
- (C) NO SMOKING
- (D) 45 MPH

NOTES:
1. HORIZONTAL CONTROL IS BASED ON MICHIGN STATE PLANE COORDINATES NAD83

EXISTING STORM SEWER STRUCTURES

CB PT #1051
4' DIA. PRECAST
RIM ELEV. 802.55
24" RCP 791.62 SW
24" RCP 791.65 NW
12" RCP 795.35 SE

CB PT #1055
4' DIA. PRECAST
RIM ELEV. 802.05
12" RCP 797.87 NW

CB PT #1143
4' DIA. PRECAST
RIM ELEV. 804.94
12" RCP 799.49 SE
12" RCP 799.39 NW

CB PT #1160
4' DIA. PRECAST
RIM ELEV. 804.91
12" RCP 801.06 NW

CB PT #1322
4' DIA. PRECAST
RIM ELEV. 801.73
21" RCP 792.23 SW
24" RCP 792.13 NE
12" RCP 797.33 NW

CB PT #32008
4' DIA. PRECAST
W/ BEEHIVE COVER
RIM ELEV. 813.62
12" RCP 808.92 NW

CB PT #303214
RIM ELEV. 802.54
COULD NOT OPEN

OVERFLOW PT #32384
4' DIA. PRECAST W/
5' DIA. GRATED COVER
RIM ELEV. 793.29
12" RCP 784.29 NW
(3) 1.5" HOLES @ 791.07
(HOLES ARE AT E. SIDE OF STRUCTURE

EXISTING SANITARY SEWER STRUCTURES

MH SAN
PT #1695
4' DIA. PRECAST
RIM ELEV. 797.73
12" * 785.48 S
12" * 785.61 N
(* UNABLE TO VERIFY)

MH SAN
PT #1727
4' DIA. PRECAST
RIM ELEV. 800.44
12" * 786.69 S
12" * 786.69 N
(* UNABLE TO VERIFY)

MH SAN
PT #1821
4' DIA. PRECAST
RIM ELEV. 810.76
12" PVC 797.86 N
12" PVC 797.56 S

MH SAN
PT #1888
4' DIA. PRECAST
RIM ELEV. 818.35
12" RCP 803.37 S
12" RCP 803.55 N

LEGEND

- ELECTRIC HANDHOLE
- (E) ELECTRIC MANHOLE
- END SECTION
- DOWN SPOUT
- STORM MANHOLE
- CATCH BASIN ROUND
- CATCH BASIN SQUARE
- STORM CONTROL STRUCTURE
- SANITARY CLEANOUT
- (S) SANITARY MANHOLE
- WATER SHUTOFF VALVE
- WATER MAIN POST INDICATOR VALVE
- GATE VALVE IN BOX
- GATE VALVE IN WELL
- FDC
- HYDRANT
- IRRIGATION VALVE BOX
- MANHOLE
- P WETLAND FLAG
- GUY WIRE
- UTILITY POLE
- SIGN
- LIGHT POLE
- BOLLARD LIGHT
- BOLLARD
- CONIFEROUS TREE
- DECIDUOUS TREE
- POST
- FLAG POLE
- FINISHED FLOOR
- FOUND IRON ROD
- SECTION CORNER
- TRAVERSE POINT-SET
- BENCHMARK
- EXISTING OVERHEAD UTILITY LINE
- —SAN— EXISTING SANITARY SEWER LINE
- — ST — EXISTING STORM SEWER LINE
- —GAS— EXISTING UNDERGROUND GAS LINE
- — W — EXISTING UNDERGROUND WATER LINE
- — T — EXISTING COMMUNICATION LINE
- — E — EXISTING UNDERGROUND ELECTRIC LINE
- GUARDRAIL
- TREE LINE
- ASPHALT PAVEMENT
- CONCRETE
- BRICK PAVERS

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NOTE:
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TOPOGRAPHIC SURVEY
HATCI
SUPERIOR TOWNSHIP, MICHIGAN

DATE	REVISIONS

Drawn: N. LEMONS
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2 of 2

FILE: C:\Users\User\Dropbox (Living)\Projects\2012\12121-1 IBI HATCI Superior Twp\03 DWGS\East Cond\12121-1T.dwg