# PUBLIC IMPROVEMENT REQUEST FOR PROPOSAL

## RFP# 25-39

## High-Level Trunkline Capacity Improvements Project

City of Ann Arbor
Public Services / Engineering

## Due Date: October 30, 2025 by 11:00 a.m. (local time)

Issued By:

City of Ann Arbor
Procurement Unit
301 E. Huron Street
Ann Arbor, MI 48104

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# SECTION I - GENERAL INFORMATION

## A. OBJECTIVE

The purpose of this Request for Proposal (RFP) is to select a firm to provide construction services for the High-Level Trunkline Capacity Improvements Project.

## B. BID SECURITY

Each bid must be accompanied by a certified check or Bid Bond by a surety licensed and authorized to do business within the State of Michigan, in the amount of 5% of the total of the bid price.

***Proposals that fail to provide a bid security upon proposal opening will be deemed non-responsive and will not be considered for award.***

## C. QUESTIONS AND CLARIFICATIONS / DESIGNATED CITY CONTACTS

All questions regarding this Request for Proposal (RFP) shall be submitted via e-mail. Questions will be accepted and answered in accordance with the terms and conditions of this RFP.

**All questions shall be submitted on or before October 16, 2025 at 5:00 p.m. (local time)**, and should be addressed as follows:

Scope of Work/Proposal Content questions shall be e-mailed to Chris Elenbaas, Project Manager, chris.elenbaas@ohm-advisors.com

RFP Process and Compliance questions shall be e-mailed to Colin Spencer, Buyer - CSpencer@a2gov.org

Should any prospective bidder be in doubt as to the true meaning of any portion of this RFP, or should the prospective bidder find any ambiguity, inconsistency, or omission therein, the prospective bidder shall make a written request for an official interpretation or correction by the due date for questions above.

All interpretations, corrections, or additions to this RFP will be made only as an official addendum that will be posted to a2gov.org and MITN.info and it shall be the prospective bidder's responsibility to ensure they have received all addenda before submitting a proposal. Any addendum issued by the City shall become part of the RFP, and must be incorporated in the proposal where applicable.

## D. PRE-PROPOSAL MEETING

A **mandatory** pre-proposal conference for this project will be held on **September 29, 2025** at **10:00 a.m. at Ann Arbor City Hall, Basement Conference Room A located at 301 East**

**Huron Street, Ann Arbor, Michigan 48107**. **Failure to attend the meeting and sign the RFP sign-in sheet at the pre-proposal meeting will automatically disqualify a bidder from submitting a valid proposal.** A virtual meeting option is available and a link to the meeting can be received by emailing Chris Elenbaas, Project Manager, at chris.elenbaas@ohm-advisors.com. Any proposal submitted by a party not attending and signing the roster at the pre-proposal meeting will not be opened or considered. Administrative and technical questions regarding this project will be answered at this time. The pre-proposal meeting is for information only. Any answers furnished will not be official until verified in writing by the Financial Service Area, Procurement Unit. Answers that change or substantially clarify the proposal will be affirmed in an addendum.

## E. PROPOSAL FORMAT

To be considered, each firm must submit a response to this RFP using the format provided in Section III. No other distribution of proposals is to be made by the prospective bidder. An official authorized to bind the bidder to its provisions must sign the proposal. Each proposal must remain valid for at least one hundred and twenty (120) days from the due date of this RFP.

Proposals should be prepared simply and economically providing a straightforward, concise description of the bidder's ability to meet the requirements of the RFP. No erasures are permitted. Mistakes may be crossed out and corrected and must be initialed in ink by the person signing the proposal.

## F. SELECTION CRITERIA

Responses to this RFP will be evaluated using a point system as shown in Section III. A selection committee comprised primarily of staff from the City will complete the evaluation.

If interviews are desired by the City, the selected firms will be given the opportunity to discuss their proposal, qualifications, past experience, and their fee proposal in more detail. The City further reserves the right to interview the key personnel assigned by the selected bidder to this project.

All proposals submitted may be subject to clarifications and further negotiation. All agreements resulting from negotiations that differ from what is represented within the RFP or in the proposal response shall be documented and included as part of the final contract.

## G. SEALED PROPOSAL SUBMISSION

**All proposals are due and must be delivered to the City on or before October 30, 2025 by 11:00 a.m. (local time).** Proposals submitted late or via oral, telephonic, telegraphic, electronic mail or facsimile **will not** be considered or accepted.

**Each respondent should submit in a sealed envelope**

- **one (1) original proposal**
- **one (1) additional proposal copy**
- **one (1) digital copy of the proposal preferably on a USB/flash drive as one file in PDF format**

Proposals submitted should be clearly marked: **"RFP No. 25-39 – High-Level Trunkline Capacity Improvements Project"** and list the bidder's name and address.

Proposals must be addressed and delivered to:
City of Ann Arbor
c/o Customer Service
301 East Huron Street
Ann Arbor, MI 48107

All proposals received on or before the due date will be publicly opened and recorded on the due date. No immediate decisions will be rendered.

Hand delivered proposals may be dropped off in the Purchasing drop box located in the Ann Street (north) vestibule/entrance of City Hall which is open to the public Monday through Friday from 8am to 5pm (except holidays). The City will not be liable to any prospective bidder for any unforeseen circumstances, delivery, or postal delays. Postmarking on the due date will not substitute for receipt of the proposal.

Bidders are responsible for submission of their proposal. Additional time will not be granted to a single prospective bidder. However, additional time may be granted to all prospective bidders at the discretion of the City.

**A proposal may be disqualified if the following required forms are not included with the proposal:**

- **Attachment B – General Declarations**
- **Attachment D - Prevailing Wage Declaration of Compliance**
- **Attachment E - Living Wage Declaration of Compliance**
- **Attachment G - Vendor Conflict of Interest Disclosure Form**
- **Attachment H - Non-Discrimination Declaration of Compliance**

***Proposals that fail to provide these forms listed above upon proposal opening may be deemed non-responsive and may not be considered for award.***

## H. DISCLOSURES

Under the Freedom of Information Act (Public Act 442), the City is obligated to permit review of its files, if requested by others. All information in a proposal is subject to

disclosure under this provision. This act also provides for a complete disclosure of contracts and attachments thereto.

## I. TYPE OF CONTRACT

A sample of the Construction Agreement is included as Attachment A. Those who wish to submit a proposal to the City are required to review this sample agreement carefully. **The City will not entertain changes to its Construction Agreement.**

For all construction work, the respondent must further adhere to the City of Ann Arbor General Conditions. The General Conditions are included herein. Retainage will be held as necessary based on individual tasks and not on the total contract value. The Contractor shall provide the required bonds included in the Contract Documents for the duration of the Contract.

The City reserves the right to award the total proposal, to reject any or all proposals in whole or in part, and to waive any informality or technical defects if, in the City's sole judgment, the best interests of the City will be so served.

This RFP and the selected bidder's response thereto, shall constitute the basis of the scope of services in the contract by reference.

## J. NONDISCRIMINATION

All bidders proposing to do business with the City shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the Section 9:158 of the Ann Arbor City Code. Breach of the obligation not to discriminate as outlined in Attachment G shall be a material breach of the contract. Contractors are required to post a copy of Ann Arbor's Non-Discrimination Ordinance attached at all work locations where its employees provide services under a contract with the City.

## K. WAGE REQUIREMENTS

The Attachments provided herein outline the requirements for payment of prevailing wages or of a "living wage" to employees providing service to the City under this contract. The successful bidder must comply with all applicable requirements and provide documentary proof of compliance when requested.

Pursuant to Resolution R-16-469 all public improvement contractors are subject to prevailing wage and will be required to provide to the City payroll records sufficient to demonstrate compliance with the prevailing wage requirements. Use of Michigan Department of Transportation Prevailing Wage Forms (sample attached hereto) or a City-approved equivalent will be required along with wage rate interviews.

For laborers whose wage level are subject to federal, state and/or local prevailing wage law the appropriate Davis-Bacon wage rate classification is identified based

upon the work including within this contract. **The wage determination(s) current on the date 10 days before proposals are due shall apply to this contract.** The U.S. Department of Labor (DOL) has provided explanations to assist with classification in the following resource link: www.sam.gov.

For the purposes of this RFP the Construction Type of Heavy will apply.

## L. CONFLICT OF INTEREST DISCLOSURE

The City of Ann Arbor Purchasing Policy requires that the consultant complete a Conflict of Interest Disclosure form. A contract may not be awarded to the selected bidder unless and until the Procurement Unit and the City Administrator have reviewed the Disclosure form and determined that no conflict exists under applicable federal, state, or local law or administrative regulation. Not every relationship or situation disclosed on the Disclosure Form may be a disqualifying conflict. Depending on applicable law and regulations, some contracts may awarded on the recommendation of the City Administrator after full disclosure, where such action is allowed by law, if demonstrated competitive pricing exists and/or it is determined the award is in the best interest of the City. A copy of the Conflict of Interest Disclosure Form is attached.

## M. COST LIABILITY

The City of Ann Arbor assumes no responsibility or liability for costs incurred by the bidder prior to the execution of an Agreement. The liability of the City is limited to the terms and conditions outlined in the Agreement. By submitting a proposal, bidder agrees to bear all costs incurred or related to the preparation, submission, and selection process for the proposal.

## N. DEBARMENT

Submission of a proposal in response to this RFP is certification that the Respondent is not currently debarred, suspended, proposed for debarment, and declared ineligible or voluntarily excluded from participation in this transaction by any State or Federal departments or agency. Submission is also agreement that the City will be notified of any changes in this status.

## O. PROPOSAL PROTEST

All proposal protests must be in writing and filed with the Purchasing Manager within five (5) business days of any notices of intent, including, but not exclusively, divisions on prequalification of bidders, shortlisting of bidders, or a notice of intent to award. Only bidders who responded to the solicitation may file a bid protest. The bidder must clearly state the reasons for the protest. If any bidder contacts a City Service Area/Unit and indicates a desire to protest an award, the Service Area/Unit shall refer the bidder to the Purchasing Manager. The Purchasing Manager will provide the bidder with the

appropriate instructions for filing the protest. The protest shall be reviewed by the City Administrator or designee, whose decision shall be final.

Any inquiries or requests regarding this procurement should be only submitted in writing to the Designated City Contacts provided herein. Attempts by the bidder to initiate contact with anyone other than the Designated City Contacts provided herein that the bidder believes can influence the procurement decision, e.g., Elected Officials, City Administrator, Selection Committee Members, Appointed Committee Members, etc., may lead to immediate elimination from further consideration.

## P. SCHEDULE

The following is the schedule for this RFP process.

| **Activity/Event** | **Anticipated Date** |
|---|---|
| Pre-Proposal Conference | September 29, 2029, 10:00 a.m. (Local Time) |
| Written Question Deadline | October 16, 2025, 5:00 p.m. (Local Time) |
| Addenda Published (if needed) | Week of October 20, 2025 |
| Proposal Due Date | October 30, 2025, 11:00 a.m. (Local Time) |
| Selection/Negotiations | November 2025 |
| Expected City Council Authorizations | December 2025 |

The above schedule is for information purposes only and is subject to change at the City's discretion.

## Q. IRS FORM W-9

The selected bidder will be required to provide the City of Ann Arbor an IRS form W-9.

## R. RESERVATION OF RIGHTS

1. The City reserves the right in its sole and absolute discretion to accept or reject any or all proposals, or alternative proposals, in whole or in part, with or without cause.
2. The City reserves the right to waive, or not waive, informalities or irregularities in terms or conditions of any proposal if determined by the City to be in its best interest.
3. The City reserves the right to request additional information from any or all bidders.
4. The City reserves the right to reject any proposal that it determines to be unresponsive and deficient in any of the information requested within RFP.
5. The City reserves the right to determine whether the scope of the project will be entirely as described in the RFP, a portion of the scope, or a revised scope be implemented.
6. The City reserves the right to select one or more contractors or service providers to perform services.

7. The City reserves the right to retain all proposals submitted and to use any ideas in a proposal regardless of whether that proposal is selected. Submission of a proposal indicates acceptance by the firm of the conditions contained in this RFP, unless clearly and specifically noted in the proposal submitted.
8. The City reserves the right to disqualify proposals that fail to respond to any requirements outlined in the RFP, or failure to enclose copies of the required documents outlined within the RFP.

## S. IDLEFREE ORDINANCE

The City of Ann Arbor adopted an idling reduction Ordinance that went into effect July 1, 2017. The full text of the ordinance (including exemptions) can be found at: www.a2gov.org/idlefree.

Under the ordinance, No Operator of a Commercial Vehicle shall cause or permit the Commercial Vehicle to Idle:

(a) For any period of time while the Commercial Vehicle is unoccupied; or

(b) For more than 5 minutes in any 60-minute period while the Commercial Vehicle is occupied.

In addition, generators and other internal combustion engines are covered

(1) Excluding Motor Vehicle engines, no internal combustion engine shall be operated except when it is providing power or electrical energy to equipment or a tool that is actively in use.

## T. ENVIRONMENTAL COMMITMENT

The City of Ann Arbor recognizes its responsibility to minimize negative impacts on human health and the environment while supporting a vibrant community and economy. The City further recognizes that the products and services the City buys have inherent environmental and economic impacts and that the City should make procurement decisions that embody, promote and encourage the City's commitment to the environment.

The City strongly encourages potential vendors to bring forward tested, emerging, innovative, and environmentally preferable products and services that are best suited to the City's environmental principles. This includes products and services such as those with lower greenhouse gas emissions, high recycled content, without toxic substances, those with high reusability or recyclability, those that reduce the consumption of virgin materials, and those with low energy intensity.

As part of its environmental commitment, the City reserves the right to award a contract to the most responsive and responsible bidder, which includes bids that bring forward products or services that help advance the City's environmental commitment. In addition, the City reserves the right to request that all vendors report their annual greenhouse gas emissions, energy consumption, miles traveled, or other relevant

criteria in order to help the City more fully understand the environmental impact of its procurement decisions.

## U. MAJOR SUBCONTRACTORS

The Bidder shall identify each major subcontractor it expects to engage for this Contract if the work to be subcontracted is 15% or more of the bid sum or over $50,000, whichever is less. The Bidder also shall identify the work to be subcontracted to each major subcontractor. The Bidder shall not change or replace a subcontractor without approval by the City.

## V. LIQUIDATED DAMAGES

A liquidated damages clause, as given on page C-2, Article III of the Contract, provides that the Contractor shall pay the City as liquidated damages, and not as a penalty, a sum certain per day for each and every day that the Contractor may be in default of completion of the specified work, within the time(s) stated in the Contract, or written extensions.

Liquidated damages clauses, as given in the General Conditions, provide further that the City shall be entitled to impose and recover liquidated damages for breach of the obligations under Chapter 112 of the City Code.

The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

## SECTION II - SCOPE OF WORK

**Please see the plan set for more details.**

## SECTION III - MINIMUM INFORMATION REQUIRED

### PROPOSAL FORMAT

The following describes the elements that should be included in each of the proposal sections and the weighted point system that will be used for evaluation of the proposals.

Bidders should organize Proposals into the following Sections:

A. Qualifications, Experience and Accountability
B. Workplace Safety
C. Workforce Development
D. Social Equity and Sustainability
E. Schedule of Pricing/Cost
F. Authorized Negotiator
G. Attachments

*Bidders are strongly encouraged to provided details for all of the information requested below within initial proposals. Backup documentation may be requested at the sole discretion of the City to validate all of the responses provided herein by bidders. False statements by bidders to any of the criteria provided herein will result in the proposal being considered non-responsive and will not be considered for award.*

Pursuant to Sec 1:324.5 of the City Code which sets forth requirements for evaluating public improvement bids, Bidders should submit the following:

**A. Qualifications, Experience and Accountability - 20 Points**

1. Qualifications and experience of the bidder and of key persons, management, and supervisory personnel to be assigned by the bidder.

2. References from individuals or entities the bidder has worked for within the last five (5) years including information regarding records of performance and job site cooperation.

3. A statement from the bidder as to any major subcontractors it expects to engage including the name, work, and amount.

**B. Workplace Safety – 20 Points**

1. Provide evidence of a bidder's safety program (link to information on bidder's publicly available web-site preferred) and evidence of a safety-training program for employees addressing potential hazards of the proposed job site. Bidders must

identify a designated qualified safety representative responsible for bidder's safety program who serves as a contact for safety related matters.

2. Provide the bidder's Experience Modification Rating ("EMR") for the last three consecutive years. Preference within this criterion will be given to an EMR of 1.0 or less based on a three-year average.

3. Evidence that all craft labor that will be employed by the bidder for the project has, or will have prior to project commencement, completed at least an authorized 10-hour OSHA Construction Safety Course.

4. For the last three years provide a copy of any documented violations and the bidder's corrective actions as a result of inspections conducted by the Michigan Occupational Safety & Health Administration (MIOSHA), U.S. Department of Labor – Occupational Safety and Health Administration (OSHA), or any other applicable safety agency.

**C. Workforce Development – 20 Points**

1. Documentation as to bidder's pay rates, health insurance, pension or other retirement benefits, paid leave, or other fringe benefits to its employees.

2.. Documentation that the bidder participates in a Registered Apprenticeship Program that is registered with the United States Department of Labor Office of Apprenticeship or by a State Apprenticeship Agency recognized by the USDOL Office of Apprenticeship. USDOL apprenticeship agreements shall be disclosed to the City in the solicitation response.

3. Bidders shall disclose the number of non-craft employees who will work on the project on a 1099 basis, and the bidders shall be awarded points based on their relative reliance on 1099 work arrangements with more points assigned to companies with fewer 1099 arrangements. Bidders will acknowledge that the City may ask them to produce payroll records at points during the project to verify compliance with this section.

**D. Social Equity and Sustainability – 20 Points**

1. A statement from the bidder as to what percentage of its workforce resides in the City of Ann Arbor and in Washtenaw County, Michigan. The City will consider in evaluating which bids best serve its interests, the extent to which responsible and qualified bidders employ individuals in either the city of the county.

Washtenaw County jurisdiction is prioritized for evaluation purposes for this solicitation.

2. Evidence of Equal Employment Opportunity Programs for minorities, women, veterans, returning citizens, and small businesses.

3. Evidence that the bidder is an equal opportunity employer and does not discriminate on the basis of race, sex, pregnancy, age, religion, national origin, marital status, sexual orientation, gender identity or expression, height, weight, or disability.

4. The bidder's environmental record, including findings of violations and penalties imposed by government agencies.

**E. Schedule of Pricing/Cost – 20 Points**

**Company:**

**Project: High-Level Trunkline Capacity Improvements**

**File #: 2024-001** **RFP #: 25-39**

| ITEM NUMBER | LEGEND | UNIT | ESTIMATED QUANTITY | UNIT PRICE | TOTAL PRICE |
|---|---|---|---|---|---|
| | **General** | | | | |
| 01000.00 | General Conditions, Max. $1,400,000 | LSUM | 1 | $ | $ |
| 01001.00 | Project Supervision, Max. $700,000 | LSUM | 1 | $ | $ |
| 01002.00 | Project Clean-Up and Restoration | LSUM | 1 | $ | $ |
| 01003.00 | Digital Audio Visual Coverage | LSUM | 1 | $ | $ |
| 01010.00 | DS_Laboratory Testing Allowance | Dlr | 150,000 | $ | $ |
| 01011.00 | DS_Contaminated Groundwater Disposal Allowance | Dlr | 400,000 | $ | $ |
| 01012.00 | DS_Contaminated Soil Disposal | Cyd | 5,700 | $ | $ |
| 01021.00 | Erosion Control, Inlet Protection, Fabric Drop | Ea | 16 | $ | $ |
| 01040.00 | Minor Traffic Control, Max. $80,000 | LSUM | 1 | $ | $ |
| 01050.00 | Sign, Type B, Temp, Prismatic, Furn & Oper | Sft | 1,272 | $ | $ |
| 01051.00 | Sign, Type B, Temp, Prismatic, Special, Furn & Oper | Sft | 419 | $ | $ |
| 01052.00 | Temporary "No Parking" Sign | Ea | 20 | $ | $ |
| 01070.00 | Sign, Portable, Changeable Message, Furn & Oper | Ea | 2 | $ | $ |
| 01080.00 | Plastic Drum, High Intensity, Lighted, Furn & Oper | Ea | 8 | $ | $ |
| 01081.00 | Channelizer Cone, High Intensity, 42 In., Furn & Oper | Ea | 100 | $ | $ |
| 01091.00 | Barricade, Type III, High Intensity, Lighted, Furn & Oper | Ea | 10 | $ | $ |
| 01100.00 | Pedestrian Type II Barricade, Temp, Furn & Oper | Ea | 4 | $ | $ |
| 01101.00 | Pedestrian Channelizer Device, Furn & Oper | Ea | 4 | $ | $ |
| 01102.00 | Temporary Pedestrian Ramp, Furn & Oper | Ea | 2 | $ | $ |
| 01103.00 | Temporary Pedestrian Mat, Furn & Oper | Ft | 21 | $ | $ |
| 01131.00 | Pavt Mrkg, Wet Reflective, Type R, Tape, 12 In., White, Temp | Ft | 60 | $ | $ |
| | **Removals** | | | | |
| 02000.02 | Tree, Rem, 13 In. - 19 In. | Ea | 4 | $ | $ |
| 02021.00 | HMA Surface, Rem | Syd | 257 | $ | $ |
| 02025.00 | Concrete Pavt, Any Thickness, Rem | Syd | 1,249 | $ | $ |
| 02030.00 | Curb, Gutter, and Curb and Gutter, Any Type, Rem | Ft | 333 | $ | $ |
| 02040.00 | Sidewalk, Sidewalk Ramp, and Driveway Approach, Any Thickness, Rem | Sft | 429 | $ | $ |
| | **Earthwork** | | | | |
| 03030.01 | Exploratory Excavation, SD-TD-1, (0-10' Deep) | Ea | 10 | $ | $ |
| 03030.02 | Exploratory Excavation, SD-TD-1, Additional Depth | Ft | 60 | $ | $ |
| 03001.00 | Machine Grading | Syd | 279 | $ | $ |
| 03070.00 | Dewatering | LSUM | 1 | $ | $ |
| | **Sanitary Sewer** | | | | |
| 04000.01 | 8 In., SDR 26 PVC Sanitary Sewer, SD-TD-2 | Ft | 84 | $ | $ |
| 04000.02 | 10 In., SDR 26 PVC Sanitary Sewer, SD-TD-2 | Ft | 53 | $ | $ |
| 04000.05 | 18 In., SDR 26 PVC Sanitary Sewer, SD-TD-2 | Ft | 77 | $ | $ |
| 04000.07 | 24 In., SDR 26 PVC Sanitary Sewer, SD-TD-2 | Ft | 23 | $ | $ |
| | TOTAL THIS PAGE (BF-1) | | | | $ |

**E. Schedule of Pricing/Cost – 20 Points**

**Company:**

**Project: High-Level Trunkline Capacity Improvements**

**File #: 2024-001** **RFP #: 25-39**

| ITEM NUMBER | LEGEND | UNIT | ESTIMATED QUANTITY | UNIT PRICE | TOTAL PRICE |
|---|---|---|---|---|---|
| | **Sanitary (Continued)** | | | | |
| 04006.01 | DS_30 In., FRP Sanitary Sewer, SD-TD-2 | Ft | 32 | $ | $ |
| 04007.01 | DS_36 In., FRP Sanitary Sewer, Microtunneling | Ft | 1,595 | $ | $ |
| 04014.01 | 6 In., SDR 26 PVC Sanitary Service Lead, SD-TD-2 | Ft | 50 | $ | $ |
| 04030.01 | Sanitary Manhole, 48 In. Dia. (0-8' Deep) | Ea | 1 | $ | $ |
| 04030.02 | Sanitary Manhole, 48 In. Dia., Additional Depth | Ft | 3 | $ | $ |
| 04035.01 | DS_Sanitary Manhole, Fiberglass, 48 In. Dia., Sta 100+47 | Ea | 1 | $ | $ |
| 04035.02 | DS_Sanitary Manhole, Fiberglass, 48 In. Dia., Sta 103+82 | Ea | 1 | $ | $ |
| 04035.03 | DS_Sanitary Manhole, Fiberglass, 72 In. Dia., Sta 150+70 | Ea | 1 | $ | $ |
| 04035.04 | DS_Sanitary Manhole, Fiberglass, 48 In. Dia., Sta 155+45 | Ea | 1 | $ | $ |
| 04035.05 | DS_Sanitary Manhole, Fiberglass, 72 In. Dia., Sta 161+30 | Ea | 1 | $ | $ |
| 04036.05 | DS_Sanitary Diversion Manhole, Sta 100+17 | Ea | 1 | $ | $ |
| 04050.01 | Sanitary Manhole Over Existing ("Doghouse"), 48 In. Dia. | Ea | 2 | $ | $ |
| 04050.05 | DS_Sanitary Manhole Over Existing ("Doghouse"), 96 In. Dia. | Ea | 1 | $ | $ |
| 04051.04 | DS_Sanitary Manhole Over Existing ("Doghouse"), Fiberglass, 84 In. Dia. | Ea | 1 | $ | $ |
| 04060.00 | Sanitary Structure Cover | Ea | 13 | $ | $ |
| 04061.00 | Sanitary Structure Cover, Adjust | Ea | 13 | $ | $ |
| 04070.02 | Sanitary Sewer Pipe, 10 In. Dia., Abandon | Ft | 20 | $ | $ |
| 04070.05 | Sanitary Sewer Pipe, 18 In. Dia., Abandon | Ft | 114 | $ | $ |
| 04070.06 | Sanitary Sewer Pipe, 21 In. Dia., Abandon | Ft | 296 | $ | $ |
| 04080.02 | Sanitary Sewer Pipe, 10 In. Dia., Rem | Ft | 20 | $ | $ |
| 04080.05 | Sanitary Sewer Pipe, 18 In. Dia., Rem | Ft | 90 | $ | $ |
| 04090.00 | Sanitary Sewer Structure, Abandon | Ea | 3 | $ | $ |
| 04100.00 | Sanitary Sewer Structure, Rem | Ea | 1 | $ | $ |
| 04110.02 | Sanitary Sewer Tap, 10 In. Dia. | Ea | 1 | $ | $ |
| 04200.00 | DS_Drilling and Geotechnical instrumentation and Monitoring | LS | 1 | $ | $ |
| 04250.01 | DS_Intermediate Shaft, Sta 103+82 | LS | 1 | $ | $ |
| 04250.02 | DS_Launch Shaft, Sta 100+47 | LS | 1 | $ | $ |
| 04250.03 | DS_Launch Shaft, Sta 161+30 | LS | 1 | $ | $ |
| 04250.04 | DS_Launch/Reception Shaft, Sta 155+45 | LS | 1 | $ | $ |
| 04250.05 | DS_Reception Shaft, Sta 150+70 | LS | 1 | $ | $ |
| 04300.00 | DS_Sanitary Bypass Pumping | LS | 1 | $ | $ |
| | **Stormwater** | | | | |
| 06000.05 | 24 In., CL IV RCP Storm Sewer, SD-TD-1 | Ft | 37 | $ | $ |
| 06030.04 | Storm Sewer Tap, 12 In. Dia. | Ea | 2 | $ | $ |
| 06030.08 | Storm Sewer Tap, 24 In. Dia. | Ea | 1 | $ | $ |
| 06050.01 | Storm Manhole, 48 In. Dia. (0-8' deep) | Ea | 1 | $ | $ |
| 06050.02 | Storm Manhole, 48 In. Dia. , Additional Depth | Ft | 3 | $ | $ |

TOTAL THIS PAGE (BF-2) $

**E. Schedule of Pricing/Cost – 20 Points**

**Company:**

**Project: High-Level Trunkline Capacity Improvements**

**File #: 2024-001** **RFP #: 25-39**

| ITEM NUMBER | LEGEND | UNIT | ESTIMATED QUANTITY | UNIT PRICE | TOTAL PRICE |
|---|---|---|---|---|---|
| | **Stormwater (Continued)** | | | | |
| 06050.03 | Storm Manhole, 60 In. Dia. (0-8' deep) | Ea | 1 | $ | $ |
| 06120.03 | Storm Sewer Pipe, 12 In. Dia., Rem | Ft | 21 | $ | $ |
| 06160.01 | Storm Structure Cover | Ea | 3 | $ | $ |
| 06160.02 | Storm Structure Cover, Adjust | Ea | 3 | $ | $ |
| | **Water Mains** | | | | |
| 07000.05 | 12 In., PC 350 DIP w/polywrap, SD-TD-1 | Ft | 157 | $ | $ |
| 07013.01 | 12 In. 90° DIP Bend | Ea | 12 | $ | $ |
| 07013.02 | 12 In. 45° DIP Bend | Ea | 2 | $ | $ |
| 07090.00 | Water Structure Cover | Ea | 2 | $ | $ |
| 07091.00 | Water Structure Cover, Adjust | Ea | 2 | $ | $ |
| 07150.05 | Water Main Pipe, 12 In. Dia., Rem | Ft | 93 | $ | $ |
| | **Streets, Driveways, & Sidewalks** | | | | |
| 08000.00 | Subbase, CIP | Cyd | 66 | $ | $ |
| 08010.03 | Aggregate Base, 8 In., 21AA, CIP | Syd | 920 | $ | $ |
| 08010.04 | Aggregate Base, 10 In., 21AA, CIP | Syd | 648 | $ | $ |
| 08070.14 | HMA, 4EL | Ton | 295 | $ | $ |
| 08070.18 | HMA, 5EL | Ton | 208 | $ | $ |
| 08110.00 | Conc, Curb or Curb & Gutter, All Types | Ft | 333 | $ | $ |
| 08121.01 | Conc, Driveway Opening, Type L | Ft | 25 | $ | $ |
| 08131.01 | Conc, Sidewalk, Drive Approach, or Ramp, 6 In. | Sft | 575 | $ | $ |
| 08131.02 | Conc, Sidewalk, Drive Approach, or Ramp, 8 In. | Sft | 129 | $ | $ |
| 08150.00 | Detectable Warning Surface | Ft | 15 | $ | $ |
| 08190.01 | Pavt Mrkg, Polymer Cement Surface, Bike, Large Sym | Ea | 2 | $ | $ |
| 08190.03 | Pavt Mrkg, Polymer Cement Surface, Bike Thru Arrow Sym | Ea | 2 | $ | $ |
| 08190.06 | Pavt Mrkg, Polymer Cement Surface, Bike Lane Green | Sft | 450 | $ | $ |
| 08220.03 | Pavt Mrkg, Thermopl, 12 In., Crosswalk | Ft | 505 | $ | $ |
| 08220.06 | Pavt Mrkg, Thermopl, 24 In., Stop Bar | Ft | 42 | $ | $ |
| 08220.30 | Pavt Mrkg, Thermopl, 18 In. x 18 In. Bikeway Marks | Ft | 40 | $ | $ |
| 08240.02 | Pavt Mrkg, Waterborne, 4 In., Yellow | Ft | 1,214 | $ | $ |
| | **Landscaping** | | | | |
| 10060.00 | Turf Restoration | Syd | 23 | $ | $ |

TOTAL THIS PAGE (BF-3) $

TOTAL FROM PAGE BF-1: $

TOTAL FROM PAGE BF-2: $

**TOTAL BASE BID:** **$**

## F. AUTHORIZED NEGOTIATOR / NEGOTIATIBLE ELEMENTS (ALTERNATES)

Include the name, phone number, and e-mail address of persons(s) in your organization authorized to negotiate the agreement with the City.

The proposal price shall include materials and equipment selected from the designated items and manufacturers listed in the bidding documents. This is done to establish uniformity in bidding and to establish standards of quality for the items named.

If the bidder wishes to quote alternate items for consideration by the City, it may do so under this Section. A complete description of the item and the proposed price differential must be provided. Unless approved at the time of award, substitutions where items are specifically named will be considered only as a negotiated change in Contract Sum.

If the Bidder takes exception to the time stipulated in Article III of the Contract, Time of Completion, page C-2, it is requested to stipulate its proposed time for performance of the work.

Consideration for any proposed alternative items or time may be negotiated at the discretion of the City.

## G. ATTACHMENTS

General Declaration, Legal Status of Bidder, Conflict of Interest Form, Living Wage Compliance Form, Prevailing Wage Compliance Form and the Non-Discrimination Form should be completed and returned with the proposal. These elements should be included as attachments to the proposal submission.

## PROPOSAL EVALUATION

1. The selection committee will evaluate each proposal by the above-described criteria and point system. The City reserves the right to reject any proposal that it determines to be unresponsive and deficient in any of the information requested for evaluation. A proposal with all the requested information does not guarantee the proposing firm to be a candidate for an interview if interviews are selected to be held by the City. The committee may contact references to verify material submitted by the bidder.

2. The committee then will schedule interviews with the selected firms if necessary. The selected firms will be given the opportunity to discuss in more detail their qualifications, past experience, proposed work plan (if applicable) and pricing.

3. The interview should include the project team members expected to work on the project, but no more than six members total. The interview shall consist of a

presentation of up to thirty minutes (or the length provided by the committee) by the bidder, including the person who will be the project manager on this contract, followed by approximately thirty minutes of questions and answers. Audiovisual aids may be used during the oral interviews. The committee may record the oral interviews.

4. The firms interviewed will then be re-evaluated by the above criteria and adjustments to scoring will be made as appropriate. After evaluation of the proposals, further negotiation with the selected firm may be pursued leading to the award of a contract by City Council, if suitable proposals are received.

The City reserves the right to waive the interview process and evaluate the bidder based on their proposal and pricing schedules alone.

The City will determine whether the final scope of the project to be negotiated will be entirely as described in this RFP, a portion of the scope, or a revised scope.

Work to be done under this contract is generally described through the detailed specifications and must be completed fully in accordance with the contract documents.

Any proposal that does not conform fully to these instructions may be rejected.

## PREPARATION OF PROPOSALS

Proposals should have no plastic bindings but will not be rejected as non-responsive for being bound. Staples or binder clips are acceptable. Proposals should be printed double sided on recycled paper.

Each person signing the proposal certifies that they are a person in the bidder's firm/organization responsible for the decisions regarding the fees being offered in the Proposal and has not and will not participate in any action contrary to the terms of this provision.

## ADDENDA

If it becomes necessary to revise any part of the RFP, notice of the addendum will be posted to Michigan Inter-governmental Trade Network (MITN) www.mitn.info and/or the City of Ann Arbor web site www.A2gov.org for all parties to download.

Each bidder should acknowledge in its proposal all addenda it has received on the General Declarations form provided in the Attachments section herein. The failure of a bidder to receive or acknowledge receipt of any addenda shall not relieve the bidder of the responsibility for complying with the terms thereof. The City will not be bound by oral responses to inquiries or written responses other than official written addenda.

## SECTION IV - ATTACHMENTS

Attachment A – Sample Standard Contract

Attachment B – General Declarations

Attachment C - Legal Status of Bidder

Attachment D – Prevailing Wage Declaration of Compliance Form

Attachment E – Living Wage Declaration of Compliance Form

Attachment F – Living Wage Ordinance Poster

Attachment G – Vendor Conflict of Interest Disclosure Form

Attachment H – Non-Discrimination Ordinance Declaration of Compliance Form

Attachment I – Non-Discrimination Ordinance Poster

Sample Certified Payroll Report Template

# ATTACHMENT A
# SAMPLE STANDARD CONTRACT

***If a contract is awarded, the selected contractor will be required to adhere to a set of general contract provisions which will become a part of any formal agreement. These provisions are general principles which apply to all contractors of service to the City of Ann Arbor such as the following:***

## CONTRACT

THIS CONTRACT is between the CITY OF ANN ARBOR, a Michigan Municipal Corporation, 301 East Huron Street, Ann Arbor, Michigan 48104 ("City") and _____ _____("Contractor")

(An individual/partnership/corporation, include state of incorporation) (Address)

Based upon the mutual promises below, the Contractor and the City agree as follows:

**ARTICLE I - Scope of Work**

The Contractor agrees to furnish all of the materials, equipment and labor necessary; and to abide by all the duties and responsibilities applicable to it for the project titled **[Insert Title of Bid and Bid Number**] in accordance with the requirements and provisions of the following documents, including all written modifications incorporated into any of the documents, all of which are incorporated as part of this Contract:

Non-discrimination and Living Wage Declaration of Compliance Forms (if applicable)
Vendor Conflict of Interest Form
Prevailing Wage Declaration of Compliance Form (if applicable)
Bid Forms
Contract and Exhibits
Bonds
General Conditions
Standard Specifications
Detailed Specifications
Plans
Addenda

**ARTICLE II - Definitions**

**Administering Service Area/Unit** means **[Insert Name of Administering Service Unit]**

**Project** means **[Insert Title of Bid and Bid Number]**

**Supervising Professional** means the person acting under the authorization of the manager of the Administering Service Area/Unit. At the time this Contract is executed, the Supervising Professional is: [**Insert the person's name**] whose job title is [**Insert job**

**title**]. If there is any question concerning who the Supervising Professional is, Contractor shall confirm with the manager of the Administering Service Area/Unit.

**Contractor's Representative** means _____ [**Insert name**] whose job title is [**Insert job title**].

**ARTICLE III - Time of Completion**

(A) The work to be completed under this Contract shall begin immediately on the date specified in the Notice to Proceed issued by the City.

(B) The entire work for this Contract shall be completed within _____ ( ) consecutive calendar days.

(C) Failure to complete all the work within the time specified above, including any extension granted in writing by the Supervising Professional, shall obligate the Contractor to pay the City, as liquidated damages and not as a penalty, an amount equal to $2,000 for each calendar day of delay in the completion of all the work. If any liquidated damages are unpaid by the Contractor, the City shall be entitled to deduct these unpaid liquidated damages from the monies due the Contractor.

The liquidated damages are for the non-quantifiable aspects of any of the previously identified events and do not cover actual damages that can be shown or quantified nor are they intended to preclude recovery of actual damages in addition to the recovery of liquidated damages.

**ARTICLE IV - The Contract Sum**

(A) The City shall pay to the Contractor for the performance of the Contract, the unit prices as given in the Bid Form for the estimated bid total of:

_____Dollars ($_____)

(B) The amount paid shall be equitably adjusted to cover changes in the work ordered by the Supervising Professional but not required by the Contract Documents. Increases or decreases shall be determined only by written agreement between the City and Contractor.

**ARTICLE V - Assignment**

This Contract may not be assigned or subcontracted any portion of any right or obligation under this contract without the written consent of the City. Notwithstanding any consent by the City to any assignment, Contractor shall at all times remain bound to all warranties, certifications, indemnifications, promises and performances, however described, as are required of it under this contract unless specifically released from the requirement, in writing, by the City.

**ARTICLE VI - Choice of Law**

This Contract shall be construed, governed, and enforced in accordance with the laws of the State of Michigan. By executing this Contract, the Contractor and the City agree to venue in a court of

appropriate jurisdiction sitting within Washtenaw County for purposes of any action arising under this Contract. The parties stipulate that the venue referenced in this Contract is for convenience and waive any claim of non-convenience.

Whenever possible, each provision of the Contract will be interpreted in a manner as to be effective and valid under applicable law. The prohibition or invalidity, under applicable law, of any provision will not invalidate the remainder of the Contract.

**ARTICLE VII - Relationship of the Parties**

The parties of the Contract agree that it is not a Contract of employment but is a Contract to accomplish a specific result. Contractor is an independent Contractor performing services for the City. Nothing contained in this Contract shall be deemed to constitute any other relationship between the City and the Contractor.

Contractor certifies that it has no personal or financial interest in the project other than the compensation it is to receive under the Contract. Contractor certifies that it is not, and shall not become, overdue or in default to the City for any Contract, debt, or any other obligation to the City including real or personal property taxes. City shall have the right to set off any such debt against compensation awarded for services under this Contract.

The Regents of the University of Michigan is a third-party beneficiary of this Contract.

**ARTICLE VIII - Notice**

All notices given under this Contract shall be in writing, and shall be by personal delivery or by certified mail with return receipt requested to the parties at their respective addresses as specified in the Contract Documents or other address the Contractor may specify in writing. Notice will be deemed given on the date when one of the following first occur: (1) the date of actual receipt; or (2) three days after mailing certified U.S. mail.

**ARTICLE IX - Indemnification**

To the fullest extent permitted by law, Contractor shall indemnify, defend and hold the City, and the Regents of the University of Michigan, and their its officers, employees and agents harmless from all suits, claims, judgments and expenses including attorney's fees resulting or alleged to result, in whole or in part, from any act or omission, which is in any way connected or associated with this Contract, by the Contractor or anyone acting on the Contractor's behalf under this Contract. Contractor shall not be responsible to indemnify the City for losses or damages caused by or resulting from the City's sole negligence. The provisions of this Article shall survive the expiration or earlier termination of this contract for any reason.

**ARTICLE X - Entire Agreement**

This Contract represents the entire understanding between the City and the Contractor and it supersedes all prior representations, negotiations, agreements, or understandings whether written or oral. Neither party has relied on any prior representations in entering into this Contract. No terms or conditions of either party's invoice, purchase order or other administrative document shall modify the terms and conditions of this Contract, regardless of the other party's failure to object to such form. This Contract shall be binding on and shall inure to the benefit of the parties to this Contract and their permitted successors and permitted assigns and nothing in this Contract,

express or implied, is intended to or shall confer on any other person or entity any legal or equitable right, benefit, or remedy of any nature whatsoever under or by reason of this Contract. This Contract may be altered, amended or modified only by written amendment signed by the City and the Contractor.

**ARTICLE XI – Electronic Transactions**

The City and Contractor agree that signatures on this Contract may be delivered electronically in lieu of an original signature and agree to treat electronic signatures as original signatures that bind them to this Contract. This Contract may be executed and delivered by facsimile and upon such delivery, the facsimile signature will be deemed to have the same effect as if the original signature had been delivered to the other party.

[Signatures on next page]

***[INSERT CONTRACTOR NAME HERE]***

By: _____

Name: _____

Title: _____

Date: _____

**CITY OF ANN ARBOR**

By: _____

Name: Milton Dohoney Jr.

Title: City Administrator

Date: _____

**Approved as to substance:**

By: _____

Name: Jordan Roberts

Title: Public Services Area Administrator

Date: _____

**Approved as to form:**

By: _____

Name: Atleen Kaur

Title: City Attorney

Date: _____

*(Signatures continue on following page)*

**CITY OF ANN ARBOR**

By: _____

Name: _____

Title: Mayor

Date: _____

By: _____

Name: _____

Title: City Clerk

Date: _____

## PERFORMANCE BOND

(1) _____ of _____ (referred to as "Principal"), and _____, a corporation duly authorized to do business in the State of Michigan (referred to as "Surety"), are bound to the City of Ann Arbor, Michigan (referred to as "City"), for $ , the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the City entitled _____ _____, for RFP No. _____ and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq.

(3) Whenever the Principal is declared by the City to be in default under the Contract, the Surety may promptly remedy the default or shall promptly:
(a) complete the Contract in accordance with its terms and conditions; or
(b) obtain a bid or bids for submission to the City for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, arrange for a Contract between such bidder and the City, and make available, as work progresses, sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs and damages for which Surety may be liable hereunder, the amount set forth in paragraph 1.

(4) Surety shall have no obligation to the City if the Principal fully and promptly performs under the Contract.

(5) Surety agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder, or the specifications accompanying it shall in any way affect its obligations on this bond, and waives notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the work, or to the specifications.

(6) Principal, Surety, and the City agree that signatures on this bond may be delivered electronically in lieu of an original signature and agree to treat electronic signatures as original signatures that bind them to this bond. This bond may be executed and delivered by facsimile and upon such delivery, the facsimile signature will be deemed to have the same effect as if the original signature had been delivered to the other party.

**SIGNED AND SEALED** this _____ day of _____, 202_.

| | |
|---|---|
| _____ | _____ |
| (Name of Surety Company) | (Name of Principal) |
| By _____ | By _____ |
| (Signature) | (Signature) |
| Its _____ | Its _____ |
| (Title of Office) | (Title of Office) |
| Approved as to form: | Name and address of agent: |
| _____ | _____ |
| Atleen Kaur, City Attorney | _____ |
| | _____ |

# LABOR AND MATERIAL BOND

(1) _____

of _____(referred to as "Principal"), and _____, a corporation duly authorized to do business in the State of Michigan, (referred to as "Surety"), are bound to the City of Ann Arbor, Michigan (referred to as "City"), for the use and benefit of claimants as defined in Act 213 of Michigan Public Acts of 1963, as amended, being MCL 129.201 et seq., in the amount of

$ _____, for the payment of which Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, by this bond.

(2) The Principal has entered a written Contract with the Cityentitled _____

_____

_____

____, for RFP No. _____; and this bond is given for that Contract in compliance with Act No. 213 of the Michigan Public Acts of 1963 as amended;

(3) If the Principal fails to promptly and fully repay claimants for labor and material reasonably required under the Contract, the Surety shall pay those claimants.

(4) Surety's obligations shall not exceed the amount stated in paragraph 1, and Surety shall have no obligation if the Principal promptly and fully pays the claimants.

(5) Principal, Surety, and the City agree that signatures on this bond may be delivered electronically in lieu of an original signature and agree to treat electronic signatures as original signatures that bind them to this bond. This bond may be executed and delivered by facsimile and upon such delivery, the facsimile signature will be deemed to have the same effect as if the original signature had been delivered to the other party.

**SIGNED AND SEALED** this _____ day of _____, 202_

| | |
|---|---|
| _____ | _____ |
| (Name of Surety Company) | (Name of Principal) |
| By _____ | By _____ |
| (Signature) | (Signature) |
| Its _____ | Its _____ |
| (Title of Office) | (Title of Office) |

Approved as to form:

Atleen Kaur, City Attorney

Name and address of agent:

**GENERAL CONDITIONS**

## Section 1 - Execution, Correlation and Intent of Documents

The contract documents shall be signed in 2 copies by the City and the Contractor.

The contract documents are complementary and what is called for by any one shall be binding. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper execution of the work. Materials or work described in words which so applied have a well-known technical or trade meaning have the meaning of those recognized standards.

In case of a conflict among the contract documents listed below in any requirement(s), the requirement(s) of the document listed first shall prevail over any conflicting requirement(s) of a document listed later.

(1) Addenda in reverse chronological order; (2) Detailed Specifications; (3) Standard Specifications; (4) Plans; (5) General Conditions; (6) Contract; (7) Bid Forms; (8) Bond Forms; (9) Bid.

## Section 2 - Order of Completion

The Contractor shall submit with each invoice, and at other times reasonably requested by the Supervising Professional, schedules showing the order in which the Contractor proposes to carry on the work. They shall include the dates at which the Contractor will start the several parts of the work, the estimated dates of completion of the several parts, and important milestones within the several parts.

## Section 3 - Familiarity with Work

The Bidder or its representative shall make personal investigations of the site of the work and of existing structures and shall determine to its own satisfaction the conditions to be encountered, the nature of the ground, the difficulties involved, and all other factors affecting the work proposed under this Contract. The Bidder to whom this Contract is awarded will not be entitled to any additional compensation unless conditions are clearly different from those which could reasonably have been anticipated by a person making diligent and thorough investigation of the site.

The Bidder shall immediately notify the City upon discovery, and in every case prior to submitting its Bid, of every error or omission in the bidding documents that would be identified by a reasonably competent, diligent Bidder. In no case will a Bidder be allowed the benefit of extra compensation or time to complete the work under this Contract for extra expenses or time spent as a result of the error or omission.

## Section 4 - Wage Requirements

Under this Contract, the Contractor shall conform to Chapter 14 of Title I of the Code of the City of Ann Arbor as amended; which in part states "...that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of

subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen, mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. At the request of the City, any contractor or subcontractor shall provide satisfactory proof of compliance with the contract provisions required by the Section.

Pursuant to Resolution R-16-469 all public improvement contractors are subject to prevailing wage and will be required to provide to the City payroll records sufficient to demonstrate compliance with the prevailing wage requirements. A sample Prevailing Wage Form is provided in the Appendix herein for reference as to what will be expected from contractors. Use of the Prevailing Wage Form provided in the Appendix section or a City-approved equivalent will be required along with wage rate interviews.

Where the Contract and the Ann Arbor City Ordinance are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used.

If the Contractor is a "covered employer" as defined in Chapter 23 of the Ann Arbor City Code, the Contractor agrees to comply with the living wage provisions of Chapter 23 of the Ann Arbor City Code. The Contractor agrees to pay those employees providing Services to the City under this Contract a "living wage," as defined in Section 1:815 of the Ann Arbor City Code, as adjusted in accordance with Section 1:815(3); to post a notice approved by the City of the applicability of Chapter 23 in every location in which regular or contract employees providing services under this Contract are working; to maintain records of compliance; if requested by the City, to provide documentation to verify compliance; to take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee or person contracted for employment in order to pay the living wage required by Section 1:815; and otherwise to comply with the requirements of Chapter 23.

Contractor agrees that all subcontracts entered into by the Contractor shall contain similar wage provision covering subcontractor's employees who perform work on this contract.

## Section 5 - Non-Discrimination

The Contractor agrees to comply, and to require its subcontractor(s) to comply, with the nondiscrimination provisions of MCL 37.2209. The Contractor further agrees to comply with the provisions of Section 9:158 of Chapter 112 of Title IX of the Ann Arbor City Code, and to assure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity.

## Section 6 - Materials, Appliances, Employees

Unless otherwise stipulated, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, transportation, and other facilities necessary or used for the execution and completion of the work. Unless otherwise specified, all materials incorporated in the permanent work shall be new, and both workmanship and materials shall be of the highest quality. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials.

The Contractor shall at all times enforce strict discipline and good order among its employees, and shall seek to avoid employing on the work any unfit person or anyone not skilled in the work assigned.

Adequate sanitary facilities shall be provided by the Contractor.

## Section 7 - Qualifications for Employment

The Contractor shall employ competent laborers and mechanics for the work under this Contract. For work performed under this Contract, employment preference shall be given to qualified local residents.

## Section 8 - Royalties and Patents

The Contractor shall pay all royalties and license fees. It shall defend all suits or claims for infringements of any patent rights and shall hold the City harmless from loss on account of infringement except that the City shall be responsible for all infringement loss when a particular process or the product of a particular manufacturer or manufacturers is specified, unless the City has notified the Contractor prior to the signing of the Contract that the particular process or product is patented or is believed to be patented.

## Section 9 - Permits and Regulations

The Contractor must secure and pay for all permits, permit or plan review fees and licenses necessary for the prosecution of the work. These include but are not limited to City building permits, right-of-way permits, lane closure permits, right-of-way occupancy permits, and the like. The City shall secure and pay for easements shown on the plans unless otherwise specified.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the work as drawn and specified. If the Contractor observes that the contract documents are at variance with those requirements, it shall promptly notify the Supervising Professional in writing, and any necessary changes shall be adjusted as provided in the Contract for changes in the work.

## Section 10 - Protection of the Public and of Work and Property

The Contractor is responsible for the means, methods, sequences, techniques and procedures of construction and safety programs associated with the work contemplated by this contract. The Contractor, its agents or sub-contractors, shall comply with the "General Rules and Regulations for the Construction Industry" as published by the Construction Safety Commission of the State of Michigan and to all other local, State and National laws, ordinances, rules and regulations pertaining to safety of persons and property.

The Contractor shall take all necessary and reasonable precautions to protect the safety of the public. It shall continuously maintain adequate protection of all work from damage, and shall take all necessary and reasonable precautions to adequately protect all public and private property from injury or loss arising in connection with this Contract. It shall make good any damage, injury or loss to its work and to public and private property resulting from lack of reasonable protective precautions, except as may be due to errors in the contract documents, or caused by agents or

employees of the City. The Contractor shall obtain and maintain sufficient insurance to cover damage to any City property at the site by any cause.

In an emergency affecting the safety of life, or the work, or of adjoining property, the Contractor is, without special instructions or authorization from the Supervising Professional, permitted to act at its discretion to prevent the threatened loss or injury. It shall also so act, without appeal, if authorized or instructed by the Supervising Professional.

Any compensation claimed by the Contractor for emergency work shall be determined by agreement or in accordance with the terms of Claims for Extra Cost - Section 15.

## Section 11 - Inspection of Work

The City shall provide sufficient competent personnel for the inspection of the work.

The Supervising Professional shall at all times have access to the work whenever it is in preparation or progress, and the Contractor shall provide proper facilities for access and for inspection.

If the specifications, the Supervising Professional's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Contractor shall give the Supervising Professional timely notice of its readiness for inspection, and if the inspection is by an authority other than the Supervising Professional, of the date fixed for the inspection. Inspections by the Supervising Professional shall be made promptly, and where practicable at the source of supply. If any work should be covered up without approval or consent of the Supervising Professional, it must, if required by the Supervising Professional, be uncovered for examination and properly restored at the Contractor's expense.

Re-examination of any work may be ordered by the Supervising Professional, and, if so ordered, the work must be uncovered by the Contractor. If the work is found to be in accordance with the contract documents, the City shall pay the cost of re-examination and replacement. If the work is not in accordance with the contract documents, the Contractor shall pay the cost.

## Section 12 - Superintendence

The Contractor shall keep on the work site, during its progress, a competent superintendent and any necessary assistants, all satisfactory to the Supervising Professional. The superintendent will be responsible to perform all on-site project management for the Contractor. The superintendent shall be experienced in the work required for this Contract. The superintendent shall represent the Contractor and all direction given to the superintendent shall be binding as if given to the Contractor. Important directions shall immediately be confirmed in writing to the Contractor. Other directions will be confirmed on written request. The Contractor shall give efficient superintendence to the work, using its best skill and attention.

## Section 13 - Changes in the Work

The City may make changes to the quantities of work within the general scope of the Contract at any time by a written order and without notice to the sureties. If the changes add to or deduct from the extent of the work, the Contract Sum shall be adjusted accordingly. All the changes shall be

executed under the conditions of the original Contract except that any claim for extension of time caused by the change shall be adjusted at the time of ordering the change.

In giving instructions, the Supervising Professional shall have authority to make minor changes in the work not involving extra cost and not inconsistent with the purposes of the work, but otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order by the Supervising Professional, and no claim for an addition to the Contract Sum shall be valid unless the additional work was ordered in writing.

The Contractor shall proceed with the work as changed and the value of the work shall be determined as provided in Claims for Extra Cost - Section 15.

## Section 14 - Extension of Time

Extension of time stipulated in the Contract for completion of the work will be made if and as the Supervising Professional may deem proper under any of the following circumstances:

(1) When work under an extra work order is added to the work under this Contract;

(2) When the work is suspended as provided in Section 20;

(3) When the work of the Contractor is delayed on account of conditions which could not have been foreseen, or which were beyond the control of the Contractor, and which were not the result of its fault or negligence;

(4) Delays in the progress of the work caused by any act or neglect of the City or of its employees or by other Contractors employed by the City;

(5) Delay due to an act of Government;

(6) Delay by the Supervising Professional in the furnishing of plans and necessary information;

(7) Other cause which in the opinion of the Supervising Professional entitles the Contractor to an extension of time.

The Contractor shall notify the Supervising Professional within 7 days of an occurrence or conditions which, in the Contractor's opinion, entitle it to an extension of time. The notice shall be in writing and submitted in ample time to permit full investigation and evaluation of the Contractor's claim. The Supervising Professional shall acknowledge receipt of the Contractor's notice within 7 days of its receipt. Failure to timely provide the written notice shall constitute a waiver by the Contractor of any claim.

In situations where an extension of time in contract completion is appropriate under this or any other section of the contract, the Contractor understands and agrees that the only available adjustment for events that cause any delays in contract completion shall be extension of the required time for contract completion and that there shall be no adjustments in the money due the Contractor on account of the delay.

# Section 15 - Claims for Extra Cost

If the Contractor claims that any instructions by drawings or other media issued after the date of the Contract involved extra cost under this Contract, it shall give the Supervising Professional written notice within 7 days after the receipt of the instructions, and in any event before proceeding to execute the work, except in emergency endangering life or property. The procedure shall then be as provided for Changes in the Work-Section l3. No claim shall be valid unless so made.

If the Supervising Professional orders, in writing, the performance of any work not covered by the contract documents, and for which no item of work is provided in the Contract, and for which no unit price or lump sum basis can be agreed upon, then the extra work shall be done on a Cost-Plus-Percentage basis of payment as follows:

(1) The Contractor shall be reimbursed for all reasonable costs incurred in doing the work, and shall receive an additional payment of 15% of all the reasonable costs to cover both its indirect overhead costs and profit;

(2) The term "Cost" shall cover all payroll charges for employees and supervision required under the specific order, together with all worker's compensation, Social Security, pension and retirement allowances and social insurance, or other regular payroll charges on same; the cost of all material and supplies required of either temporary or permanent character; rental of all power-driven equipment at agreed upon rates, together with cost of fuel and supply charges for the equipment; and any costs incurred by the Contractor as a direct result of executing the order, if approved by the Supervising Professional;

(3) If the extra is performed under subcontract, the subcontractor shall be allowed to compute its charges as described above. The Contractor shall be permitted to add an additional charge of 5% percent to that of the subcontractor for the Contractor's supervision and contractual responsibility;

(4) The quantities and items of work done each day shall be submitted to the Supervising Professional in a satisfactory form on the succeeding day, and shall be approved by the Supervising Professional and the Contractor or adjusted at once;

(5) Payments of all charges for work under this Section in any one month shall be made along with normal progress payments. Retainage shall be in accordance with Progress Payments-Section 16.

No additional compensation will be provided for additional equipment, materials, personnel, overtime or special charges required to perform the work within the time requirements of the Contract.

When extra work is required and no suitable price for machinery and equipment can be determined in accordance with this Section, the hourly rate paid shall be 1/40 of the basic weekly rate listed in the Rental Rate Blue Book published by Dataquest Incorporated and applicable to the time period the equipment was first used for the extra work. The hourly rate will be deemed to include all costs of operation such as bucket or blade, fuel, maintenance, "regional factors", insurance, taxes, and the like, but not the costs of the operator.

## Section 16 - Progress Payments

The Contractor shall submit each month, or at longer intervals, if it so desires, an invoice covering work performed for which it believes payment, under the Contract terms, is due. The submission shall be to the City's Finance Department - Accounting Division. The Supervising Professional will, within 10 days following submission of the invoice, prepare a certificate for payment for the work in an amount to be determined by the Supervising Professional as fairly representing the acceptable work performed during the period covered by the Contractor's invoice. To insure the proper performance of this Contract, the City will retain a percentage of the estimate in accordance with Act 524, Public Acts of 1980. The City will then, following the receipt of the Supervising Professional's Certificate, make payment to the Contractor as soon as feasible, which is anticipated will be within 15 days.

An allowance may be made in progress payments if substantial quantities of permanent material have been delivered to the site but not incorporated in the completed work if the Contractor, in the opinion of the Supervising Professional, is diligently pursuing the work under this Contract. Such materials shall be properly stored and adequately protected. Allowance in the estimate shall be at the invoice price value of the items. Notwithstanding any payment of any allowance, all risk of loss due to vandalism or any damages to the stored materials remains with the Contractor.

In the case of Contracts which include only the Furnishing and Delivering of Equipment, the payments shall be; 60% of the Contract Sum upon the delivery of all equipment to be furnished, or in the case of delivery of a usable portion of the equipment in advance of the total equipment delivery, 60% of the estimated value of the portion of the equipment may be paid upon its delivery in advance of the time of the remainder of the equipment to be furnished; 30% of the Contract Sum upon completion of erection of all equipment furnished, but not later than 60 days after the date of delivery of all of the equipment to be furnished; and payment of the final 10% on final completion of erection, testing and acceptance of all the equipment to be furnished; but not later than l80 days after the date of delivery of all of the equipment to be furnished, unless testing has been completed and shows the equipment to be unacceptable.

With each invoice for periodic payment, the Contractor shall enclose a Contractor's Declaration - Section 43, and an updated project schedule per Order of Completion - Section 2.

## Section 17 - Deductions for Uncorrected Work

If the Supervising Professional decides it is inexpedient to correct work that has been damaged or that was not done in accordance with the Contract, an equitable deduction from the Contract price shall be made.

## Section 18 - Correction of Work Before Final Payment

The Contractor shall promptly remove from the premises all materials condemned by the Supervising Professional as failing to meet Contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute the work in accordance with the Contract and without expense to the City and shall bear the expense of making good all work of other contractors destroyed or damaged by the removal or replacement.

If the Contractor does not remove the condemned work and materials within l0 days after written notice, the City may remove them and, if the removed material has value, may store the material

at the expense of the Contractor. If the Contractor does not pay the expense of the removal within 10 days thereafter, the City may, upon 10 days written notice, sell the removed materials at auction or private sale and shall pay to the Contractor the net proceeds, after deducting all costs and expenses that should have been borne by the Contractor. If the removed material has no value, the Contractor must pay the City the expenses for disposal within 10 days of invoice for the disposal costs.

The inspection or lack of inspection of any material or work pertaining to this Contract shall not relieve the Contractor of its obligation to fulfill this Contract and defective work shall be made good. Unsuitable materials may be rejected by the Supervising Professional notwithstanding that the work and materials have been previously overlooked by the Supervising Professional and accepted or estimated for payment or paid for. If the work or any part shall be found defective at any time before the final acceptance of the whole work, the Contractor shall forthwith make good the defect in a manner satisfactory to the Supervising Professional. The judgment and the decision of the Supervising Professional as to whether the materials supplied and the work done under this Contract comply with the requirements of the Contract shall be conclusive and final.

## Section 19 - Acceptance and Final Payment

Upon receipt of written notice that the work is ready for final inspection and acceptance, the Supervising Professional will promptly make the inspection. When the Supervising Professional finds the work acceptable under the Contract and the Contract fully performed, the Supervising Professional will promptly sign and issue a final certificate stating that the work required by this Contract has been completed and is accepted by the City under the terms and conditions of the Contract. The entire balance found to be due the Contractor, including the retained percentage, shall be paid to the Contractor by the City within 30 days after the date of the final certificate.

Before issuance of final certificates, the Contractor shall file with the City:

(1) The consent of the surety to payment of the final estimate;
(2) The Contractor's Affidavit in the form required by Section 44.

In case the Affidavit or consent is not furnished, the City may retain out of any amount due the Contractor, sums sufficient to cover all lienable claims.

The making and acceptance of the final payment shall constitute a waiver of all claims by the City except those arising from:

(1) unsettled liens;
(2) faulty work appearing within 12 months after final payment;
(3) hidden defects in meeting the requirements of the plans and specifications;
(4) manufacturer's guarantees.

It shall also constitute a waiver of all claims by the Contractor, except those previously made and still unsettled.

## Section 20 - Suspension of Work

The City may at any time suspend the work, or any part by giving 5 days notice to the Contractor in writing. The work shall be resumed by the Contractor within 10 days after the date fixed in the

written notice from the City to the Contractor to do so. The City shall reimburse the Contractor for expense incurred by the Contractor in connection with the work under this Contract as a result of the suspension.

If the work, or any part, shall be stopped by the notice in writing, and if the City does not give notice in writing to the Contractor to resume work at a date within 90 days of the date fixed in the written notice to suspend, then the Contractor may abandon that portion of the work suspended and will be entitled to the estimates and payments for all work done on the portions abandoned, if any, plus 10% of the value of the work abandoned, to compensate for loss of overhead, plant expense, and anticipated profit.

## Section 21 - Delays and the City's Right to Terminate Contract

If the Contractor refuses or fails to prosecute the work, or any separate part of it, with the diligence required to insure completion, ready for operation, within the allowable number of consecutive calendar days specified plus extensions, or fails to complete the work within the required time, the City may, by written notice to the Contractor, terminate its right to proceed with the work or any part of the work as to which there has been delay. After providing the notice the City may take over the work and prosecute it to completion, by contract or otherwise, and the Contractor and its sureties shall be liable to the City for any excess cost to the City. If the Contractor's right to proceed is terminated, the City may take possession of and utilize in completing the work, any materials, appliances and plant as may be on the site of the work and useful for completing the work. The right of the Contractor to proceed shall not be terminated or the Contractor charged with liquidated damages where an extension of time is granted under Extension of Time - Section 14.

If the Contractor is adjudged a bankrupt, or if it makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of its insolvency, or if it persistently or repeatedly refuses or fails except in cases for which extension of time is provided, to supply enough properly skilled workers or proper materials, or if it fails to make prompt payments to subcontractors or for material or labor, or persistently disregards laws, ordinances or the instructions of the Supervising Professional, or otherwise is guilty of a substantial violation of any provision of the Contract, then the City, upon the certificate of the Supervising Professional that sufficient cause exists to justify such action, may, without prejudice to any other right or remedy and after giving the Contractor 3 days written notice, terminate this Contract. The City may then take possession of the premises and of all materials, tools and appliances thereon and without prejudice to any other remedy it may have, make good the deficiencies or finish the work by whatever method it may deem expedient, and deduct the cost from the payment due the Contractor. The Contractor shall not be entitled to receive any further payment until the work is finished. If the expense of finishing the work, including compensation for additional managerial and administrative services exceeds the unpaid balance of the Contract Sum, the Contractor and its surety are liable to the City for any excess cost incurred. The expense incurred by the City, and the damage incurred through the Contractor's default, shall be certified by the Supervising Professional.

## Section 22 - Contractor's Right to Terminate Contract

If the work should be stopped under an order of any court, or other public authority, for a period of 3 months, through no act or fault of the Contractor or of anyone employed by it, then the Contractor may, upon 7 days written notice to the City, terminate this Contract and recover from the City payment for all acceptable work executed plus reasonable profit.

## Section 23 - City's Right To Do Work

If the Contractor should neglect to prosecute the work properly or fail to perform any provision of this Contract, the City, 3 days after giving written notice to the Contractor and its surety may, without prejudice to any other remedy the City may have, make good the deficiencies and may deduct the cost from the payment due to the Contractor.

## Section 24 - Removal of Equipment and Supplies

In case of termination of this Contract before completion, from any or no cause, the Contractor, if notified to do so by the City, shall promptly remove any part or all of its equipment and supplies from the property of the City, failing which the City shall have the right to remove the equipment and supplies at the expense of the Contractor.

The removed equipment and supplies may be stored by the City and, if all costs of removal and storage are not paid by the Contractor within 10 days of invoicing, the City upon 10 days written notice may sell the equipment and supplies at auction or private sale, and shall pay the Contractor the net proceeds after deducting all costs and expenses that should have been borne by the Contractor and after deducting all amounts claimed due by any lien holder of the equipment or supplies.

## Section 25 - Responsibility for Work and Warranties

The Contractor assumes full responsibility for any and all materials and equipment used in the construction of the work and may not make claims against the City for damages to materials and equipment from any cause except negligence or willful act of the City. Until its final acceptance, the Contractor shall be responsible for damage to or destruction of the project (except for any part covered by Partial Completion and Acceptance - Section 26). The Contractor shall make good all work damaged or destroyed before acceptance. All risk of loss remains with the Contractor until final acceptance of the work (Section 19) or partial acceptance (Section 26). The Contractor is advised to investigate obtaining its own builders risk insurance.

The Contractor shall guarantee the quality of the work for a period of one year. The Contractor shall also unconditionally guarantee the quality of all equipment and materials that are furnished and installed under the contract for a period of one year. At the end of one year after the Contractor's receipt of final payment, the complete work, including equipment and materials furnished and installed under the contract, shall be inspected by the Contractor and the Supervising Professional. Any defects shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. Any defects that are identified prior to the end of one year shall also be inspected by the Contractor and the Supervising Professional and shall be corrected by the Contractor at its expense as soon as practicable but in all cases within 60 days. The Contractor shall assign all manufacturer or material supplier warranties to the City prior to final payment. The assignment shall not relieve the Contractor of its obligations under this paragraph to correct defects.

## Section 26 - Partial Completion and Acceptance

If at any time prior to the issuance of the final certificate referred to in Acceptance and Final Payment - Section 19, any portion of the permanent construction has been satisfactorily completed, and if the Supervising Professional determines that portion of the permanent construction is not required for the operations of the Contractor but is needed by the City, the Supervising Professional shall issue to the Contractor a certificate of partial completion, and immediately the City may take over and use the portion of the permanent construction described in the certificate, and exclude the Contractor from that portion.

The issuance of a certificate of partial completion shall not constitute an extension of the Contractor's time to complete the portion of the permanent construction to which it relates if the Contractor has failed to complete it in accordance with the terms of this Contract. The issuance of the certificate shall not release the Contractor or its sureties from any obligations under this Contract including bonds.

If prior use increases the cost of, or delays the work, the Contractor shall be entitled to extra compensation, or extension of time, or both, as the Supervising Professional may determine.

## Section 27 - Payments Withheld Prior to Final Acceptance of Work

The City may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any certificate to the extent reasonably appropriate to protect the City from loss on account of:

(1) Defective work not remedied;

(2) Claims filed or reasonable evidence indicating probable filing of claims by other parties against the Contractor;

(3) Failure of the Contractor to make payments properly to subcontractors or for material or labor;

(4) Damage to another Contractor.

When the above grounds are removed or the Contractor provides a Surety Bond satisfactory to the City which will protect the City in the amount withheld, payment shall be made for amounts withheld under this section.

## Section 28 - Contractor's Insurance

(1) The Contractor shall procure and maintain during the life of this Contract, including the guarantee period and during any warranty work, such insurance policies, including those set forth below, as will protect itself and the City from all claims for bodily injuries, death or property damage that may arise under this Contract; whether the act(s) or omission(s) giving rise to the claim were made by the Contractor, any subcontractor, or anyone employed by them directly or indirectly. Prior to commencement of any work under this contract, Contractor shall provide to the City documentation satisfactory to the City, through City-approved means (currently myCOI), demonstrating it has obtained the required policies and endorsements. The certificates of insurance endorsements and/or copies of

policy language shall document that the Contractor satisfies the following minimum requirements. Contractor shall add registration@mycoitracking.com to its safe sender's list so that it will receive necessary communication from myCOI. When requested, Contractor shall provide the same documentation for its subcontractor(s) (if any).

Required insurance policies include:

(a) Worker's Compensation Insurance in accordance with all applicable state and federal statutes. Further, Employers Liability Coverage shall be obtained in the following minimum amounts:

Bodily Injury by Accident - $1,000,000 each accident
Bodily Injury by Disease - $1,000,000 each employee
Bodily Injury by Disease - $1,000,000 each policy limit

(b) Commercial General Liability Insurance equivalent to, as a minimum, Insurance Services Office form CG 00 01 04 13 or current equivalent. The City of Ann Arbor shall be named as an additional insured. There shall be no added exclusions or limiting endorsements specifically for the following coverages: Products and Completed Operations, Explosion, Collapse and Underground coverage or Pollution. Further there shall be no added exclusions or limiting endorsements that diminish the City's protections as an additional insured under the policy. The following minimum limits of liability are required:

| | |
|---|---|
| $1,000,000 | Each occurrence as respect Bodily Injury Liability or Property Damage Liability, or both combined. |
| $2,000,000 | Per Project General Aggregate |
| $1,000,000 | Personal and Advertising Injury |
| $2,000,000 | Products and Completed Operations Aggregate, which, notwithstanding anything to the contrary herein, shall be maintained for three years from the date the Project is completed. |

(c) Motor Vehicle Liability Insurance, including Michigan No-Fault Coverages, equivalent to, as a minimum, Insurance Services Office form CA 00 01 10 13 or current equivalent. Coverage shall include all owned vehicles, all non-owned vehicles and all hired vehicles. The City of Ann Arbor shall be named as an additional insured. There shall be no added exclusions or limiting endorsements that diminish the City's protections as an additional insured under the policy. Further, the limits of liability shall be $1,000,000 for each occurrence as respects Bodily Injury Liability or Property Damage Liability, or both combined.

(d) Umbrella/Excess Liability Insurance shall be provided to apply excess of the Commercial General Liability, Employers Liability and the Motor Vehicle coverage enumerated above, for each occurrence and for aggregate in the amount of $10,000,000. The Umbrella/Excess Liability Insurance shall provide substantially the same coverage as the underlying Commercial General Liability Insurance, including additional insureds.

(e) Builders Risk Insurance in an amount equal to or greater than the Contract Sum. There shall be no exclusions or added endorsements limiting coverage for tunnel and subsurface construction.

(f) Professional Liability or Errors and Omissions Insurance protecting Contractor and its employees - $1,000,000.

(g) Contractor Pollution/Environmental Liability Insurance with minimum limits per occurrence and project aggregate limits of $2,000,000. The policy must provide Natural Resources Damages coverage either as part of the policy or as an endorsement.

(h) Railroad Protective Liability Insurance in the form and amount required by the applicable railroad(s).

(2) For all required insurance the City and the Regents of the University of Michigan shall be named as additional insureds without added exclusions or limiting endorsements. Insurance required under subsection (1)(b) and (1)(c) above shall be considered primary as respects any other valid or collectible insurance that the City may possess, including any self-insured retentions the City may have; and any other insurance the City does possess shall be considered excess insurance only and shall not be required to contribute with this insurance. Further, the Contractor agrees to waive any right of recovery by its insurer against the City for any insurance listed herein.

(3) Insurance companies and policy forms are subject to approval of the City Attorney, which approval shall not be unreasonably withheld. Documentation must provide and demonstrate an unconditional and un-qualified 30-day written notice of cancellation in favor of the City of Ann Arbor. Further, the documentation must explicitly state the following: (a) the policy number(s); name of insurance company(s); name and address of the agent(s) or authorized representative(s); name(s), email address(es), and address of insured; project name; policy expiration date; and specific coverage amounts; (b) any deductibles or self-insured retentions which may be approved by the City, in its sole discretion; (c) that the policy conforms to the requirements specified Contractor shall furnish the City with satisfactory certificates of insurance and endorsements prior to commencement of any work. Upon request, the Contractor shall provide within 30 days a copy of the policy(ies) and all required endorsements to the City. If any of the above coverages expire by their terms during the term of this Contract, the Contractor shall deliver proof of renewal and/or new policies and endorsements to the Administering Service Area/Unit at least ten days prior to the expiration date.

(4) Any Insurance provider of Contractor shall be authorized to do business in the State of Michigan and shall carry and maintain a minimum rating assigned by A.M. Best & Company's Key Rating Guide of "A-" Overall and a minimum Financial Size Category of "V". Insurance policies and certificates issued by non-authorized insurance companies are not acceptable unless approved in writing by the City.

(5) City reserves the right to require additional coverage and/or coverage amounts as may be included from time to time in the Detailed Specifications for the Project.

(6) The provisions of General Condition 28 shall survive the expiration or earlier termination of this contract for any reason.

## Section 31 - Refusal to Obey Instructions

If the Contractor refuses to obey the instructions of the Supervising Professional, the Supervising Professional shall withdraw inspection from the work, and no payments will be made for work performed thereafter nor may work be performed thereafter until the Supervising Professional shall have again authorized the work to proceed.

## Section 32 - Assignment

Neither party to the Contract shall assign the Contract without the written consent of the other. The Contractor may assign any monies due to it to a third party acceptable to the City.

## Section 33 - Rights of Various Interests

Whenever work being done by the City's forces or by other contractors is contiguous to work covered by this Contract, the respective rights of the various interests involved shall be established by the Supervising Professional, to secure the completion of the various portions of the work in general harmony.

The Contractor is responsible to coordinate all aspects of the work, including coordination of, and with, utility companies and other contractors whose work impacts this project.

## Section 34 - Subcontracts

The Contractor shall not award any work to any subcontractor without prior written approval of the City. The approval will not be given until the Contractor submits to the City a written statement concerning the proposed award to the subcontractor. The statement shall contain all information the City may require.

The Contractor shall be as fully responsible to the City for the acts and omissions of its subcontractors, and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind subcontractors to the Contractor by the terms of the General Conditions and all other contract documents applicable to the work of the subcontractors and to give the Contractor the same power to terminate any subcontract that the City may exercise over the Contractor under any provision of the contract documents.

Nothing contained in the contract documents shall create any contractual relation between any subcontractor and the City.

## Section 35 - Supervising Professional's Status

The Supervising Professional has the right to inspect any or all work. The Supervising Professional has authority to stop the work whenever stoppage may be appropriate to insure the proper execution of the Contract. The Supervising Professional has the authority to reject all work and materials which do not conform to the Contract and to decide questions which arise in the execution of the work.

The Supervising Professional shall make all measurements and determinations of quantities. Those measurements and determinations are final and conclusive between the parties.

## Section 36 - Supervising Professional's Decisions

The Supervising Professional shall, within a reasonable time after their presentation to the Supervising Professional, make decisions in writing on all claims of the City or the Contractor and on all other matters relating to the execution and progress of the work or the interpretation of the contract documents.

## Section 37 - Storing Materials and Supplies

Materials and supplies may be stored at the site of the work at locations agreeable to the City unless specific exception is listed elsewhere in these documents. Ample way for foot traffic and drainage must be provided, and gutters must, at all times, be kept free from obstruction. Traffic on streets shall be interfered with as little as possible. The Contractor may not enter or occupy with agents, employees, tools, or material any private property without first obtaining written permission from its owner. A copy of the permission shall be furnished to the Supervising Professional.

## Section 38 - Lands for Work

The Contractor shall provide, at its own expense and without liability to the City, any additional land and access that may be required for temporary construction facilities or for storage of materials.

## Section 39 - Cleaning Up

The Contractor shall, as directed by the Supervising Professional, remove at its own expense from the City's property and from all public and private property all temporary structures, rubbish and waste materials resulting from its operations unless otherwise specifically approved, in writing, by the Supervising Professional.

## Section 40 - Salvage

The Supervising Professional may designate for salvage any materials from existing structures or underground services. Materials so designated remain City property and shall be transported or stored at a location as the Supervising Professional may direct.

## Section 41 - Night, Saturday or Sunday Work

No night or Sunday work (without prior written City approval) will be permitted except in the case of an emergency and then only to the extent absolutely necessary. The City may allow night work which, in the opinion of the Supervising Professional, can be satisfactorily performed at night. Night work is any work between 8:00 p.m. and 7:00 a.m. No Saturday work will be permitted unless the Contractor gives the Supervising Professional at least 48 hours but not more than 5 days notice of the Contractor's intention to work the upcoming Saturday.

## Section 42 - Sales Taxes

Under State law the City is exempt from the assessment of State Sales Tax on its direct purchases. Contractors who acquire materials, equipment, supplies, etc. for incorporation in City projects are not likewise exempt. State Law shall prevail. The Bidder shall familiarize itself with the State Law and prepare its Bid accordingly. No extra payment will be allowed under this Contract for failure of the Contractor to make proper allowance in this bid for taxes it must pay.

## Section 43

## CONTRACTOR'S DECLARATION

I hereby declare that I have not, during the period _____, 20___, to _____, 20 , performed any work, furnished any materials, sustained any loss, damage or delay, or otherwise done anything in addition to the regular items (or executed change orders) set forth in the Contract titled _____, for which I shall ask, demand, sue for, or claim compensation or extension of time from the City, except as I hereby make claim for additional compensation or extension of time as set forth on the attached itemized statement. I further declare that I have paid all payroll obligations related to this Contract that have become due during the above period and that all invoices related to this Contract received more than 30 days prior to this declaration have been paid in full except as listed below.

There is/is not (Contractor please circle one and strike one as appropriate) an itemized statement attached regarding a request for additional compensation or extension of time.

_____ _____
Contractor Date

By _____
(Signature)

Its _____
(Title of Office)

Past due invoices, if any, are listed below.

## Section 44

# CONTRACTOR'S AFFIDAVIT

The undersigned Contractor,_____, represents that on _____, 20___, it was awarded a contract by the City of Ann Arbor, Michigan to_____ under the terms and conditions of a Contract titled _____. The Contractor represents that all work has now been accomplished and the Contract is complete.

The Contractor warrants and certifies that all of its indebtedness arising by reason of the Contract has been fully paid or satisfactorily secured; and that all claims from subcontractors and others for labor and material used in accomplishing the project, as well as all other claims arising from the performance of the Contract, have been fully paid or satisfactorily settled. The Contractor agrees that, if any claim should hereafter arise, it shall assume responsibility for it immediately upon request to do so by the City of Ann Arbor.

The Contractor, for valuable consideration received, does further waive, release and relinquish any and all claims or right of lien which the Contractor now has or may acquire upon the subject premises for labor and material used in the project owned by the City of Ann Arbor.

This affidavit is freely and voluntarily given with full knowledge of the facts.

_____ _____
Contractor Date

By _____
(Signature)

Its _____
(Title of Office)

Subscribed and sworn to before me, on this _____ day of _____, 20__
_____ , _____ County, Michigan
Notary Public
_____ County, MI
My commission expires on:

## STANDARD SPECIFICATIONS

All work under this contract shall be performed in accordance with the Public Services Department Standard Specifications in effect at the date of availability of the contract documents stipulated in the Bid. All work under this Contract which is not included in these Standard Specifications, or which is performed using modifications to these Standard Specifications, shall be performed in accordance with the Detailed Specifications included in these contract documents.

Standard Specifications are available online:

http://www.a2gov.org/departments/engineering/Pages/Engineering-and-Contractor-Resources.aspx

# DETAILED SPECIFICATIONS

CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
**PROJECT SCHEDULE AND PAYMENT**



## Description

Examination of Plans, Specifications, and Work Site

Bidders shall carefully examine the Bid Form, plans, specifications, and the work site until the Bidder is satisfied as to all local conditions affecting the contract and the detailed requirements of construction. The submission of the bid shall be considered prima facie evidence that the Bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and all requirements of the Contract.

The entire work under this Contract shall be completed in accordance with, and subject to, the scheduling requirements as outlined below, and all other requirements of the Contract Documents.

1. The Contractor shall begin the work of this project on **January 12, 2026**, and only upon receipt of the fully executed Contract and Notice to Proceed. Appropriate time extensions shall be granted if the Notice to Proceed is delayed beyond this date.

2. This Contract requires microtunneled sanitary sewer, water main, stormwater improvements, road repairs and concrete repair work on Washington St between Third St and First St, and First St between Washington St to north of Miller Ave. The Contract shall be completed in phases and shall be completed within **two hundred and sixty-nine (269) consecutive calendar days**.

3. The work shall be sequenced to meet the schedule requirements identified. Contractor shall determine the exact sequence of work at the project locations and clearly note any deviations from the sequence identified below.

    a. Install microtunneling shafts on First St, including the launch shaft at Sta. 161+30, intermediate shaft at Sta. 155+45 and reception shaft at Sta. 150+70.
    b. Install 36-inch sanitary sewer on First St starting at the Miller Ave end and constructing south.
    c. Install sewer up to low-level connection manhole at Sta. 161+46 and complete testing of sanitary sewer from Sta. 150+70 to Sta. 161+46. Place sewer in service to permit bypass pumping into the sewer.
    d. Complete restoration of First St north of Huron St including concrete and HMA pavement by **June 20, 2026.**
    e. Washington St microtunneling shafts can be installed once the First St microtunneling has commenced.
    f. It is anticipated that the intermediate microtunnel shaft on Washington St will be installed after completion of the Washington St microtunnel has been installed.
    g. Sewer connections on Washington Street with flow through the newly installed sewer must be completed by **August 22, 2026**.

4. The following schedule and phasing of work shall form the basis for bidding of the project. The Contractor may submit an alternative project timeline for Owner review that adheres to the general scheduling requirements previously identified.

The entire work at these locations as required by this Contract includes, but is not limited to the following:

- Temporary and permanent water main and valves installation, chlorinating, pressure testing and flushing.
- Sanitary sewer structures needed for bypass pumping for microtunneling operations.
- Storm sewer installations for installation of microtunneling shafts.
- Pavement removal.
- Replacement of pavement base within utility trenches.
- Pavement base proof rolling and undercutting.
- Replacement of storm sewer and structures.
- Sanitary sewer installation and sanitary sewer abandonment.
- Replacement and installation of curb and gutter, sidewalk and driveway approaches as needed.
- Permanent placement of hot mix asphalt.
- Restoration of all disturbed areas.
- Removal of all traffic control devices.

5. Contractor shall sequence the sanitary sewer installation in a way that does not interrupt service of other utilities.

6. Contractor shall provide all necessary sewer flow control to maintain flow at all sewer replacement sections, sewer crossings, connections and lead transfers.

7. The following workday, hour and other work restrictions are imposed by the City of Ann Arbor.

   Contractor operations shall be limited by local municipality work time, noise and dust ordinance:

   - Monday through Friday: 7am – 8pm
   - Saturday: 7am – 8pm; Notice given to City of Ann Arbor no less than 48 hours and no more than 5 days
   - Sunday: Only with written approval from the City of Ann Arbor

   No work shall be performed during Holiday weekends as follows, unless approved by the City of Ann Arbor:

   - Memorial Day, from 3:00 p.m. Friday through 7:00 a.m. Tuesday
   - Fourth of July, from 3:00 p.m. July 2, 2026, through 7:00 a.m. July 6, 2026
   - Labor Day, from 3:00 p.m. Friday through 7:00 a.m. Tuesday
   - Thanksgiving, from 3:00 p.m. the Wednesday before Thanksgiving through 7:00 a.m. the Monday after Thanksgiving.

City Council approval is expected on or before **December 15, 2025**. The Contractor shall not begin the work without approval from the Project Engineer, and in no case before the receipt of the Notice to Proceed.

Contractor will be furnished with two (2) copies of the Contract, for his/her execution, before the aforementioned City Council meeting. The Contractor shall properly execute both copies of the Contract and return them, with the required Bonds and Insurance Certificate, to the City within ten (10) days.

Time is of the essence in the performance of the work of this contract. The Contractor is expected to mobilize sufficient personnel and equipment and work throughout all authorized hours to complete the project by the final completion date. Should the Contractor demonstrate that they must work on some Sundays in order to maintain the project schedule, they may do so between the hours of 9:00 a.m. and 5:00 p.m. with prior approval from the City. There will be no additional compensation due to the Contractor for work performed on Sundays.

Prior to the start of any construction, the Contractor shall submit a detailed schedule of work for the Engineer's review and approval. Work shall not be started until a schedule is approved in writing by the Engineer. The proposed schedule must fully comply with the scheduling requirements contained in this Detailed Specification. The Contractor shall update the approved work schedule upon request by the Engineer and present it to the Engineer within seven days of said request.

The Engineer may delay or stop the work due to threatening weather conditions. The Contractor shall not be compensated for unused materials or downtime due to rain, or the threat of rain. The Contractor is solely responsible for repairing all damages to the work and to the site, including road infrastructures, road subgrades, and any adjacent properties, which are caused as a result of working in the rain.

The Contractor shall not work in the dark except as approved by the Engineer and only when lighting for night work is provided as detailed elsewhere in this contract. The Engineer may stop the work, or may require the Contractor to defer certain work to another day, if, in the Engineer's opinion, the work cannot be completed within the remaining daylight hours, or if inadequate daylight is present to either properly perform or inspect the work. The Contractor will not be compensated for unused materials or downtime when delays or work stoppages are directed by the Engineer for darkness and/or inadequate remaining daylight reasons. The Contractor is solely responsible for repairing all damages to the work and to the site, including road infrastructures, road subgrades, and any adjacent properties, which are caused as a result of working in the dark.

Liquidated Damages

Failure to complete all work, including sub-phases, as specified herein within the times specified herein, including time extensions granted thereto as determined by the Engineer, shall entitle the City to deduct from the payments due the Contractor, **$2,000.00** in Liquidated Damages, and not as a penalty, for delays in the completion of the work for each and every calendar day beyond the

times for substantial completion as required by this Detailed Specification.

Substantial Completion shall include the installation of all utilities, HMA roadway pavement open to traffic including pavement markings and restoration. If restoration has not been installed, temporary erosion control measures such as staked in-place mulch blanket shall be installed. This work is included in the cost of **Turf Restoration**.

Liquidated Damages will be assessed until the required work is completed in the current construction season. If, with the Engineer's approval, work is extended beyond seasonal limitations, the assessment of Liquidated Damages will be discontinued until the work is resumed in the following construction season.

If the construction Contract is not completed within the specified calendar day period including any extensions of time granted thereto, at the sole discretion of the City of Ann Arbor, this Contract may be terminated with no additional compensation due to the Contractor, and the Contractor may be forbidden to bid on future City of Ann Arbor projects for a period of at least three (3) years. If the Engineer elects to terminate the Contract, Contract items paid for on a Lump Sum basis shall be paid up to a maximum percentage equal to the percentage of the Contract work that has been completed.

CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
**PROJECT COORDINATION**



## Description

The Contractor shall be aware of other road construction work projects within the City of Ann Arbor.

The Contractor shall also be aware that other projects may be constructed within the City by other agencies or contractors that may affect work under this contract.

It is the Contractor's responsibility to coordinate efforts with other projects. It is the Contractors responsibility to investigate other projects in the area with the City and County. Additional costs incurred by the Contractor resulting from conflict with another project will not be considered for additional compensation.

The Contractor shall not receive a time extension due to reasonable work delays resulting from other projects within the area. Refer to the Proposal for information on the required completion date and associated penalties.

The City of Ann Arbor anticipates a water main and road reconstruction project on Ann St between 1st St and 5th Ave during the 2026 construction season. Detour routes may overlap and coordination maybe required between the two projects.

The Contractor shall coordinate to utilize the existing City owned parcel located adjacent to the project site at 415 W Washington Street. The proposed staging area is identified on the contract drawings and shall be fenced off with a permanent 6' high chain link fence. The existing standing chimney on this site must be protected as a roosting spot for chimney swifts, and temporary barriers should be installed around the chimney to protect it from damage. This site includes concrete slabs and foundations from previously demolished buildings. Any surface improvements necessary to utilize the site shall be provided by the Contractor and incidental to the work.

The Contractor shall coordinate with the YMCA located at 400 W Washington Street. This includes coordinating with YMCA staff to ensure access through the 415 W Washington site from Liberty Street for vendor deliveries, solid waste collection and bus transportation. The parking lot beneath the YMCA will be closed to normal traffic, and the parking area at 415 W Washington will be utilized by YMCA patrons. An accessible pedestrian route from this parking lot must be provided to the YMCA.

CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
**INSURANCE REQUIREMENTS**



In addition to the insurance requirements noted in Section 28 of the General Conditions, the following additional insurance requirements apply:

Railroad Protective Liability Insurance naming Ann Arbor Railroad as Named Insured with limits of $5,000,000.00 per occurrence for bodily injury and property damage , with at least $10,000,000 aggregate limit per annual policy period.

The University of Michigan shall be listed as additional insured.

CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
**SANITARY SEWER**



## Description

This work shall consist of furnishing all labor, tools, equipment, and material to install sanitary sewer as indicated on the Plans. This work shall be performed in accordance with 2025 Public Services Standard Specifications Article 2 and Article 10, except as specified herein.

Additionally, where applicable, the work shall be performed in accordance with the following technical specifications incorporated as part of the Contract Documents:

Section 03 30 00 Cast-In-Place Concrete
Section 31 09 13 Geotechnical Instrumentation and Monitoring
Section 31 23 19 Dewatering
Section 31 41 00 Shaft Construction and Support
Section 31 73 00 Contact Grouting
Section 33 01 30 Sewer Flow Control
Section 33 05 07.36 Microtunneling
Section 33 05 36 Fiberglass-Reinforced Plastic Utility Pipe.

## Materials

All precast concrete sanitary manholes and diversion structures shall contain Xypex Bio-San C500 admixture or approved equal.

## Measurement and Payment

The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

| Pay Item | Pay Unit |
|---|---|
| DS_Sanitary Manhole, Fiberglass, ____In. Dia., Sta____ | Each |
| DS_Sanitary Diversion Manhole, Sta ____ | Each |
| DS_Sanitary Manhole Over Existing ("Doghouse"), ____In. Dia. | Each |
| DS_Sanitary Manhole Over Existing ("Doghouse"), Fiberglass, ____In. Dia | Each |
| DS_Geotechnical Instrumentation and Monitoring | Lump Sum |
| DS_ ____ Shaft, Sta ____ | Each |
| DS_Sewer Flow Control | Lump Sum |

**DS_Sanitary Manhole, Fiberglass, ____In. Dia., Sta____** will be paid for at the Contract unit price for each fiberglass manhole installed. Payment includes but is not limited to furnishing the labor, equipment and materials for all necessary excavation; any needed sheeting, shoring and bracing; properly disposing off-site of all surplus or unsuitable excavated material; backfilling and compaction; frame and structure cover; and, constructing the structure complete, including pipe connections and structure cleaning, with the nominal diameter shown and up to the structure depth as detailed on the Contract Drawings.

**DS_Sanitary Diversion Manhole, Sta ____** will be paid for at the Contract unit price for each precast concrete diversion structure installed as detailed on the Contract Drawings. Payment includes but is not limited to furnishing the labor, equipment and materials for all necessary excavation; any needed sheeting, shoring and bracing; properly disposing off-site of all surplus or unsuitable excavated material; backfilling and compaction; frame and structure covers; and, constructing the structure complete, including pipe connections, flow channels, stainless steel stop logs, and stainless steel orifice plate, as detailed on the Contract Drawings.

**DS_Sanitary Manhole Over Existing ("Doghouse"), ____In. Dia.** will be paid for at the Contract unit price for each precast concrete manhole installed as detailed on the Contract Drawings. Payment includes but is not limited to all work required to design and construct the manhole structure over and around the existing sewer pipe, including but not limited to: field investigation of existing sewer pipe, design of the manhole structure and appurtenances, submitting shop drawings to the Engineer for review and approval, fabricating and constructing the doghouse style manhole structure over and around the existing sewer pipe, constructing a concrete base for the manhole structure, furnishing and installing the manhole access riser structure with frame and cover, removal of portions of the existing sewer pipe within the new manhole structure, benching, connections into the manhole structure for sanitary outlet pipes with associated flow channels, temporary or final grade adjustments of the manhole riser structure, and all associated earthwork and backfill.

**DS_Sanitary Manhole Over Existing ("Doghouse"), Fiberglass, ____In. Dia.** will be paid for at the Contract unit price for each fiberglass manhole installed as detailed on the Contract Drawings. Payment includes but is not limited to all work required to design and construct the manhole structure over and around the existing sewer pipe, including but not limited to: field investigation of existing sewer pipe, design of the manhole structure and appurtenances, submitting shop drawings to the Engineer for review and approval, fabricating and constructing the doghouse style manhole structure over and around the existing sewer pipe, constructing a concrete base for the manhole structure, furnishing and installing the manhole access riser structure with frame and cover, removal of portions of the existing sewer pipe within the new manhole structure, benching, connections into the manhole structure for sanitary outlet pipes with associated flow channels, temporary or final grade adjustments of the manhole riser structure, and all associated earthwork and backfill.

**DS_Geotechnical Instrumentation and Monitoring** will be paid for at the Contract unit price on a lump sum basis for the scope of work as detailed in the technical specifications and on the Contract Drawings. 25% of the lump sum amount shall be paid following the initial installation and acceptance of the probes, sensors and readout devices by the Engineer. The remaining amount shall be paid based on percentage of microtunneling and shaft construction completed. The contract unit price for this item shall include all labor, supervision, tools, permits, shop drawing submittals, materials, equipment, operation, any incidental items, and all other work as noted on the Drawings and as specified herein to allow the Contractor to perform the work of furnishing, installing, monitoring, reading, recording, maintaining, protecting, and removing or abandoning geotechnical instrumentation for measuring ground movements and groundwater levels in the vicinity of trenchless installations and related work.

**DS_ ____ Shaft, Sta ____** will be paid for at the Contract unit price for each access shaft constructed as detailed in the technical specifications at the locations identified in the Contract Drawings. Payment includes but is not limited to all work required to design and construct the shafts, field investigation of existing utilities, design of the shaft, submitting shop drawings to the Engineer for review and approval, installation, ground improvement, constructing a concrete working slab, and all associated earthwork and backfill.

Payment for shafts shall include 15% payment upon the delivery of materials, bracing, utility location and the mobilization of necessary installation equipment. An additional 60% payment after the installation of the shaft within project tolerances. The final 25% will be paid upon the successful removal and backfill of the temporary works. Locating existing utilities within or adjacent to the proposed shafts shall be incidental to the shaft and not paid as exploratory excavations.

**DS_Sewer Flow Control** will be paid for at the Contract unit price on a lump sum basis for the scope of work as detailed in the technical specifications and on the Contract Drawings. Contractor shall provide a schedule of values associated with the required sanitary bypass setups. For each setup, 50% of the lump sum shall be paid following the initial installation and acceptance of the system by the Engineer. The remaining 50% of the lump sum for each setup shall be paid upon returning the sewer back to service. The contract unit price for this item shall include all labor, supervision, tools, permits, shop drawing submittals, materials, equipment, operation, any incidental items, and all other work as noted on the Drawings and as specified herein to allow the Contractor to perform the work of diverting and bypass pumping flows.

CITY OF ANN ARBOR
DETAILED SPECIFICATION
FOR
**REMOVAL AND DISPOSAL OF CONTAMINATED MATERIAL**



## Description

This work shall consist of furnishing all labor, tools, equipment, and material to sample, remove and properly dispose of contaminated material. This work shall be performed in accordance with 2025 Public Services Standard Specifications Article 1 and Article 10, except as specified herein.

Additionally, where applicable, the work shall be performed in accordance with the following technical specifications incorporated as part of the Contract Documents:

Section 02 61 00 Removal and Disposal of Contaminated Material
Section 31 23 19 Dewatering
Documentation of Due Care Compliance

## Construction

The Contractor shall submit detailed invoices, receipts, and a summary of all costs incurred against the allowance items with each pay application. each submission must include copies of certified laboratory reports, chain of custody forms, manifests and any other documentation required by the engineer.

## Measurement and Payment

The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

| Pay Item | Pay Unit |
|---|---|
| DS_Laboratory Testing Allowance | Dollar |
| DS_Contaminated Groundwater Disposal Allowance | Dollar |
| DS_Contaminated Soil Disposal | Cubic Yard |

**DS_ Laboratory Testing Allowance** will be paid for at the Contract unit price for dollar based on actual expenses incurred. This allowance is established to cover the costs of third-party laboratory testing, analysis, and reporting services that are directed by the Engineer and are not otherwise included in the unit prices for other pay items within the Contract. This shall include laboratory fees, sample collection and handling, courier and shipping fees, and analytical reports.

The Contractor shall submit a written request to the Engineer for authorization to perform any work to be paid from this allowance. Payment from the allowance will be made on actual costs based on invoice amounts from a third-party laboratory. The Contractor shall not add any markup or overhead to the cost of these services.

Any unused portion of the allowance upon final completion and acceptance of the work shall revert to the Owner, and no additional payment shall be made to the Contractor for this item. If the total

cost of approved laboratory services exceeds the allowance amount, the Contractor shall notify the Engineer and a Change Order will be issued to cover the additional, authorized costs.

**DS_Contaminated Groundwater Disposal Allowance** will be paid for at the Contract unit price for dollar based on actual expenses incurred for groundwater disposed or treated onsite due to contamination. Payment for this item shall be considered full compensation for all labor, equipment, materials, and services necessary to perform the work as specified herein, including but not limited to temporary storage in approved tanks, frac tanks, or other designated containers on-site. Installation and operation of onsite groundwater treatment systems. All on-site management of the contaminated groundwater, including routine inspections, maintenance of containment systems, and any required security measures. All costs associated with obtaining and completing any required permits for transportation and disposal, including state and local permits, and preparation of all required manifests. The mobilization of a licensed hauler and the transport of the contaminated groundwater from the project site to the approved off-site disposal facility. All fees charged by the receiving disposal facility for the treatment, disposal, or recycling of the contaminated groundwater. The provision of all required documentation, including disposal facility receipts, certified manifests, and a summary of all costs incurred.

The Contractor shall submit a written request to the Engineer for authorization to perform any work to be paid from this allowance. Payment from the allowance will be made on actual costs based on invoice amounts. The Contractor shall not add any markup or overhead to the cost of these services.

Any unused portion of the allowance upon final completion and acceptance of the work shall revert to the Owner, and no additional payment shall be made to the Contractor for this item. If the total cost of approved laboratory services exceeds the allowance amount, the Contractor shall notify the Engineer and a Change Order will be issued to cover the additional, authorized costs.

**DS_Contaminated Soil Disposal** will be paid for at the Contract unit price of cubic yards for disposal of contaminated soil. Payment for this item shall be considered full compensation for all labor, equipment, materials, and services necessary to perform the work as specified herein, including but not limited to the segregation of contaminated soil from clean soil within the work area as directed by the Engineer. The temporary stockpiling of contaminated soil on a designated area of the site, including the use of impermeable liners and covers to prevent runoff and exposure. All on-site management of the contaminated soil, including routine inspections, maintenance of stockpiles, and any required security measures. The mobilization of a licensed hauler and the transport of the contaminated soil from the project site to the approved off-site disposal facility. All costs associated with obtaining and completing any required permits for transportation and disposal, including state and local permits, and preparation of all required manifests. All fees charged by the receiving disposal facility for the treatment or disposal of the contaminated soil.

# TECHNICAL SPECIFICATIONS

**SECTION 02 61 00**

**REMOVAL AND DISPOSAL OF CONTAMINATED MATERIAL**

## PART 1 - GENERAL

### 1.01 SCOPE OF WORK

A. This Section specifies the minimum requirements for furnishing all labor, supervision, tools, equipment, materials, incidental items needed for screening, excavation, dewatering, handling, stockpiling, temporarily storing, and disposing of Hazardous or Contaminated Substances, including soils, groundwater, or debris, which are known or that may be encountered during the Work.

B. Hazardous or Contaminated Substances in soils, groundwater, and/or water are anticipated to be encountered during the Work. These conditions will require the screening, excavation, handling, stockpiling, temporary storage, profiling, transportation and off-site disposal of Hazardous or Contaminated Substances.

C. The Contractor shall take all the steps that he considers necessary to familiarize himself with the site conditions, the ground conditions, and the groundwater conditions.

D. The Contractor or his subcontractor(s) shall be currently and appropriately licensed by the State of Michigan to undertake the work covered under this Section and shall submit such information to the Engineer.

### 1.02 SUBMITTALS

A. Related Sections

B. Specifications, Code and Standards

1. ASTM D5434 Guide for Field Logging of Subsurface Explorations of Soil and Rock.

2. 29 CFR 1910 Occupational Safety and Health Standards.

3. 40 CFR 262 Standards Applicable to Generators of Hazardous Waste.

4. 40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.

5. 40 CFR 268 Land Disposal Restrictions.

6. 40 CFR 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST).

7. EGLE Part 201 Generic Cleanup Criteria and Screening levels for Nonresidential Soil, (Part 201 Criteria), dated October 12, 2023, under the Natural Resources Environmental Protection Act 1994, Public Act 451 as amended (NREPA).

8. EGLE Part 201 Generic Cleanup Criteria and Screening levels for Nonresidential and Residential groundwater, (Part 201 Criteria), dated October 12, 2023, under the Natural Resources Environmental Protection Act 1994, Public Act 451 as amended (NREPA).

C. Definitions:

1. Contaminated Substances Subject Matter Expert: Subject matter expert with knowledge of and experience in management and remedial actions for Contaminated Substances and Dangerous Waste and associated regulatory requirements.

2. Contaminated Substance Handling Plan: A work plan covering activities, excavation, staging, transport, sampling, emergency release and disposal of identified contaminated substances and dangerous waste in soil, groundwater or other environmental media.

3. Dewatering: Process of capture, extract, collect and contain groundwater encountered during construction excavation activities; dewatering water may also include trench seepage and/or infiltration which could comingle with saturated zone groundwater.

4. Hazardous and Contaminated Substances: Materials classified as Hazardous Waste, Dangerous Waste, Hazardous Building Materials, and/or Contaminated Substances.

5. Photoionization Detector (PID): A field screening device to detect contaminated materials, utilizing an ultraviolet light to detect ions from volatile organic compounds emitted from a sample.

6. Suspected Contaminated Substances – Soil, groundwater, debris or other environmental media that has not been assessed yet for verification of contamination levels and:

a. Is in contact or close proximity to known contaminated groundwater, soil or other contaminated media.

b. Has visual or olfactory evidence of contamination, or,

c. Is located in an area where hazardous or contaminated substances may be present based on-site historical information or uses.

1.03 COORDINATION

A. A preconstruction meeting with the Owner and Engineer is required before beginning any soil excavation or groundwater dewatering.

B. Schedule an on-site meeting(s) with the Owner and Engineer if suspect contaminated substances are discovered during construction.

C. Meeting(s) with the Engineer to discuss chemical analytical results prior to backfill.

D. Meeting(s) with the Owner and Engineer to review dewatering plans when contaminated substances are anticipated prior to starting dewatering.

1.04 SUBMITTALS

A. Contaminated Substance Handling Plan: 2 weeks prior to construction in areas of Hazardous or Contaminated Substances. Do not perform excavation or groundwater dewatering until the Work Plan is approved by the Engineer. The CSHP should include the following:

1. Summary of location, extent and analytical data for known and suspected Hazardous or Contaminated Substances.

2. Summary of planned construction activities in area of Hazardous or Contaminated Substances.

3. Schedule of activities.

4. Summary of plan for supplemental sampling to classify and characterize Hazardous or Contaminated Substances for disposal and/or reuse. Summary must include sampling approach and analytical methods.

5. Sampling and analysis plan(s) including identification of chemical analytical methods, chemical analytical laboratories, analyte target reporting limits, field and laboratory QC samples and frequency, sample containers and preservation methods and planned sample locations.

6. Methods and procedures of excavation and equipment to be used. Include methods to prevent the spread of Hazardous or Contaminated Substances.

7. Methods for documenting/surveying locations of samples, stockpiles and excavations.

8. Methods for field screening during excavation and dewatering in areas of Hazardous or Contaminated Substances.

9. Methods to prevent non-contaminated soil excavated from mixing with Contaminated Substances.

10. Staging and storage methods, procedures, and locations for liquid and solid Hazardous or Contaminated Substances:

11. Methods and procedures for the transportation, disposal, and off- site treatment of Hazardous or Contaminated Substances, in compliance with applicable federal, state, and local laws and regulations, including the identification of disposal and treatment facilities, and the use of certified, licensed transporters.

12. Equipment decontamination procedures to prevent cross contamination.

13. Project-wide Spill Prevention, Control, and Countermeasures Plans.

14. Methods for water management including groundwater, stormwater runoff, and surface water.

15. Procedures for documenting and reporting encounters with and/or releases of Hazardous or Contaminated Substances.

16. Analytical testing results including field screening results: within 24 hours of receipt.

17. Daily field logs during removal of Hazardous or Contaminated Substances: One week from date of activity.

18. Surveys of stockpile, sample location(s) and excavation area boundaries and elevations: 21 days from date of activity.

1.05 QUALITY ASSURANCE

A. Comply with local, state, and federal regulatory requirements and guidance documents included in this specification.

B. Qualifications:

C. Contaminated Substances Subject Matter Expert:

1. Must be a Michigan Professional Engineer, Licensed Geologist, Licensed Hydrogeologist, or demonstrate a minimum of 12 years of experience in the management of Hazardous or Contaminated Substances.

D. Site supervisor:

1. Trained and experienced in Hazardous or Contaminated Substances handling.

2. Completed OSHA training requirements for working with hazardous substances including the 8-hour supervisory course.

3. Minimum of three (3) years of experience in managing Hazardous or Contaminated Substances projects

E. Site personnel working with Hazardous or Contaminated Substances:

1. Minimum three (3) years of experience with similar work.

F. Employees entering the Exclusion Zone for Hazardous or Contaminated Substances must have HAZWOPER training and certification. For Level D and above personal protective equipment (PPE) protection:

1. Completed appropriate safety training in compliance with 29 CFR 1910.120, 29 CFR 1910.134, and WAC 296843-100.

2. Minimum of 40 hours health and safety training.

3. Minimum 24 hours of “on the job” training.

4. Eight (8) hours annual refresher training.

5. Respirator training and medical monitoring (as required for respirator use).

G. Certifications:

1. All personnel must have respirator fit test certification (qualitative/quantitative) for the respirators they intend to use.

2. Disposal sites certification for proper disposal or treatment of Hazardous or Contaminated Substances.

3. The transporter is a state-licensed transporter of Hazardous or Contaminated Substances.

H. Perform Hazardous or Contaminated Substances excavation and disposal work in compliance with applicable statutes and regulations.

I. Laboratories: Use laboratories as required by the Contract, Hazardous or Contaminated Substances Health and Safety Program.

1.06 PROJECT CONDITIONS

A. Hazardous or Contaminated Substances in soils, groundwater, and/or water are anticipated to be encountered during the Work. These conditions will require the screening, excavation, handling, stockpiling, temporary storage, profiling, transportation and off-site disposal of Hazardous or Contaminated Substances.

## PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Obtain all required permits and notifications for removal, excavation, dewatering, storage, transportation, and disposal of Hazardous or Contaminated Substances.

B. Utilize a PID to perform screening for Hazardous or Contaminated Substance. Use a PID that is able to perform headspace analysis and is able to detect the contaminants of concern.

C. Colorimetric Field Screening Kit: A field testing kit (such as a “Hanby kit” or “RemediAid kit”) may be used in addition to the PID to screen for aromatic compounds, including BTEX, gasoline, and diesel. This screening method includes the extraction of aromatic compounds from the sample and provides a colorimetric indication of the concentration and type of contaminants present.

D. Immunoassay Test Kit: An immunoassay test kit may be used in addition to the PID/FID and OVA to screen petroleum compounds, polychlorinated biphenyls (PCBs) and polynuclear aromatic hydrocarbons (PAHs). This screening method depends on the ability of antibodies (analytes) to specifically bind to an antigen (compound); test results are measured visually or by a special instrument.

2.02 MATERIALS

A. Spill Response Materials:

1. As required and described in the Contaminated Substances Handling Plan.

2. Containers, adsorbents, shovels, and personnel protective equipment.

3. Available at all times in which Hazardous or Contaminated Substances are being handled or transported.

4. Compatible with the type of materials and contaminants being handled.

## PART 3 - EXECUTION

### 3.01 GENERAL REQUIREMENTS

A. Complete site characterization, site remediation and soil management activities, including documenting site activities, removing and properly disposing of Hazardous or Contaminated Substances, and collecting soil and groundwater samples to confirm limits of Hazardous or Contaminated Substances in accordance with applicable regulations and standards of practice.

B. Contractor is responsible for obtaining all required samples.

C. Characterize Hazardous or Contaminated Substances for disposal purposes in accordance with applicable regulations and industry standards of practice. Media to be characterized may include sediment in utilities, soil, groundwater, and/or other water.

D. Anticipate a delay between the collection of confirmation samples and the completion of chemical laboratory analyses and secure and maintain excavation areas during that time. Contractor is responsible for arranging all sampling and testing, and associated delays.

E. Notify the Owner and Engineer immediately if Hazardous or Contaminated Substances are discovered, which had not been previously identified, or if other discrepancies between data provided and actual field conditions are discovered.

### 3.02 HAZARDOUS OR CONTAMINATED SUBTANCE REMOVAL

A. Give notification to the Engineer at least seven (7) days prior to the start of excavation or dewatering of known Hazardous or Contaminated Substances.

B. Implement environmental controls as required by the Contract prior to the start of excavation or dewatering.

C. Strip and stockpile noncontaminated soil separately from Hazardous or Contaminated Substances, for areas that are considered to be below Cleanup Levels based on field screening and chemical analytical data. The Contractor is responsible for staging and protecting this material from becoming contaminated. Dispose of such soil that becomes contaminated or characterized as Dangerous Waste as a result of work activities at the Contractor’s expense.

D. Excavate areas of contamination as required by the Work. Limit the potential for Hazardous or Contaminated Substances to be mixed with uncontaminated material during excavation. Dispose of such mixed soil that becomes contaminated and/or Dangerous Waste as a result of work activities at Contractor's own expense.

E. Maintain a log of the materials and visible indications of contamination encountered during excavation for each area of excavation. Prepare excavation logs in accordance with ASTM D5434.

F. Contain water generated during dewatering until collection and analysis of samples in accordance with applicable federal, state, and local disposal regulations until analytical results are obtained.

G. Perform field surveys immediately prior to and after excavations of Hazardous or Contaminated Substances. Develop cross-sections on 30-foot intervals and at obvious break points for excavated areas. Survey all sample locations. Perform field surveys of stockpiled soil in order to the estimate the volume of the stockpile if tonnage cannot be verified through weight tickets.

H. Provide approved containers, vehicles, equipment, labor, signs, labels, placards and manifests, and associated disposal notices and notifications, necessary for accomplishment of the Work:

3.03 HAZARDOUS OR CONTAMINATED SUBSTANCE STAGING

A. For known or suspected Hazardous or Contaminated Substance, place material in a staging unit immediately after excavation while awaiting test results. Use staging units that are in good condition and constructed of materials that are compatible with the material or liquid to be staged. If multiple staging units are required, clearly label each unit with an identification number and keep a written log to track the source of Hazardous or Contaminated Substance in each staging unit.

B. Isolate known and/or suspected Hazardous or Contaminated Substance from the surrounding environment.

C. Staging units may include stockpiles placed on minimum 6 mils thick plastic sheeting, water-tight barrels, water-tight portable tanks, or water-tight roll-off units lined with 6 mils thick plastic sheeting.

D. Staging units with known and suspected Hazardous or Contaminated Substances must be clearly labeled with the source, date generated, and type of material. Keep a written log to track the source of Hazardous or Contaminated Substances in each staging unit.

E. Place an impermeable cover over the units to prevent precipitation from contacting the stored material. Remove and store liquid that collects inside the units.

3.04 BACKFILL

A. Backfill excavations only after Hazardous or Contaminated Substances removal is complete.

B. All non-contaminated soil removed during the removal of Contaminated Soil must be stockpiled material, sampled and tested prior to backfill.

C. The testing for backfill must conform to the requirements of Reuse Criteria as required by the Contract and local, state and federal regulations.

D. Transmit soil chemical analytical results for material used as backfill to the Engineer prior to placement of backfill.

E. Place and compact backfill in as required by the Contract.

3.05 OFF-SITE DISPOSAL

A. Transport and dispose of excavated material with Hazardous or Contaminated Substances as required by the Contract and local, state, and federal requirements.

B. Transmit to Engineer documentation of off-site disposal facilities' acceptance criteria and associated soil sample chemical analytical data for soil to be disposed that meet acceptance criteria prior to transport of soil to facility.

C. An individual delegated with such authority must sign the waste profile as the generator. The Contractor is responsible for coordinating with the Engineer and providing sufficient chemical analytical data and information to verify waste characterization.

D. For disposal of all Dangerous Waste, with the exception of those wastes resulting from the release of Hazardous or Contaminated Substances negligently disturbed, removed, or handled by Contractor, its employees, agents, officers, or Subcontractors, or any other persons for whom the Contractor may be contractually or legally responsible, ensure that the Generator's Certification portion of the Uniform Hazardous Waste Manifest is signed only by an individual delegated with such authority.

3.06 LOGS, REPORTS AND RECORDKEEPING

A. Maintain field reports covering the implementation of all work identified in this specification.

B. Include in Daily Field Report when working in areas of Hazardous or Contaminated Substances, at a minimum, the following:

1. Date and time of day during which work was performed.

2. Weather conditions (temperature, precipitation).

3. Area (site specific) were work occurred.

4. Employees in particular area and regulators observing the work.

5. Equipment and monitoring instruments utilized in the course of the work.

6. Any substantive deviations from the specifications, plans or submittals as it relates to the daily work performed.

7. Activities completed including, but not limited to:

    a. Text and visual summary of activities including but not limited to drilling, excavation, backfill, dewatering, soil types encountered, groundwater conditions encountered, subsurface features encountered if any.

    b. Field screened sample locations and results.

    c. Map with locations, coordinates and identification of samples collected.

    d. Copies of chains of custody.

    e. Estimated quantities of soil or groundwater excavated and/or contained or disposed.

    f. Summary of disposal activities include quantity disposed and disposal locations.

    g. Mapped location and surveyed volume of stockpiles generated.

    h. Representative photographs of daily work performed.

3.07 SAMPLING, SCREENING, AND ANALYSIS

A. Sampling and Analysis:

1. The Contractor shall perform required sampling and chemical analyses relating to generation, use, release, and disposal of contaminated substances in the course of the Contractor operations.

2. The Contractor perform required characterization sampling and associated chemical analysis to determine disposal methods relating to known Contaminated Substances. Characterize and dispose of material as required in this specification.

3. The Contractor inspect the removal of existing Contaminated Substances from each area of Hazardous or Contaminated Substances. The Contractor must complete field screening during excavation. Samples must be collected in areas where contamination is likely to be present (for example same depth as known Contaminated Soil, areas where field screening indicate Contaminated Soil is present, near groundwater table etc.).

4. Have laboratory retained by the Contractor perform chemical analysis of collected samples with testing per the chemicals of concern and methods as required by the Contract.

B. Screening Procedures for Hazardous or Contaminated Substances:

1. Visually inspect all excavated soil for staining, debris, slag, or sheen. Note unusual odors to evaluate the presence of contamination. Notify Owner and Engineer

immediately if suspected Hazardous or Contaminated Substances are encountered.

2. Screen samples collected from the material excavated in the areas of suspected Hazardous or Contaminated Substance, as identified above, with a water sheen test and headspace measurements for the presence of volatile organic compounds and petroleum hydrocarbons. Screening must be conducted by collecting measurements in the vicinity of the suspect soil as excavation is completed. Conduct headspace analysis by placing suspect material into an inert sealable container, such as a glass jar or "Ziploc" bag, allowing the material to come to room temperature, and collecting measurements of the air within the container.

C. Action and Cleanup Levels.

1. Michigan Department of Environment, Great Lakes, and Energy (EGLE) Part 201 Generic Cleanup Criteria and Screening levels for Nonresidential Soil and Residential Groundwater.

2. If significant staining, sheen, odor, debris, or other evidence of Hazardous or Contaminated Substances is observed in areas where Hazardous or Contaminated Substances were not anticipated, cease all work in the area. Do not continue work in the area until potential risks are evaluated and as directed by the Owner and Engineer.

3.08 CLOSEOUT ACTIVITIES

A. Prepare and submit closeout documents related to the removal of Hazardous or Contaminated Substances. The closeout documentation must include sufficient information for the Engineer to develop the Cleanup Action Report:

B. Summary of excavation and backfill activities, sampling (if completed), and disposal.

C. Documentation prepared for regulatory agencies, including permits, notices, and closure checklists.

D. Information on who transported and accepted wastes encountered, including copies of manifests, waste profile sheets, land disposal restriction, notification and certification forms, disposal ticket and receipts, Bills of Lading, certificates of disposal, and other pertinent documentation signed by the responsible disposal facility official.

E. Surveys of sample locations, stockpiles and excavation area(s).

F. Analytical laboratory test results and chains-of-custody for samples collected.:

**END OF SECTION**

**SECTION 31 09 13**

**GEOTECHNICAL INSTRUMENTATION AND MONITORING**

## PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the minimum requirements for furnishing, installing, monitoring, reading, recording, maintaining, protecting, and removing or abandoning geotechnical instrumentation for measuring ground movements and groundwater levels in the vicinity of trenchless installations and related work. The work includes, but is not limited to, installing and monitoring reflectorless monitoring points, subsurface monitoring points, and piezometers; furnishing monitoring equipment; and recording observations and measurements from the monitoring points on a periodic basis before, during, and after trenchless construction.

B. The Contractor is responsible for surveying the elevations of the monitoring points and other instrumentation locations in accordance with the requirements of this Section. Starting, or baseline, elevations or measurements shall be determined before operations begin to establish a baseline, and during and after operations to monitor any movements related to the trenchless construction. All monitoring points shall be surveyed after trenchless construction has been completed to evaluate longer-term movement or settlement, as Specified herein.

C. Minimum monitoring point location requirements are shown on the Drawings and specified herein. Additionally, the Contractor shall install other monitoring points as necessary to control operations, monitor ground conditions, and ground response to achieve specified project requirements and to prevent damage to existing structures, utilities, and facilities. The Contractor may also be required to install additional instrumentation if required to comply with permits or easements.

D. Vibration monitoring work includes, but is not limited to, furnishing and installing vibration monitoring equipment, performing vibration monitoring, and removing and abandoning equipment.

E. Contractor is responsible for procurement, installation, and monitoring of the required instrumentation.

1.02 REFERENCES

A. Related Sections

1. 31 41 00 – Shaft Construction and Support

2. 33 05 07.36 Microtunneling

B. Specifications, Code, and Standards

1. American Railway Engineering and Maintenance-Of-Way Association (AREMA), Manual for Railway Engineering.

2. ASTM A53, Standard Specification for Pipe. Steel, Black and Hot- Dipped Zinc-Coated (Galvanized), Welded and Seamless.

3. ASTM C778, Standard Specification for Standard Sand.

4. ASTM D5434, Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock.

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

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

1.03 DEFINITIONS:

A. Geotechnical Instrumentation: General term for devices used for measuring groundwater levels, surface and subsurface movement, and movement of existing infrastructure. Includes measurement devices and appurtenant equipment, probes, sensors, cabling, readout devices, data loggers, and PC-based data management systems, as well as ancillary facilities required for their operation, such as boreholes, casings, housings, and covers.

B. Monitoring Point Array (MPA): A series of monitoring points arranged in a line perpendicular to the tunnel alignment. The array is centered over the center line of the tunnel alignment and is used to measure the settlement immediately above the tunnel and laterally away from the tunnel centerline.

C. Inclinometer (INC): Term for an instrument comprised of a specially designed probe (inclinometer probe) and a grooved casing having two sets of grooves orthogonal to each other. The casing is grouted into a borehole in proximity to a shaft or other excavation. The probe is lowered into the inclinometer casing, tracking each set of grooves to monitor horizontal ground displacements relative to fixity at the bottom of the casing that might occur during excavation of shafts or other subsurface structures.

D. Utility Monitoring Point (UMP): A system for monitoring vertical displacements of an existing utility, set on top of the existing utility.

E. Optical Survey Target (OST): Target established to monitor, by optical survey methods, the occurrence and amount of vertical and horizontal displacements.

F. Automatic Total Station (ATS): Total station that can be programmed to take readings for targets and reflectorless points without the need for manual operation.

G. Vibration Monitor (VM): A system to monitor vibrations caused by construction or blasting operations.

H. Observation Well / Piezometer: Open standpipe piezometers (piezometers or wells) consist of a slotted PVC well screen attached to a PVC riser pipe installed in a borehole with the well screen at a prescribed depth (typically the bottom of the borehole). The well screen is installed in a sand filter, the combination being referred to as the sensing

zone. The top of the sensing zone is sealed with bentonite and the annulus around the riser pipe is filled with grout.

I. Pavement Monitoring Points (PMP): A system for monitoring surface displacement induced by construction on pavement. This system shall only be used when the ATS is unavailable, in accordance with Paragraph 2.06.F.1.

J. Sleeved Settlement Monitoring Point (SSMP): A system for monitoring vertical deformation (settlement or heave) at or near the ground surface using optical survey techniques.

K. Reflectorless Point (RLP): Location established to monitor vertical displacements by automatic total station (ATS) that does not involve the installation of a reflector or target on the ground.

1.04 MONITORING CRITERIA

A. Contractor's ground control measures to minimize ground movements during shaft and trenchless construction activities as stated elsewhere in these Specifications shall be implemented to prevent ground movements from exceeding the applicable values listed in Section 3.05.B. and values listed in applicable permits.

B. Tolerances:

1. General: Install geotechnical instruments within 1 foot of the theoretical location specified or indicated except where otherwise approved by the Engineer. Avoid obstacles and utilities.

2. Survey Control: Achieve a level circuit closure with closure error no less accurate than third-order closure.

3. Survey Reference Point Readings:

a. Elevation: Within 0.05 in.

b. Position: Within 0.1 in.

1.05 QUALIFICATIONS

A. Installation and Monitoring Personnel: At least one (1) year of experience installing and reading instrumentation of the type specified. Where installation requires a drilled borehole, installation personnel shall be a geologist, geotechnical engineer, or qualified technician with at least three years of experience with geotechnical drilling and logging soil and rock samples.

B. Surveyor: Land Surveyor registered in the State of Michigan with at least three (3) years of experience in surveying of structure or surface deformations.

C. Manufacturer: The instrumentation manufacturer/supplier specializes in the fabrication and distribution of instrumentation of the type specified.

1.06 SUBMITTALS

A. General:

1. All instrumentation readings shall be reported in imperial units.

2. All submittals except for monitoring records and record drawings shall be provided a minimum of 30 days prior to the scheduled installation of any monitoring points.

3. All monitoring points to be installed or established in a timeframe allowing initial readings to be submitted in accordance with Paragraph 1.06.B.11.

B. Required Submittals:

1. Product Data: Submit manufacturers' catalog sheets, specifications, and installation, operating, and maintenance instructions for each type of data acquisition and management system, instrumentation component, and monitoring device shall be submitted at least 30 days prior to installing instruments.

2. Geotechnical Instrumentation Layout Drawings:

a. Indicate and describe instrumentation types, locations, and layouts in conjunction with a detailed plan of existing surface and subsurface utilities at a scale no less 1:40 (1-inch equals 40 feet). Include the identification number or label with elevation, station, offset, and coordinates as applicable for each instrumentation location.

b. Proposed deviations from the Geotechnical Instrumentation layouts shown on the Contract Drawings must be identified in appropriate submittals and accepted by the Engineer prior to installation at revised locations. Submit drawings with proposed locations, quantities, or types of instruments and a detailed description of the reason for the requested change.

c. Locations of all installed or established monitoring instrumentation on drawings showing monitoring locations in relation to trenchless shafts and segments. Drawings to be provided in DWG or pdf format.

3. Method Statements:

a. Method statements for installing, monitoring, maintaining, protecting, replacing damaged, and removing or abandoning instrumentation.

b. Method statements for installation shall include the equipment used for drilling and grouting, including the manufacturer and model of drilling rigs and methods to be used for advancing the borings.

c. Description of methods and materials for installing and protecting surface and subsurface monitoring points.

d. Installation and monitoring schedule.

e. Corrective measures when Threshold Value, Contractor Response Value, and Maximum Allowable Value are reached.

4. Mix Designs: Materials, admixtures, other additives, and grout mix design required for the instrumentation installation. Provide manufacturer's product descriptions for all admixtures and additives.

5. Drill Logs.

    a. Detailed boring logs including but not limited to soil and rock classification, top of rock elevations, drilling rates, recovery and RQD values, blow counts, groundwater elevation during drilling, voids, and notes describing karstic features, if encountered.

    b. Drilling activities shall be supervised, and boring logs recorded by a geologist or geotechnical engineer experienced with the specific types of earth materials to be encountered.

    c. Drafted logs shall be prepared using gINT, or similar logging software, and submitted to the Engineer.

    d. Field logs shall not be an acceptable submittal.

    e. Soils shall be classified in accordance with ASTM D2487 and D2488.

6. Preconstruction and Post-Construction Surveys of Adjacent Structures

    a. At the pre-construction conference, the Contractor shall submit plans for the preconstruction survey to the Engineer and Owner. This information should be complete and of sufficient detail to inform both the Engineer and Owner of the extent and detail to be achieved throughout the Work. During the course of the survey the Contractor shall keep the Engineer and Owner informed of the progress of the Work and shall notify them of any modifications to the initial plan.

    b. The Engineer and Owner will not be responsible for the accuracy, adequacy, and results of the pre-construction survey. Review of the Contractor's plan shall not denote an assumption of liability by either the Engineer or Owner due to the implementation of the survey or construction operations by the Contractor. The Contractor shall bear full responsibility for damages to either surveyed or un-surveyed property caused by construction operations.

7. Quality Control: Submit a quality control plan describing how the quality of materials and installation will be controlled (e.g. measurements, inspections, testing, etc.), including:

    a. Proposed methods for identifying instrumentation.

    b. Proposed format for presenting raw data readings. Include the date, time, and name of personnel taking measurements or performing monitoring.

c. Methods for assuring the quality of data readings.

d. Methods for protecting instrumentation and, if damaged, assuring their timely repair or replacement.

8. Certifications:

a. Calibration by the manufacturer for each sensor, probe, readout device, inclinometer, and data logger.

b. Provide certifications by the manufacturer for materials specified in Part 2.

9. Acceptance Criteria: Provide certification to indicate that the manufacturer's test equipment is calibrated and maintained in accordance with the manufacturer's calibration requirements, and that all calibrations have been made with equipment certified as meeting standards established for that purpose.

10. Testing: Calibrate all sensors and readout instruments at the manufacturer's facility prior to shipment and provide calibration records to the Engineer.

11. Initial Readings: Submit initial or baseline readings for all monitoring points at least seven (7) days prior to commencing trenchless shaft construction.

C. Reports and Records:

1. Within 72 hours following the installation of each monitoring point, piezometer, and inclinometer, submit:

a. Drawings showing the surveyed as-built location for each monitoring instrument relative to shaft or tunnel alignment.

b. As-installed details including identification numbers, ground elevations, location in terms of stations and offsets, and coordinates as applicable for each type of instrumentation.

c. Details of installed monitoring instruments, accessories, and protective measures including all dimensions and materials used.

d. For subsurface monitoring instrumentation, such as piezometers and inclinometers, provide the instrument tip elevation; sensing zone depths and elevations for piezometers; piezometer installation details, including sensing zone length, bentonite seal thickness and depth, backfill details, and protective good box details; and depths of inclinometer casings and groove orientations.

e. Procedures and sequence used for installation of each instrument.

2. A report including a summary of all monitoring data collected shall be submitted the day following collection of each set of monitoring data. Reporting frequency shall match the measurement frequency for instruments as specified herein.

Provide the data electronically and in hard copy in a format acceptable to the Engineer.

1.07 NOTIFICATIONS

A. Notify the Engineer as described below:

1. Seven (7) working days prior to the intended instrument installation.

2. Immediately upon discovering damaged or malfunctioning instrumentation.

3. Immediately for any reading exceeding specified levels or limits.

4. Immediately for any reading exceeding the Threshold Value Levels specified in Paragraph 3.05.B.

5. Two weeks prior to abandoning existing instrumentation previously installed for this contract.

1.08 WARRANTY

A. Equipment warranty as provided by the manufacturer.

B. Installation warranty shall be for the period of construction and post-construction instrumentation monitoring as specified herein.

**PART 2 - PRODUCTS**

2.01 MONITORING POINT ARRAY (MPA):

A. As shown on the Contract Drawings or as directed and accepted by the Engineer.

2.02 INCLINOMETER (INC)

A. Provide an inclinometer readout system that is capable of data storage and retrieval for immediate representation by a printer in either tabular form, graphic form, or both. The system shall allow editing, correction, and adjustment of data and shall provide error-checking routines.

B. Casing shall be an aluminum or plastic pipe with internal longitudinal grooves and with telescoping couplings, caps, and fittings. The casing shall have a minimum inside diameter of 3.3 inches.

C. Provide an inclinometer sensor with 100 feet of cable.

2.03 UTILITY MONITORING POINT (UMP)

A. As shown on the Contract Drawings and as directed or accepted by the Engineer.

2.04 OPTICAL SURVEY TARGETS (OST)

A. Surveyor's prisms or reflectors compatible with the survey equipment used and capable of providing measurements within the specified tolerances. Provide optical survey targets as shown on the Contract Drawings and specified herein.

B. If OSTs detach from mounting locations, the Contractor shall reinstall the OSTs within 24 hours or less, when such failure is observed by either the Contractor or Engineer.

2.05 SURFACE SURVEY POINTS ON RAILROAD TRACKS (OST):

A. Optical survey targets as shown on the drawings and as directed or accepted by the Engineer.

B. If OSTs on railroad tracks detach from mounting locations, the Contractor shall reinstall the OSTs within 24 hours or less, when such failure is observed by either the Contractor or Engineer.

2.06 AUTOMATIC TOTAL STATION (ATS)

A. Use Sixense Centaur automatic total station, or equivalent.

B. The Contractor shall choose suitable positions for the Automatic Total Stations to provide continuous readings of optical survey targets (OST) on railroad rails and reflectorless points (RLP) subject to the approval of the Engineer. The ATS shall be set to provide an unbroken line-of-sight to all monitoring points providing readings at all times without the need to move and re-establish either the ATS or any monitoring point. If such line-of-sight cannot be established and maintained, a second ATS shall be used.

1. The term “continuous” means that one optical survey target measurement shall be obtained at least every three hours.

C. Automatic total stations shall be robust and weather resistant and capable of operating to the specified accuracy in all weather conditions.

D. ATS shall be suitably mounted on a secure foundation or purpose-built bracket. The mounting shall be birdproof and vandal and theftproof.

E. The positions of the reference prisms are to be selected by the Contractor outside of the construction zone and zone of influence of the underground works. Where reference points are within the zone of influence, the data processing software shall recalculate the position of these points based on a survey by other ATS to allow correct calculation of the position of all total stations using those reference points. The Contractor shall propose the number and position of reference points outside the zone of influence, subject to the agreement of the Engineer.

F. During the monitoring period, one spare ATS shall be maintained for use as an emergency replacement for damaged or malfunctioning equipment. A damaged or malfunctioning ATS shall be replaced within one business day. The Contractor shall allow for replacement setups, including calibration, at no additional cost to the Owner.

1. The Contractor shall install an equivalent number of pavement monitoring points (PMP) to be monitored daily by a licensed surveyor for the duration of the delay, at no additional cost to the Owner. The PMPs shall only be used when the ATS is unavailable, due to malfunction or maintenance.

G. Results from monitoring reflectorless points by the ATS system shall be presented as a change in elevations with an overall accuracy of 0.01 foot (0.12 inch).

H. Provide the Engineer web-based access to the monitoring system, readouts, and any monitoring software required, such that the Engineer is able to view all ATS measurements at the same time as the Contractor.

2.07 VIBRATION MONITORS (VM)

A. Vibration Monitoring: Construction vibrations shall be monitored by the Contractor in terms of peak particle velocity using a seismograph with continuous recording capability. The vibration sensors shall be capable of recording three (3) orthogonal components of vibration.

2.08 OBSERVATION WELLS / PIEZOMETERS

A. Piezometers shall be installed as indicated in the Drawings.

B. Piezometers shall consist of 2-inch nominal diameter Schedule 40 PVC riser pipe with a vented cap in which an air vent hole of 0.2 inches in diameter has been drilled and a slotted Schedule 40 PVC well screen has been installed. The cap shall be easy to remove. The well screen shall conform to the requirements shown on the Drawings.

C. Filter sand shall conform to ASTM C778, Standard Specification for Standard Sand, type 20-30 sand.

D. Granular bentonite shall be Enviroplug Medium, manufactured by Wyo-Ben, Inc., Billings, Montana, or Holeplug, manufactured by Barold Division, Petroleum Services, Inc., Houston, Texas, or equivalent.

E. Water level indicator shall be an electrical indicator cable of appropriate length with graduations at 12-inch or smaller intervals. Provide two water level indicators to enable independent readings by the Contractor and the Engineer.

2.09 PAVEMENT MONITORING POINTS (PMP)

A. If used in lieu of Reflectorless Monitoring Points, or conditionally used when the ATS is unavailable, Pavement Monitoring Points in paved areas shall be hardened steel markers with an exposed convex head having a minimum diameter of 1/2 inch, a minimum length of two (2) inches, and similar to surveyor's "PK" nails.

2.010 ACCESS COVERS

A. Furnish access cover and install at the ground surface to protect installed inclinometer casings, soil deformation monitoring points, and piezometers. Use steel of sufficient

strength to withstand AASHTO (HS-20) truck loadings where traffic rated covers are required. Provide a traffic rated, minimum 8” ID, watertight access cover.

B. Grout covers in place in areas where instrumentation is subject to damage by construction operation. Install suitable barriers or guard posts as necessary to protect the monuments.

## PART 3 - EXECUTION

### 3.01 PRECONSTRUCTION AND POST-CONSTRUCTION SURVEYS

A. Contractor shall perform a preconstruction survey of the interior and exterior of all structures, buildings, and utilities within 500 feet of each trenchless segment. The Engineer will assign a representative to participate in the survey. The Contractor shall be required to submit the results of the survey in a report. The survey shall include photographing and videotaping the exterior of each structure and building and recording (including sketches) any evidence of distress, such as cracks, distortions of the building frame, and any evidence of total and differential settlement. In the event that any cracks or other evidence of distress are observed, it may become necessary to enter the buildings (where distress is evident) to map any other evidence of distress in the building. Cracks and other evidence of existing distress shall be marked, catalogued, photographed, and crack-monitoring gauges shall be installed at the direction of the Engineer or the Engineer’s representative. The gauges can be glued to the wall spanning across the crack. The crack gauges shall allow monitoring of movement as reflected by enlargement of the cracks. For each building, a file shall be prepared that contains the photographic records, and a form report that records the preconstruction observations. This information shall be presented in a report and provided to the Owner. Where evidence of distress or damage is present, the information shall have to be disclosed to the owner of the structure. The Engineer may concurrently perform independent surveys at selected locations to verify the Contractor’s survey. The Contractor and the Engineer shall exchange results of the surveys and reconcile any differences in their findings before construction begins.

B. Periodic surveys to assess the condition of existing structures may be required. Such additional surveys may be conducted if there is evidence of damage to any of the adjacent properties or any allegations of damage by any of the property owners along the project alignment. At least one post-construction survey shall be performed at the end of all construction activities for each trenchless segment.

### 3.02 INSTALLATION

A. General

1. Notify the Engineer in advance of installation in accordance with Paragraph 1.07 NOTIFICATIONS. Install instrumentation in accordance with accepted submittals and other requirements of the Contract Documents.

2. Install instrumentation as shown on Drawings, as directed or accepted by the Engineer, and consistent with the Contractor’s submittals. Install in accordance with the manufacturer's printed instructions and as specified in this Section. Install within the accuracy limits specified by the manufacturer.

3. Inspect and log any drilled hole for instrument installation in accordance with the associated ASTM standards. Confirm the ground conditions are compatible with the proposal installation.

4. Protection: Install protective housing with cap for piezometers, inclinometers, and sleeved settlement monitoring points. Protective housing shall be installed within a flush-mounted precast concrete box or vault if in traffic lanes or paved areas, so as not to obstruct vehicle or foot traffic, and shall be in accordance with standards and permit requirements. Install access covers as specified herein where required.

B. Monitoring Point Array (MPA)

1. Install monitoring points as close as practicable to the locations shown on the Contract Documents with the intent of locating them within 0.5 feet of the horizontal and vertical location shown on the Contract Documents or as directed by the Engineer. The Engineer may modify monitoring point locations depending on field conditions, conflicting utilities, and monitoring objectives.

C. Inclinometers

1. Inclinometers shall be provided as shown on the Contract Drawings.

2. Install inclinometer casings in accordance with the manufacturer's recommendations and the approved submittals. Grout annulus between the inclinometer casing and the drill hole in accordance with the manufacturer's recommendations. Grout installations from the bottom of the hole to the ground surface. Use a grout tube inside the casing, connected to grout port connection in bottom cap only when external tremie pipes will not be possible. Grout casing into hole immediately after installation.

3. Labeled protective covers shall be installed above each inclinometer.

D. Utility Monitoring Points (UMP)

1. Drill and probe with methods that will not damage the utility.

2. Use drill casing as necessary for hole stability and proper installation.

3. After completion of installation, the as-built location in horizontal position shall be determined to an accuracy of $\pm$ 1 ft and the elevation of the top of the riser pipe to an accuracy of $\pm$ .01 ft

E. Optical Survey Targets (OST)

1. Install one optical survey target, centrally located horizontally and vertically, on each of the shaft walls. Optical survey target locations are to be approved by the Engineer.

F. Automatic Total Station (ATS)

1. The contractor shall submit the proposed ATS installation locations for acceptance by the Engineer in accordance with Paragraph 1.06 SUBMITTALS.

G. Observation Wells / Piezometers

1. Piezometers shall be installed at the locations and depths required on the Drawings.

2. Bentonite and other types of drilling mud shall not be used when drilling boreholes for piezometer installation.

3. For any piezometer to be installed in the soil overburden, a standard split spoon sample shall be taken at the top and bottom of the piezometer sensing zone.

4. The well screen, riser pipe, filter pack, filter pack seal, and annular space seal shall be installed as shown on the Drawings. Pipe joints shall be made secure and watertight. The drill casing shall be withdrawn slowly as the backfill materials are placed, at the same rate as backfill placement, so that collapse of the borehole does not occur. Casing shall not be rotated during withdrawal.

5. Filter pack material shall be placed slowly so that bridging does not occur in the boring and to prevent the well screen and riser pipe from being lifted as the casing is withdrawn. A measuring rod, cylindrical sounding hammer or similar device shall be used to measure the height of the filter pack to ensure that the filter pack is installed over the proper depth interval. The measuring rod shall be carefully raised and lowered while the filter pack is installed, to prevent bridging and to tamp the filter pack in place.

6. After the filter pack is placed, the filter pack seal, consisting of granular bentonite, shall be placed as shown on the Drawings. Granular bentonite shall be placed slowly so that bridging does not occur in the boring and to prevent the well screen and riser pipe from being lifted as the casing is withdrawn. Depth to the top of each increment of granular bentonite shall be checked using a cylindrical sounding hammer. The granular bentonite shall not be tamped.

7. An annular space seal, consisting of Portland cement grout, shall be placed above the filter pack seal to fill the annular space between the riser pipe and borehole. The annular space seal shall be placed by tremie grouting. The grout shall be placed in such a manner as to not disturb the integrity of the filter pack and seal.

8. Each installation shall be developed a minimum of 24 hours after completion. Development shall be continued until the water becomes clear and, in the opinion of the Engineer, the material soil filter has been developed.

9. After completion of piezometer development, a post-installation acceptance test shall be performed within seven (7) calendar days after development by conducting a falling head permeability test to verify seal integrity to the satisfaction of the Engineer.

H. Seismographs

1. Two seismographs per shaft location shall be installed and in operation for each day the Contractor conducts vibration inducting operations including, but not limited to, installation of support of excavation systems, pile driving, excavation, and backfilling. The seismographs shall be installed adjacent to existing structures within 25 feet of the work. If there are no existing structures within 25 feet, the seismograph shall be installed on a firm surface 25 feet from the work zone.

2. Vibration sensors shall be firmly mounted on the surface of concrete or asphalt.

3.03 SURVEYS AND INITIAL READINGS

A. After installation, survey the location of the top of each instrument or its marker point to horizontal and vertical accuracy as stated in this Section. Submit location information to the Engineer.

B. After completion of each instrument installation, take 3 sets of verification data readings for each instrument to demonstrate the adequacy of the installation, to demonstrate the proper operation of the instrument, and to establish an initial or baseline value. Submit the initial readings to the Engineer for approval. Location survey for each monitoring point and establishment of baseline readings shall be completed at least 7 days prior to the start of shaft excavation or trenchless construction.

C. Initial readings of vibrations shall be performed by the Contractor and shall consist of at least three days of monitoring prior to the start of vibration producing construction activities. Readings shall be taken at various locations within the proposed work zones to provide information on background vibration levels.

3.04 MONITORING

A. General: The Contractor shall monitor all instruments during construction. Upon the Engineers' request, the Contractor shall provide such assistance, labor and equipment necessary for the Engineer to monitor instruments, if desired, at no additional cost to the Owner.

B. Coordinate with such instrumentation monitoring activities as follows:

1. Make probes, sensors, and readout devices available as required by the Engineer.

2. Schedule employees' and subcontractors' activities to minimize interference.

3. Remove obstructions from lines of sight when requested.

C. Temporarily cease activities that create hazards to instrument monitoring or surveying personnel.

D. Be available to discuss the interpretation of instrumentation data as used in evaluating tunneling performance and controlling settlements to prevent damage to structures, facilities, and utilities.

E. Monitoring frequency: The frequency of instrument reading shall be as follows unless otherwise indicated:

1. All monitoring instrumentation at and adjacent to shafts and along tunnel alignments shall be monitored daily during shaft and tunnel excavation for that tunnel drive, regardless of whether work progresses at the site that day. Monitoring can be reduced to twice per week after the trenchless excavation is complete.

2. Once related construction operations are complete, all monitoring devices and points shall be surveyed once at seven days, once at 14 days, and once at 30 days after completion of the trenchless excavation. In this context, “completion” means that the jacking pipe has been installed, piping in the launch and reception shafts is placed, and the shafts are fully backfilled.

3. Upon completion of construction, monitoring shall continue for any monitoring points that show movement from the prior survey until three consecutive surveys, each performed on different days, show no additional movement.

F. Additional measurements are required in the following cases:

1. Double the frequency of measurements when measurements reach Threshold Values.

2. Take additional, immediate measurements where measured values indicate excessive variability, as determined by the Engineer.

3.05 RESPONSE VALUES

A. The response values listed herein are only the maximum allowed and do not relieve the Contractor of the responsibility of controlling the work and preventing damages.

B. The Contractor shall abide by the following response values. The Contractor shall use more stringent response values as necessary to control the work and prevent damage to all facilities.

| Instrument | Threshold Value | Shutdown Value |
|---|---|---|
| Inclinometer | 0.50 inch | 1.0 inch |
| (1) Optical Survey Target | 0.50 inch | 1.0 inch |
| Settlement Monitoring Point | 0.50 inch | 1.0 inch |
| Structural Monitoring Point on Railroad Bridge | 0.1 inch | 0.25 inch |
| Utility Monitoring Point | 0.25 inch | 0.50 inch |
| Vibrations: PPV | 1.0 in/sec | 1.5 in/sec |

(1) Maximum allowable deflection (Shutdown Value) of shaft walls is 1 inch or designer's recommendation, whichever is less.

When a given response value is reached, the Contractor shall respond in accordance with the following:

Threshold Value: The Contractor shall meet with the Engineer to: 1) review interpretation of the data and results, 2) review the construction means and methods, and 3) determine what changes, if any, shall be made to better control movement.

Shutdown Value: The Contractor shall stop all work immediately, if it is safe to do so, and meet with the Engineer to develop a plan of action before work can be resumed.

C. When the threshold value is reached, the frequency of readings for any affected instruments shall be double the frequency stated herein, or as otherwise directed by the Engineer. The increased frequency of readings shall be maintained until readings made during five (5) consecutive days are below the Threshold Value for the instrument(s) in question or reading values have stabilized, as determined by the Engineer.

3.06 INSTRUMENT PROTECTION, MAINTENANCE AND RESTORATION

A. Protect and maintain instruments throughout the duration of monitoring. Drain water or flush debris from under traffic covers. Keep traffic covers secured.

B. Provide substantial protective barriers such as bollards or Engineer approved equal around instruments in construction areas that are suitable for protecting instruments from damage due to construction activities.

C. Maintain instrumentation in accordance with manufacturer recommendations.

D. Repair or replace damaged or missing instrumentation in accordance with manufacturer recommendations. Repair or replace damaged or missing instrument components or the entire instrument within 24 hours or as approved by the Engineer. All repairs and replacements will occur at no additional cost to the Owner.

E. If any instruments deemed by the Engineer to be critical are damaged, the Contractor will be instructed to cease Work until the damaged instrument is replaced and readings re-established. The Contractor will not be entitled to additional time or compensation resulting from this delay or the cost of materials, labor, and equipment to install the replacement.

F. For replacement instrumentation, take initial readings and correlate with previous readings to the satisfaction of the Engineer.

3.07 REMOVAL OR ABANDONMENT

A. All instrumentation shall remain the property of the Contractor following completion of the work and shall be removed or abandoned according to this section and the

Contract Documents, applicable codes, permits, and standards unless otherwise noted.

B. Removal:

3. Verify with the Engineer that instrumentation is no longer required.

4. Remove instrumentation prior to substantial completion of the work unless otherwise indicated.

5. Remove all instrumentation per the requirements and methods of the applicable regulatory agency. Backfill holes with grout mix approved by the applicable regulatory agency, or the Engineer, and restore surfaces to conditions existing before installation.

6. Fill holes drilled in masonry or concrete surfaces with cement mortar to present an appearance matching the surrounding surface.

**END OF SECTION**

**SECTION 31 23 19**

**DEWATERING**

## PART 1 - GENERAL

### 1.01 SCOPE OF WORK

A. This Section specifies the minimum requirements for furnishing all labor, supervision, tools, equipment, appliances, materials, incidental items, and the installation, operation, and maintenance needed to lower and control the groundwater levels and hydrostatic pressures to permit all excavation and construction specified under this contract to be performed in the dry. The control of all ice, snow and surface water shall be considered as part of the work under this Section.

B. The Contractor shall take all the steps that he considers necessary to familiarize himself with the site conditions, the ground conditions, and the groundwater conditions.

C. The Contractor or his dewatering subcontractor shall be currently and appropriately licensed by the State of Michigan to undertake the work covered under this Section and shall submit such information to the Engineer.

D. Groundwater depths in the proposed sanitary alignment area are expected to be encountered based on soil boring data. Select metals were identified in the groundwater in excess of Michigan Department of Environment, Great Lakes, and Energy (EGLE) Part 201 Generic Cleanup Criteria and Screening levels for Nonresidential Soil, (Part 201 Criteria), dated October 12, 2023, under the Natural Resources Environmental Protection Act 1994, Public Act 451 as amended (NREPA). These metals include arsenic, lead, copper, mercury, silver and zinc. The south end of First Street may also have tetrachloroethene (PCE) present. Treatment will be required prior to discharge through the City of Ann Arbor stormwater infrastructure.

E. All dewatering shall be in compliance with the Documentation of Due Care Compliance incorporated into the Contract Documents.

### 1.02 SUBMITTALS

A. Prior to commencement any excavation within three feet. of the prevailing groundwater levels, the Contractor shall submit a detailed plan and operation schedule for dewatering of excavations. The detailed plan shall include mitigation measures to prevent settlement of nearby structures and a contingency plan for restoring nearby structures if settlement is observed as a result of the Contractor’s dewatering operations. The Contractor may be required to demonstrate the system proposed and to verify that adequate equipment, personnel, and materials are provided to dewater the excavations at all locations and times. The Contractor's dewatering plan is subject to review by the Engineer.

B. Submit dewatering plan as an informational submittal no less than 30 days before installation of dewatering systems. Review will be solely for conformance to requirements of this section with no warranty of whether reviewer believes the plan

will work. Contractor shall review available geotechnical information in development of the dewatering plan and gather any additional information necessary to inform the plan.

C. The dewatering plan shall include the following elements:.

1. Applicable permit requirements
2. Equipment proposed
3. Methods proposed
4. Standby equipment proposed
5. Capacities of pumps, motors and engines, including standby equipment
6. Power supply
7. Standby power
8. Contaminant monitoring requirements
9. Pollution control facilities
10. Proposed discharge locations
11. Operation procedures
12. Equipment removal and/or abandonment procedures.

D. For each submittal and re-submittal, the Contractor shall allow at least 14 calendar days from the date of the submittal to receive the Engineer's acceptance or request for revisions. The Engineer's comments shall be incorporated into the re-submitted plans, calculations, and descriptions. The Engineer's acceptance of the plan is required before beginning the work. Re-submittals shall be reviewed and returned to the Contractor within 14 calendar days. Required revisions will not be a basis of payment for additional compensation, extra work, or an extension of contract time. The Contractor shall include time for this entire review process in their schedule.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer that has specialized in design of dewatering systems and dewatering work. Contractor must be registered with EGLE for projects in Michigan.

## PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic

pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

B. Delegated Design: Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, that excavation does not flood, and that damage to subgrades and permanent structures is prevented.

D. Prevent surface water from entering excavations by grading, dikes, or other means acceptable to the Engineer and Authorizing Jurisdictions.

E. Accomplish dewatering without damaging existing buildings, structures, sensitive natural features (i.e. wetlands, etc) and site improvements adjacent to excavation. Method shall prevent loss, caving, loosening or softening of ground as water is removed.

F. Remove dewatering system when no longer required for construction.

2.02 DEWATERING BAGS

A. Bags shall be constructed from a robust geotextile filter fabric made for the purpose of accommodating flow from groundwater dewatering operations. They shall include integrated hose inlets.

B. Fabric shall be a heavy-duty needle punched non-woven geotextile filter fabric; fabric shall provide high permittivity pore structure that allows water to pass through while containing fine soils.

C. Bags shall be sized to accommodate the volume of water being pumped, the quantity and type of sediment, the permittivity of the bag, and the volume of materials being contained. The volume per bag is dependent on pumping rates, soil composition, and site conditions.

## PART 3 - EXECUTION

3.01 DEWATERING

A. The Contractor shall provide all equipment necessary for dewatering. The Contractor shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition and shall have available, at all times, competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.

A. Dewatering for structures and pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.

B. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.

C. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

D. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with approved aggregate.

E. The Contractor shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation, construction, backfilling, and up to acceptance.

F. Flotation shall be prevented by the Contractor by maintaining a positive and continuous removal of water. The Contractor shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.

G. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check by the Contractor shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

H. No water shall be drained into work built or under construction without prior consent of the Engineer. Water shall be filtered using an approved method to remove sand and fine-sized soil particles before disposal into any drainage system.

I. After all requirements of this Section are met; the Contractor shall remove all materials and equipment used during this operation. All holes, wells, and pits shall be filled immediately with suitable material.

3.02 PRE-INSTALLATION CONFERENCE

A. Conduct conference at project site to review methods and procedures related to dewatering including, but not limited to, the following:

1. Inspection and discussion of condition of site to be dewatered including coordination with temporary erosion control measures and temporary controls and protections.

1. Geotechnical report.

2. Proposed site clearing and excavations.

3. Existing utilities and subsurface conditions.

4. Coordination for interruption, shutoff, capping, and continuation of utility services.

5. Construction schedule. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

6. Testing and monitoring of dewatering system.

3.03 PERMITTING

A. All water removed from the excavation will be managed and discharged to the stormwater system in accordance with City of Ann Arbor Dewatering Permit requirements. Permit for discharge to the stormwater system has been submitted to the City of Ann Arbor Systems Planning Unit for review and approval.

B. The Contractor shall temporarily store water from the excavation in frac tanks staged. Water from the initial frac tank will be sampled and analyzed by a laboratory. If the water meets the requirements in the permit, the water will be discharged to an existing stormwater manhole.

C. If the water does not meet the permit requirements, the Contactor shall arrange for disposal of the water, or can utilize a portable treatment system (granular activated carbon or similar) to pre-treat the water prior to discharge.

D. Contractor shall register with Michigan EGLE for large quantity water withdrawal, should the estimated water withdrawals with a capacity of 70 gpm or more, be expected. Registration is required before the withdrawal can begin. Use the WWAT to determine requirements based on your bid assumptions: https://www.egle.state.mi.us/wwat/(S(ihruwth5tbgqfices1qqxbbl))/Default.aspx.

3.04 REGULATORY REQUIREMENTS

A. Comply with governing jurisdiction regulations before beginning dewatering. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. In Michigan, dewatering is subject to review by EGLE. Natural Resources and Environmental Protection Act 451, 1994, Part 327, Section 32 4. 32723 identifies permit and registration requirements. There are limits on the amount of groundwater that can be withdrawn without a permit or registration.

C. Contractor is responsible to obtain a Part 327 groundwater discharge permit if necessary for construction. Contractor is responsible to comply with the Part 327 groundwater discharge permit or registration required by EGLE for this project, and the Washtenaw County Department of Health.

D. Michigan Department of Environment, Great Lakes, and Energy EGLE Part 201 Generic Cleanup Criteria and Screening levels for Nonresidential and Residential groundwater, (Part 201 Criteria), dated October 12, 2023, under NREPA. Requirements.

3.05 NOISE CONTROL

A. All noise generated by the dewatering operation shall not exceed the sound limits as required by City Code and shall follow necessary procedures as required for temporary exemptions.

B. The Contractor shall provide a secondary sound barrier for pumps and any power generating equipment.

3.06 DEWATERING BAGS

C. Bags shall be placed at locations approved by the Engineer and Owner. Bags shall not be placed on steep sloped surfaces, as the bag may roll.

D. Lay bags flat on ground. If manufacturer's recommendations allow for it, bags can be placed on trailers or dump trucks to facilitate removal.

E. To improve the performance levels of the filtration bags, placement on a permeable or porous surface (such as hay bales or aggregate) may help to facilitate a faster dewatering process. Select a media that will not damage the bag. All temporary surfaces must be removed after the completion of dewatering operations, and all areas restored to original conditions.

F. Water runoff from the bag shall be guided to the nearest watercourse without causing any soil erosion.

G. Monitor the performance to ensure that pump rates or concentration of sediment are not excessive. Replace the bag when the bag stops filtering and passing water at a normal rate.

H. Avoid multiple pipe discharges into one bag.

I. Used bags and collected contents shall be disposed of by the Contractor off- site.

3.07 GROUNDWATER CONTAMINATION

A. Where non-perched groundwater is encountered, it may contain tetrachloroethylene, arsenic, lead, copper, mercury, silver and zinc as shown in the appended geotechnical information.

B. Contractor shall include provisions to pre-treat or properly dispose of water that does not meet EGLE Part 201 Generic Cleanup Criteria and Screening levels for Nonresidential and Residential groundwater, (Part 201 Criteria), dated October 12, 2023, under NREPA. requirements.

C. Groundwater will need to be directed through an activated carbon filter before discharging. The groundwater will be sampled every four days during active continuous dewatering. Contractor is responsible for replacing filter media when needed to maintain concentrations to state-approved levels. Submit dewatering plan and coordinate with the Owner's operations.

D. Water shall be initially staged in a frac tank and sampled for the parameters listed in Part 201. Contractor will be responsible to conduct the water sampling.

E. Once approved by the City and Engineer, the water can be discharged to the storm sewer system via an approved discharge manhole. Any additional frac tanks utilized shall be sampled by the Contractor for a reduced list of parameters (in accordance with the permit), and the Contractor shall monitor the headspace in the tank(s) for lower explosive limit (LEL) to verify it is below 10%.

F. Costs for sampling, treatment and storage of groundwater shall be paid from the allowance items associated with groundwater contamination. All other costs associated with dewatering shall be paid for under the lump sum dewatering pay item.

**END OF SECTION**

**SECTION 31 41 00**

**SHAFT CONSTRUCTION AND SUPPORT**

## PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall design, furnish, install, and maintain a system of temporary supports, including all bracing and associated items, to retain excavations in a safe manner, to control ground movements, and to control groundwater inflows. Upon completion of the required excavation and pipe installation, the Contractor shall remove the support system and backfill the excavations. Certain types of shoring may be cut off below grade and left in place below a specified depth. This section covers requirements for all shafts to be constructed under this Contract for trenchless construction.

B. The Contractor shall have sole responsibility for sizing the shaft excavations to accommodate shoring, bracing, and pipe installation to the specified lines, grades, and tolerances to meet the Contractor's means and methods and subject to constraints or limitations shown on the Drawings or stated in the Specifications. The shafts shall also be sized to facilitate the construction of connections, valves, vaults, manholes, and other permanent structures shown on the Drawings.

C. The work shall include site grading; temporary access road construction; fencing and signage; construction staging areas; design and construction of shaft excavations and excavation support systems; material disposal; control and disposal of infiltrating groundwater, surface water, and construction water; backfilling and abandoning shafts; and site restoration.

D. Acceptable types of shaft support include: interlocking steel sheet piles, concrete caisson, secant pile or other Contractor-proposed construction methods which meet all requirements of this Section, and are subject to the review and written approval of the Owner. Soldier piles and lagging with external dewatering, may be used in situations where penetrations into the shaft wall for existing utilities make the shoring options listed above infeasible.

1.02 REFERENCES

E. RELATED SECTIONS

1. 03 30 00 Cast-In-Place Concrete

2. 31 09 13 Geotechnical Instrumentation and Monitoring

3. 31 23 19 Dewatering

4. 33 05 07.36 Microtunneling

F. SPECIFICATIONS, CODES, AND STANDARDS

5. City of Ann Arbor 2025 Standard Specifications for Construction

6. ANSI/AWS D1.1 - Structural Welding Code.

7. ASTM A 36 - Standard Specification for Carbon Structural Steel.

8. ASTM A 328 - Standard Specification for Steel Sheet Piling.

1.03 DEFINITIONS

1. Ground Improvement: A term referring to creation of a prism of stabilized ground just outside the shoring system using grouting methods appropriate for the ground conditions.

2. Sheetpile Shaft: A watertight excavation support system consisting of interlocking steel sheetpiles driven or vibrated into place. A concrete working slab, of sufficient thickness to resist buoyant forces on the dewatered shaft and to limit groundwater inflows to those specified herein, is then placed at the bottom of the shaft. Sheet pile shafts can be constructed to provide a watertight shoring system.

3. Soldier Pile and Lagging Shaft: A non-watertight excavation support system composed of vertical steel piles, wales, struts, and lagging. The vertical piles extend from ground surface to a sufficient depth below the final excavation depth to provide adequate resistance against earth pressures. Lagging, consisting of wooden boards or steel sheets is inserted between the flanges of the adjacent H-beams to support the excavation and prevent soil from sloughing or caving into the excavation. Wales are horizontal support beams installed and welded to the vertical soldier piles to stiffen the support system and are sized and installed at a vertical spacing to safely support external earth loads. The shaft bottom is covered with a concrete slab with one or more sumps. The support system must be coupled with external dewatering. Concrete Caisson Shaft: A watertight excavation support system composed of either precast or cast-in-place concrete rings or segments that are fitted together to form circumferential rings to support the shaft walls. The first ring is typically fitted with a metal cutting shoe to increase ground pressure and aid in sinking. Rings are constructed at the ground surface and soil excavated from within the ring, allowing the rings to sink under self-weight into the soil as excavation progresses. Alternatively, rings can be jacked into the soil if adverse conditions are encountered. A concrete working slab, of sufficient thickness to resist buoyant forces on the dewatered shaft and to limit groundwater inflows to those specified herein, is then placed at the bottom of the shaft.

4. Secant Pile Shaft: A watertight excavation method that involves blind drilling holes to below shaft invert level and then filling the holes with concrete which may be reinforced or unreinforced depending on the design. In the first phase of installation every other secant pile is installed. The spacing between these holes is set so that when the remaining holes are drilled, they will overlap with the primary holes to create a contiguous structure. A concrete working slab, of sufficient thickness to resist buoyant forces on the dewatered shaft and to prevent groundwater inflows to those specified herein, is then placed at the bottom of the shaft.

5. Watertight: defined as a groundwater inflow rate into the excavated volume of the shaft not to exceed 10-gallons per minute at any time during the useful life of the temporary structure or until permanent shaft structure is constructed and backfilled.

6. Working Slab: A concrete slab poured at the bottom of a shaft for the purpose of providing a level working platform, bearing capacity to support the loading and operation of all trenchless equipment, and resisting uplift pressure from any groundwater that may be present.

1.04 GENERAL REQUIREMENTS

A. The design shall include all elements of the support of the shaft excavations, including maximum depths of excavation prior to installation of support, as well as the design calculations of the thrust reaction block and the capacity of the shaft wall to resist the reaction thrust if the thrust is transferred to the shaft wall.

B. Coordinate with the submittal required by Section 33 05 07.36 Microtunneling to ensure the shoring system is designed to withstand the maximum planned jacking forces.

C. The launch shaft shall be of adequate size to meet the operational requirements of the tunneling machine, jacking frame, thrust block, and other components necessary to support the tunneling.. The Contractor can select different shaft dimensions and shape from those shown on the Drawings, with the concurrence of the Engineer and subject to constraints delineated on the Drawings or elsewhere in the Specifications.

D. All excavations shall be protected in accordance with the relevant safety regulations and project requirements.

E. In no case shall the pits remain open without appropriate lights and safety barricades, fencing or guardrails. Placement of construction equipment shall not be used in lieu of fencing, barricades and/or guardrails. Pits/shafts are to be adequately plated over when not in use.

F. Portable concrete traffic barriers will be placed around the perimeter of the staging area or pits, meeting applicable safety standards providing a barrier from the surrounding roadways. Concrete traffic barriers shall be angled in the direction of the traffic flow; do not place barriers perpendicular to on-coming traffic.

G. A staircase or ladder shall be provided in accordance with the relevant safety regulations and guidelines. A minimum of two means of egress shall be provided

1.05 QUALIFICATIONS

A. Contractor performing the work shall have successfully completed at least three (3) shafts using the proposed shaft construction methods of similar size, depth, and complexity, and in similar soil conditions, within the past five (5) years.

B. Shaft construction superintendent shall have had at least five (5) years of shaft and excavation construction experience and shall have worked on at least two (2) similar

projects within the past five (5) years using similar types of equipment required for this work and in similar soil and groundwater conditions.

C. The Design Engineer responsible for the design shall have a minimum of 10 years of experience in the design of similar structures for support of excavation of shafts for launching and receiving tunneling equipment as appropriate for the shaft. All designs and shop drawings shall be signed and sealed by the approved design engineer meeting these qualifications. The Design Engineer must be a Professional Engineer registered in the State of Michigan.

1.06 SUBMITTALS

A. The following pre-construction submittals shall be submitted at least 30 days prior to the start of any shaft excavation unless stated otherwise:

1. Qualifications: Written documentation summarizing the qualifications and experience of the trenchless Contractor, superintendent, and Design Engineer responsible for the shaft construction and support work. Required documentation shall be submitted no more than 30 days after the Notice to Proceed.

2. Schedule: Proposed schedules and methods of construction, equipment, facilities, method for removal of spoil from shaft excavation, and any other pertinent details.

3. For each shaft excavation, provide scaled drawings (plan and section views with dimensions and sizes) showing the proposed shaft support elements, including connection details and installation sequence in relation to the excavation; groundwater control provisions; adjacent and nearby existing structures and utilities; details of all pipe penetrations; work areas for all shaft construction operations such as sheet pile storage, drilling fluid tanks, and/or caisson form storage at each site.

4. Details of procedures for preloading bracing members.

5. Details for protecting existing utilities and structures within the zone of influence of the shafts that could be impacted by shaft construction.

6. Methods and sequencing of excavation and installation of staged excavation support, including a schedule with major milestones for shaft excavation and support such as driving of sheets, drilling secant piles, installation of reinforcement and placement of structural concrete in the caisson or secant pile, pouring of concrete working slab or plug in the base of the shaft, grouting, and dewatering of the shaft interior, etc.

7. Layout of the jacking thrust block and its reaction transfer connection details the shaft temporary support and base slab.

8. The contractor’s work plan shall identify the location, size, depth, layout, and ground support design of the launch and receiving pits as well as the spoil storage areas.

9. Methods and sequencing of launch/retrieval of the tunneling machine through the shaft wall. Describe in detail the steps that will be taken to ensure the ground is stable and groundwater is controlled prior to boring through/removal of the shaft wall. The Contractor shall submit ground improvement methods and details of construction that will be usedto stabilize ground at the launch/retrieval locations to prevent the inflow of soil and groundwater into the shaft.

10. Details and drawings of the tunnel entry and exit seals that will be implemented at the launch and retrieval shafts to prevent loss of ground and groundwater inflow into the shafts.

11. Procedures for checking and maintaining plumbness of the shaft and ensuring proper elevation is reached.

12. Concrete mix information and placement procedures for the working slab, secant piles, and/or annular grout.

13. Contingency Plan for anticipated difficulties and proposed resolutions, including unfavorable performance of the selected construction method, excessive movement of shaft elements, tilting, flooding, and bottom heave.

14. Work Plan for backfilling of voids as required to minimize ground movement and protect adjacent property.

15. Describe procedures for control of groundwater inflows, method of maintaining bottom stability, and protection of subgrade.

16. Details for handrails and protective barriers, fences, and covers at each shaft location.

17. Method for establishing survey control and transferring line and grade to shaft entry and exit locations.

18. Plans and procedures for backfilling and removal of shaft wall components upon completion of all relevant work in the launch and retrieval shafts.

19. Procedures for disposal of excavated materials at an approved disposal site.

20. Calculations: Submit calculations in a neat, legible format. Assumptions used in calculations shall be clearly stated and shall be consistent with the ground conditions described in the Geotechnical Report, and conditions anticipated by the Contractor. All calculations shall be prepared by or under the direct supervision of a Professional Engineer licensed in the State of Michigan, who shall stamp and sign calculations:

    a. Calculations for the shaft support elements and all bracing, indicating it can withstand all earth and groundwater pressures, thrust forces, equipment, applicable traffic, construction loads, and other surcharge loads in accordance with the site conditions and any other requirements described in the Contract Documents.

b. Calculations for the structural design of the tremie plug and/or working slab, and uplift resistance of the shaft. Confirm that tremie plug and/or working slab weight, structural connection to shaft walls, weight of casing, determination of shaft wall embedment depth below bottom of excavation, and any frictional resistance assumed along sidewalls of the shaft are adequate to resist uplift and that assumptions are reasonable and appropriate. Confirm that an adequate factor of safety against uplift of at least 1.5 is achieved under the most extreme loading conditions.

c. Estimated ground settlement and lateral deflection of each wall face and groundwater drawdown.

d. Calculations for shaft covers outside of the roadways.

21. Steel Sheet Pile Shafts:

a. Describe the equipment and procedures to be used to construct the sheetpile shafts.

b. Describe methods for ensuring sheetpile tips reach design depth and interlocks remain engaged.

c. Describe the procedure for installing and sealing corners.

d. Describe procedure for installing tremie plug and/or working slab to the required thickness and at the correct elevation.

e. Describe method of monitoring deviation of shaft supports and proposed corrective measures to be implemented.

f. Describe procedures for providing control of groundwater inflows and soil inflows at launch/retrieval locations.

22. Secant Pile Shafts:

a. Description of construction sequence and procedures to be used to construct the drilled secant pile shafts, including excavation, installation of steel reinforcement, and placement of structural concrete. Steel reinforcement shall not be permitted within the tunnel eye. Glass reinforced plastic (GRP) reinforcement shall be used at tunnel eyes.

b. Describe procedure for installing and backfilling the shafts, including sequence of operations and grout mixture.

c. Describe procedure for installing tremie plug and/or working slab to the required thickness and at the correct elevation.

d. Describe the procedure used to tie the shaft to the temporary support system for the adjacent riser sections of pipe, if utilized.

e. Concrete mix design.

f. Describe procedures for providing control of groundwater and soil at launch/retrieval locations.

g. Describe method for monitoring deviation of secant piles and proposed corrective measures to be implemented.

23. Caisson Shafts:

a. Describe construction sequence and procedures to be used to construct the concrete caisson shafts including excavation, installation of steel reinforcement and placement of structural concrete. Steel reinforcement will not be permitted within the tunnel eye. Glass reinforced plastic (GRP) reinforcement shall be used at tunnel eyes.

b. Provide details for cutting shoe design on the leading caisson ring.

c. Describe procedure for installing and verifying elevation and thicknesses of tremie plug and working slab.

d. Describe procedures for providing control of groundwater and soil at launch/retrieval locations.

e. Concrete mix design whether using precast concrete segments or cast-in-place concrete segments.

f. Describe method of monitoring deviation of rings and proposed corrective measures to be implemented if necessary.

24. Soldier Pile and Lagging Wall Shafts with Dewatering:

a. Describe the equipment, procedures, and sequence to be used to construct the soldier pile shafts or slide rail shafts.

b. Provide details for installing piles, lagging, plates, wales, struts and braces.

c. Describe method of monitoring deviation of shaft supports and proposed corrective measures to be implemented.External dewatering plan to be in conjunction with Soldier Pile and Lagging.

B. Construction Submittals: During construction, the Contractor shall submit the following to the Engineer at the times indicated:

1. Daily progress reports: Progress reports shall have field logs recorded at intervals of five feet or less during excavation and shall be submitted to the Engineer within one working day of the shift for which the excavation occurred. As a minimum, the logs shall include:

a. The date, starting time, and finish time.

b. Equipment used and personnel on site.

c. Actual quantities and descriptions of excavated material, including soil/ rock types and presence of groundwater if encountered.

d. Any unusual conditions, breakdowns, and delays, including problems with support, bottom instability, and obstructions.

e. Detailed description of the support installed, including sizes, lengths, spacing, and elevations relative to excavation elevation.

f. Pumping rates from shafts and inflow conditions for all shafts or flooding levels for shafts excavated “in the wet.”

2. Deformation monitoring: Excavation monitoring data of horizontal and vertical deflections of shaft supports, settlement, and deformation monitoring data associated with each shaft shall be submitted in accordance with SECTION 311 06 13 Geotechnical Instrumentation and Monitoring. Include records of action taken by the designer of record and the Contractor if deflections are outside the tolerances specified in the Contract Documents.

3. Results of all material and field tests shall be submitted at the end of each shift, and results of lab tests within one week of sampling.

C. Post-Construction: Within 15 days of the backfill of excavations, the Contractor shall submit a detailed as-built location plan of all remaining buried shoring members including size, location, and cutoff elevation.

1.07 DESIGN CRITERIA

A. All shaft design and related calculations shall use the highest observed groundwater level recorded as of the date the calculations are prepared or as required by the Engineer. A lower observed groundwater level may be used in calculations if that results in a more conservative load case.

B. The type and design of shaft construction methods that meet the specification requirements herein are the Contractor’s responsibility and shall be of a size large enough to facilitate all the necessary groundwater control, construction operations, pipeline equipment and operations, microtunneling, and to accommodate indicated connections to other reaches of the project. Shaft design is subject to review and approval by the Engineer. Allowable shaft construction options are as described above in Section 1.01 Scope of Work.

C. In all areas, excavation support systems shall be designed by the Contractor’s Design Engineer to support earth pressure, unrelieved hydrostatic pressures, bottom heave, overall buoyancy, utility loads, equipment, applicable traffic loads, applicable rail loads, maximum safe jacking loads, and other surcharge loads in such manner as will allow safe construction and will prevent damage to adjacent structures (including existing buildings, roads, pipelines, and utilities) and injury to workers and the public.

D. Shaft excavation support systems shall be designed to be compatible with the geologic conditions described in the Geotechnical Baseline Report, including any adjacent

slope support structures. Design support systems shall use a minimum factor of safety of 2.0 for lateral loads or as determined by the Contractor's design engineer.

E. The support system shall be designed to protect adjacent utilities from damage and to limit movements to less than the allowable values for deformation and groundwater variations specified in Section 31 09 13 Geotechnical Instrumentation and Monitoring.

F. All welding shall conform to the applicable provisions of ANSI/AWS D1.1.

G. Contractor shall perform all water control work and properly dispose of all collected water in accordance with permit requirements and other applicable Sections. The Contractor shall not discharge water into storm sewers, sanitary sewers, water bodies, or streets without obtaining and submitting copies of the required permissions and/or permits.

H. The Contractor's groundwater control methods shall provide means to prevent removal of soil/fines from the surrounding ground, or other adverse effects. In the event any damage does occur as a result of groundwater control efforts, or lack thereof, the Contractor shall be fully responsible for correction of damage.

I. All shafts shall have a concrete working slab and shall be designed to protect the excavation invert in accordance with these minimum design criteria:

    1. The finished concrete working slab shall incorporate an adequate sump system to control groundwater inflows through the bottom of the shaft and to resist uplift at the baseline groundwater level, as defined in the Geotechnical Baseline Report for each shaft location. The slab design, including its weight, structural connection to the shaft walls, and any assumed frictional resistance along the sidewalls, shall be sufficient to resist uplift with a minimum factor of safety of 1.5. Additionally, the slab must be capable of safely resisting bending moments caused by buoyant uplift forces with a minimum factor of safety of 1.5. All shafts shall also be designed to provide a minimum factor of safety of 1.5 against bottom heave

    2. Be capable of supporting such combined dead and live loads as required by the Contractor's means and methods.

J. Shaft support systems shall be constructed within 1% of vertical plumbness, i.e., within 1 foot in 100 feet.

K. The strength of the grout mixture used to fill the annulus between the sheet piles or other support and the excavation shall be selected to allow the tunneling machine to excavate or advance through the grouted annulus during both launch and retrieval.

L. Traffic plates or other approved covers used within the roadway shall be designed for AASHTO HS-20 loading and any additional construction loads required by the Contractor. Shaft covers not within the roadway shall be designed for a 100 psf minimum live load as well as any additional construction loads required by the Contractor.

M. Sheet Pile Shafts:

1. Fully interlocking steel sheetpiles shall be used to construct the sheetpile shafts.

2. Sheetpiles shall be driven or vibrated into place.

3. Install sheetpiles using pre-drilling if needed based on the expected ground conditions.

4. Constructed sheet pile walls shall be designed to accommodate the maximum planned jacking forces exerted by the thrust block to the sheet pile wall without causing excessive deflection or separation of sheet piles during loading.

N. Secant Pile Shafts:

1. Fully overlapping secant piles shall be used to construct the secant pile shafts.

2. The shaft excavations shall be safely supported at all times during and after construction using polymer or bentonite, or any other approved means necessary. The polymer or bentonite shall have adequate viscosity, gel strength, and density to safely support earth and groundwater loads at the upper limit baseline groundwater level described in the Geotechnical Report.

3. Polymer or bentonite shall be disposed of offsite by Contractor, at Contractor's expense at an approved disposal facility.

4. Constructed secant pile walls shall be designed to accommodate the maximum planned jacking forces exerted by the thrust block to the pile wall without causing excessive deflection or failure of piles during loading.

O. Caisson Shafts:

1. A cutting shoe shall be utilized on the bottom ring of the concrete caisson to aid in sinking the ring after soil excavation.

2. If precast concrete segments are to be used for ring building, rubber gaskets shall be used between each segment and between each ring to control the inflow of groundwater.

3. Install caisson to the shaft tip elevations shown on the drawings.

4. Constructed concrete caisson walls shall be designed to accommodate the maximum planned jacking forces exerted by the thrust block to the caisson wall without causing excessive deflection or failure of caisson during loading

P. Soldier Pile and Lagging Wall Shafts with Dewatering:

1. Install piles to the tip elevations shown in approved submittals.

2. Provide timber, steel, or precast concrete lagging or sheets of sufficient thickness to withstand lateral earth pressures.

3. It shall be anticipated that pre-drilling will be required to install soldier piles.

4. Dewatering must be applied in conjunction with Solider Pile and Lagging application.

1.08 QUALITY CONTROL, TESTS, AND INSPECTIONS

A. The Contractor's Design Engineer shall provide quality control, testing, and inspection of their designs in accordance with accepted submittals. The Design Engineer shall visit the site to observe the shaft construction work in progress on a weekly basis or more frequently, if required by the Engineer, and provide an assessment of their inspection of the installation.

B. The Contractor shall coordinate with the Engineer regarding additional quality assurance testing to be provided at the Owner's discretion. The Contractor shall permit free access during the construction of shoring systems for the Owner's testing staff and the Engineer. The Contractor shall allow access to the Engineer and shall furnish necessary assistance and cooperation to aid the Engineer in observations, and data and sample collection at all times at no additional cost to the Owner.

C. The Contractor shall notify the Engineer, in writing, within 24 hours when any problems are encountered with equipment or materials.

D. Construction Monitoring: Ground, utility, and structure monitoring of shaft and adjacent facilities shall be conducted in accordance with Section 31 09 13 Geotechnical Instrumentation and Monitoring.

1.09 WARRANTY

A. The Contractor shall be solely responsible for and bear the sole burden of cost for any and all damages resulting from improper shaft support.

B. The safety of workers, the protection of adjacent structures, property and utilities, and the installation of adequate supports for all excavations shall be the sole responsibility of the Contractor.

## PART 2 - PRODUCTS

2.01 MATERIALS:

A. Structural Steel: ASTM A36 or better, unless approved otherwise.

B. Steel Sheet Piles: ASTM A328.

C. Concrete for cast-in-place secant piles, caissons, and working slabs shall be in accordance with the requirements for concrete as stated in Section 03 30 00 Cast-In-Place Concrete.

D. All timber and structural steel used for the shoring systems, whether new or used, shall be sound and free from defects that may impair strength.

## PART 3 -- EXECUTION

3.01 GENERAL

A. Shaft excavations and site development shall commence only after approval or acceptance of applicable submittals by the Engineer. Install excavation support systems in accordance with approved submittals.

B. Before beginning excavation, install geotechnical instrumentation as shown on the Drawings and consistent with Section 31 09 13 Geotechnical Instrumentation and Monitoring. Adequately protect existing structures, utilities, trees, shrubs, and other existing facilities. The Contractor shall repair damage to existing facilities at no cost to the Owner.

C. Excavation shall be performed in sequence with shaft and support installation in a manner that limits settlement of surrounding ground and adjacent utilities, vaults, structures, or roads and offers no hazard to building movement or occupancy, train, truck, or automobile operations.

D. The Contractor shall notify the Engineer not less than 15 days before beginning any shaft excavation.

E. The Contractor shall conduct all excavation, shoring, shaft support, temporary facilities, materials storage, and construction traffic within construction easements established for this project. All work shall be in accordance with applicable permits.

F. Shafts not in active use for a period of 8 hours or longer shall be covered with traffic plates or other covers as approved by the Engineer. Shaft staging areas shall be completely fenced in to prevent unauthorized access at all times.

G. Any correction of shaft deviation and any construction and associated costs resulting from the relocation of appurtenances inside the shaft, including pipe connections and the launch and retrieval seals, caused by the shaft's deviation from plumb or other deficiencies in workmanship shall be accomplished at the Contractor's expense and shall not be cause for schedule extension.

H. All excavated spoils, polymers, drilling fluids, or other materials used during shaft construction shall be completely contained when stockpiled on site. Disposal of spoils shall be in accordance with approved disposal procedures at an approved disposal site.

I. Pumping from shaft sumps shall not result in boils, softening of the ground, or loss of fines. Sumps shall use suitable filters or screens so that fines are not removed from the formation.

J. The Contractor shall use ground improvement and other measures to stabilize the ground at shaft penetrations. Do not begin microtunneling until the Contractor has implemented ground improvement at all entry and exit locations for the planned tunnel drives and behind thrust blocks or elements where necessary and as directed by the Engineer to stabilize the ground.

K. Perform shaft construction activities in conformance with all federal, state, and local regulations.

3.02 SHEET PILES INSTALLATION

A. Steel sheet piling shall be used to the full depth of penetration required and to proper alignment and plumbness without damage to the sheet piling or rupture of its interlocks.

B. Sheet piles shall be driven in a plumb position, with each sheet pile interlocked with adjoining piles for its entire length to form a continuous diaphragm throughout the length of each run of the wall, bearing tightly against the original ground. Sheet piles shall be driven to the depth indicated on the approved shop drawings. Care shall be exercised in driving so that interlocking members can be extracted without damaging adjacent structures or utilities. The methods of driving, cutting, and splicing shall conform to the approved shop drawings.

C. Sheet pile corners shall be installed with interlocks properly engaged for the full depth of sheet piles. If interlocks cannot be properly engaged for full depth, corner connections shall be welded continuously to seal all cracks and avoid inflows of groundwater and soils.

D. Internal supports, including wales, struts, and corner braces, shall be installed sequentially as the shaft is excavated. At no time shall the unsupported excavation depth exceed the design spacing plus two (2) feet of horizontal support members as shown on approved submittals. All internal supports shall be installed within +/- 3 inches of design locations shown on approved submittals.

E. The sheet piles shall be flush with the ground surface where traffic plates are required. The sheet piles may extend not more than 5 feet above the ground surface where shafts are not within traffic lanes or shoulders.

F. Safety rails shall be installed in accordance with applicable safety regulations.

G. The internal bracing support system for sheet pile shafts shall include wales, struts, and/or shores where necessary.

1. Struts with intermediate bracing shall be provided to enable sheet piles to carry maximum design loads without distortion or buckling.

2. Web stiffeners, plates, or angles shall be included as needed to prevent rotation, crippling, or buckling of connections and points of bearing between structural steel members. Allow for eccentricities caused by field fabrication and assembly.

3. All bracing support members shall be installed and maintained in tight contact with each other and with the surface being supported.

4. Bracing members shall be preloaded by jacking struts, if necessary, to control shoring movement. Bracing members shall be preloaded in accordance with methods, procedures, and sequence as described in the submittals. Excavation work shall be coordinated with the installation of bracing and preloading. Steel

shims and steel wedges shall be welded or bolted in place to maintain the preloading force in the bracing after release of the jacking equipment pressure. Support and preload shall be installed immediately after installation and prior to continuing excavation.

5. Procedures that produce uniform loading of bracing member shall be used without eccentricities or overstressing and distortion of members of the system.

3.03 SECANT PILES INSTALLATION

A. At all times during drilling, reaming, and installation of reinforcement, the drilling mud/polymer used to support the excavation shall be maintained at or above the ground surface to safely support the excavation and resist caving and sloughing. The polymer used shall have adequate viscosity, gel strength, and density to safely support earth and groundwater conditions described in the Geotechnical Baseline Report.

B. If groundwater is present in the drilled shaft holes, the hole shall be dewatered prior to placing concrete, or concrete shall be placed using tremie methods. If a temporary casing is used, care shall be taken to avoid the creation of voids in the completed shaft by withdrawing the casing during concrete placement while maintaining the concrete level above the bottom of the casing.

C. Overlap of adjacent secant pile shafts shall be sufficient to prevent soil and groundwater movement into the completed Work.

D. Care should be exercised during excavation to avoid damaging the concrete shafts.

E. Any voids in the completed shaft detected during excavation shall be immediately repaired to the satisfaction of the secant pile shaft designer before excavation progresses.

3.04 CAISSON INSTALLATION

A. To the extent possible, centralize the tunnel or pipe jack on a joint between two adjacent pre-cast units. Inlet and outlet pipes should be located as far as practically possible to minimize loss in overall integrity of the caisson structure. The construction of a suitably designed thrust wall is required.

B. Utilize metal angles or another method to assist in maintaining the verticality of the caisson.

C. Center of caisson to be installed not more than 4 inches from center location shown on the submitted drawings.

D. Excavate the pit at least 3 feet deep and 1.5 feet greater than the overall diameter of the cutting shoe.

E. A bottom/choker ring shall be designed and constructed to provide a seal diameter between the shaft and excavated ground, so that the fluid in the annulus above the ring is retained.

F. If suitable for the anticipated soil conditions, a steel cutting edge will be added beneath the choker ring to cut through the ground was well as acts are a stiffener.

G. The choker concrete collar rings should be designed and constructed on the surface around the location of the shaft to act as a work platform and ground support, as well as serve as a guide for sinking subsequent caisson units.

H. As the excavation progresses, introduce bentonite slurry into the annulus between the shaft and the soil to lubricate and reduce the friction force between the caisson structure and the ground.

I. For pre-cast concrete caisson units, sealant strips shall be used at all joints.

J. The lower-most unit of the caisson shall be sunk to a depth of at least 3 feet below the invert of the tunnel.

K. The annular space shall be filled with approved grout material upon completion of the installation of the caisson.

L. The concrete base might be cast manually if conditions are dry or via a tremie tube if the shaft is flooded. If cased under flooded conditions, under no circumstances shall the shaft be pumped out until the base concrete has matured.

3.05 SOLDIER PILE AND LAGGING INSTALLATION

A. Install piles in predrilled holes, to the tip elevations shown in approved submittals. Provide casing or drilling mud, as necessary, to prevent caving of holes and loss of ground.

B. After each soldier pile has been seated plumb in the drill hole, encase it with concrete or crushed rock from the tip to the bottom level of the final excavation. Apply vibration through the pile. Concrete strength shall be in accordance with submittals, and concrete shall be placed by means of a tremie system.

C. Provide timber, steel, or precast concrete lagging or sheets that spans completely between adjacent solider piles, and of sufficient thickness to withstand lateral earth pressures.

D. Lagging shall be advanced concurrent with the excavation and at no time shall the unsupported excavation depth exceed 2 feet.

E. Install lagging with no gap between adjacent boards. As installation progresses, backfill the voids between the excavation face and the lagging with sand, pea gravel, or other self-compacting material. Pack with materials such as hay, burlap, or geotextile fabric where necessary to allow drainage of groundwater without loss of ground due to piping. Dewatering must be applied in prior to the application of Solider Pile and Lagging.

3.06 SHAFT WALL PENETRATION

A. Shaft entry and exit seals are required to be installed completely prior to initiating penetration through the shaft wall. The Contractor shall improve the ground outside the shaft seals as described above and as necessary to ensure stability during the launching or receiving of the tunneling machine. The ground shall be improved to the extent that the ground will remain stable without soil or water inflow into the shaft while the machine is being launched or received.

B. Successful completion of shaft wall penetrations and related activities necessary to demonstrate such shall be at the Contractor's sole expense.

3.07 INSTRUMENTATION AND MONITORING

A. Conform to the requirements of Section 31 09 13 Geotechnical Instrumentation and Monitoring. The Contractor shall make modifications to the excavation and shaft support as required based on monitoring results. Revised shop drawings and calculations shall be submitted to the Engineer. Changes to excavation sequence and support shall be implemented as necessary at no additional cost to the Owner.

3.08 SHAFT BACKFILL AND RESTORATION

A. Shafts shall be backfilled to within 7 feet of the ground surface with flowable fill.

B. Backfill shall be per City of Ann Arbor 2025 Standard Specifications for Construction.

3.09 REMOVAL OF SUPPORT SYSTEM

A. Excavation support shall not be removed until support can be removed without damage to existing facilities, completed work, or adjacent property.

B. Temporary excavation support shall not be removed until permanent shaft structure is installed and shaft has been backfilled.

C. As a minimum, excavation support shall be removed from the existing adjacent surface grade to a depth of 7 feet. As-built drawings shall be prepared showing the location of temporary shoring and bracing that remains in place.

D. The design, planning, installation, and removal of all supports shall be accomplished in such a manner as to maintain the stability of the required excavation and prevent movement of soil that may cause damage to adjacent shoring systems, structures, and utilities, damage or delay the work, or endanger life and health.

E. Excavation support shall be removed in a manner that will maintain support as excavation is backfilled and will not leave voids in the backfill. Removal of the support system shall be performed in a manner that will not disturb the pipeline, the compacted backfill, or adjacent construction or facilities.

F. Any void left by the shoring system or voids created by the removal of the shoring system shall be filled with lean concrete or cement grout, as approved by the Engineer,

to provide ground support between the backfill zone and the native ground. Implement contact grouting, if needed, in addition to void filling.

G. Sheet piling removal shall be performed in a manner that will avoid “vibro-consolidation” of sandy or granular material below the excavation that could lead to settlement of the pipeline or other works of construction.

H. The support system removed from the excavation shall remain the property of the Contractor and shall be removed from the site.

3.010 CLEANUP

A. The Contractor shall remove all construction debris, spoil, drilling fluid, oil, grease, and other materials from shafts, pipelines, and all surface work areas upon completion of construction to the satisfaction of the Engineer. Cleanup will be incidental to the construction. No separate payment shall be made for the cleanup.

**END OF SECTION**

**SECTION 31 73 00**

**CONTACT GROUTING**

## PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section covers the work necessary for contact grouting including furnishing, mixing and placing grout; furnishing all labor, materials, equipment and incidentals; and all other related work necessary for grouting, complete.

B. The Contractor's work under this Section shall include: all work necessary to perform grouting operations including furnishing, handling, transporting, and storing of all materials and equipment for grouting; mixing and injecting grouts; capping, patching, and plugging the finished grout holes; cleanup of work areas; and all other operations incidental to grouting.

C. Contact grouting is to fill gaps and displace lubricant outside of the jacking (casing) pipe at completion of the microtunneling drive. Contact grouting includes using grout to fill void space between the casing pipe and the ground where over excavation occurs. Contact grouting is to be performed for Washington Street, First Street, and associated shafts.

1.02 REFERENCES

A. Related Sections

1. 31 09 13 Geotechnical Instrumentation and Monitoring

2. 31 41 00 Shaft Construction and Support

3. 33 05 07.36 Microtunneling

4. 33 05 36 Fiberglass-Reinforced Jacking Pipe

B. Specifications, Code, and Standards

1. American Railway Engineering and Maintenance-Of-Way Association (AREMA), Manual for Railway Engineering.

2. ASTM A53, Standard Specification for Pipe. Steel, Black and Hot- Dipped Zinc-Coated (Galvanized), Welded and Seamless.

3. ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

4. ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens)

5. ASTM C138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of concrete

6. ASTM C143 Standard Test Method for Slump of Hydraulic-Cement Concrete

7. ASTM C172 Standard Test Method for Sampling Freshly Mixed Concrete

8. ASTM C311, Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete.

9. ASTM C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

10. ASTM C940 Standard Test Method for Expansion and Bleeding of Freshly Mixed Grout for Preplaced Aggregate Concrete in the Laboratory

11. ASTM C1090, Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.

1.03 DEFINITIONS:

A. Contact Grouting: An injection of neat cement grout into voids outside of initial support systems and final linings of shaft excavations and jacking pipe installed during microtunnel operations to achieve continuous and permanent contact between support systems or lining/casing pipe and the ground. This definition includes grouting the annular space outside the casing pipe string after microtunnel installations are complete.

B. Refusal: The point at which grouting is stopped on a grout hole. It is defined as a grout injection rate of less than one-half cubic foot of grout over a 5-minute interval, at 100 percent of the required pressure.

C. Voids: Spaces within soil that are filled with air, water, slurry, lubricant, or disturbed ground resulting in void ratios (volume of voids divided by volume of solids) greater than 2.0 in any given sample volume.

1.04 SUBMITTALS

A. Provide all submittals at least 30 days in advance of contact grouting operations, with the exception of daily reports, which are to be submitted per the schedule specified below.

B. Grout Mixes:

1. The Contractor shall submit to the Engineer all proposed grout mixes for contact grouting. The submittal shall be made a minimum of 30 days prior to start of grouting operations. The Contractor shall resubmit as appropriate if the mixes are modified during the course of the work.

2. Submit mix designs for each contact grout mix proposed for use. Each mix design shall show the ingredients of the mix and shall include:

a. Type, brand, source, and amounts of cement, admixtures, and other additives.

b. Source and amount of water.

c. Provide three representative UCS test results of the same grout materials and mix proportion.

d. Combined gradation of each mix design.

e. Specific gravity of all materials in the mix.

f. Results of each Uniaxial Compressive Strength (UCS) of required tests.

3. Submit a certificate of compliance signed by the supplier identifying the type of fly ash (if used) and stating that the fly ash is in accordance with ASTM C618, MDOT Standard Specifications and these Specifications. Supporting test data shall be furnished for the proposed grout mixes. All testing and sampling procedures shall be in accordance with ASTM C311.

4. Submit material specifications and instructions for use of any proposed concrete admixtures.

C. Work Plan: The Contractor shall submit, prior to the start of any excavation, a work plan for contact grouting. The work plan for placing contact grout shall cover each type of contact grouting required and shall include:

1. Contact grouting methods, procedures and sequences for each tunnel segment as well as locations determined within the shafts that require contact grout.

2. Method of transporting grouting equipment, grout, and materials into and within the tunnel and shafts.

3. Quantitative prediction of grout volumes required at each location, with consideration of volume of annular space due to difference between the excavated diameter and outside diameter of initial support system or jacked pipe, ground loss volumes, soil stand-up time and diametrical closure.

4. Means for measuring grout takes (volume) per foot or segment of initial support system or pipe.

5. Means for measuring grout pressures and planned grout pressure limits for refusal criteria.

6. Timing of grout injection.

7. Maximum grout pressure for shaft and for tunnel, signed and sealed by the Contractor’s professional engineer licensed in the State of Michigan.

D. Grouting Equipment:

1. Submit prior to the start of grouting operations calibration records for all meters and gauges to be used in grouting operations.

2. Submit the following for the contact grouting equipment proposed:

a. Manufacturer's specifications and operation instructions for grout conveyance equipment.

b. Pump specifications.

c. Grout hose, valve and port sizes and specifications.

d. Grout pressure gauges and pressure gauge calibration data.

E. Grouting Records and Testing: All sampling shall be performed in accordance with ASTM C172. The Contractor shall submit records of grouting operations as specified hereinafter.

1. Submit prior to performing grouting of microtunnel segment:

a. Mill test reports for Portland cement.

b. Certificates of compliance for each load of Portland cement and fly ash (if used).

c. Certificates of compliance for all admixtures.

d. Proposed contact grout mix designs with mix data for all components, mix properties including admixtures, slump (per ASTM C143), wet unit weight, cured unit weight (per ASTM C138), bleed (per ASTM C940), height change per ASTM C1090, and compressive strength tests (per ASTM C39 or C109) from an AASHTO and ASTM certified testing laboratory.

2. Submit the following daily reports and records for contact grouting within a day of completion:

a. Daily logs of grouting operations at all contact grouting locations (station and position) of grout ports, including pressures, volumes, and grout mix pumped, times of injecting, locations where grout samples for test cylinders are taken, and grout slump results per ASTM C143.

b. An analysis of overcut annulus volume at the time of grouting with consideration of soil stand-up time, diametrical closure and effects of injected bentonite slurry volumes. Provide a comparison of anticipated annulus volume with grout volume placed by contact grouting for each pipe.

c. Compressive strength test reports from a certified testing laboratory in accordance with ASTM C39 or C109 test methods.

## PART 2 - PRODUCTS

2.01 CONSTITUENTS OF PORTLAND CEMENT GROUT

A. Portland cement, water and flyash shall conform to the requirements of the MDOT Standard Specifications.

B. Bentonite or other clay-like materials shall not be used as an admixture.

2.02 FLUIDIFER

A. Fluidifier shall be a compound with characteristics that will hold the solid constituents of the grout in colloidal suspension, be compatible with the cement and water used in the grout mix and contain a shrinkage compensator. Fluidifier shall not contaminate the groundwater.

B. Fluidifier shall be furnished in moisture resistant paper sacks shipped in sealed containers and shall be handled and stored to avoid absorption of moisture, damage, or waste. Material which has become caked due to moisture absorption will be rejected.

2.03 CONTACT GROUT

A. Contact grout shall consist of a mixture of water and Portland cement or other suitable materials, with mineral fillers or admixtures as necessary to achieve a non-shrink (less than 0.1% height change per ASTM C1090), non-bleed (0% wick induced bleed at 3 hours per ASTM C940) flowable grout. The grout shall have a minimum 24-hour compressive strength of 100 psi (1.4 MPa) and a minimum 28-day compressive strength of 250 psi (3.5 MPa).

2.04 EQUIPMENT, CONTACT GROUTING

A. Mixers shall be colloidal type capable of providing a homogenized mix and shall be capable of an impeller speed of not less than 1500 RPM. The grout mixer shall pump the grout into a mechanically agitated holding tank. Mixer and mechanical agitator tanks shall be of sufficient capacity to ensure an uninterrupted supply of grout to the grout pump. Means of accurately measuring the separate grout ingredients at the mixer shall be provided. Means shall be provided for increasing or decreasing the water-cement ratio, as required by the ground conditions encountered.

B. Pumping equipment shall deliver grout from the holding tank to the point of injection at a steady pressure without pulsation. Grout pumps shall be capable of delivering grout to the point of injection at a pressure equal to 3 psi for every foot of overburden. Pumping equipment shall be capable of handling water-cement ratios of the Contractor’s proposed mix design.

C. Means shall be provided for accurately determining the amount of grout injected. The flowmeter shall be accurate within 10 percent at a flow rate of 2.5 gallons per minute.

D. The grout plant shall be equipped with reliable pressure gauges at point of injection and at the pump. The pressure gauges shall have a range such that the maximum pressure specified shall be approximately two thirds of the capacity of the gauge. The gauges shall be protected from grout contamination by an oil or air buffer and shall be easily cleaned in the field.

E. Flexible hose for pressure grouting shall have an inside diameter not less than 1 inch and shall be capable of withstanding the maximum water and grout pressures to be used. Grout pipes shall have an inside diameter of 1.5 inch or larger. A diaphragm

valve shall be provided on each grout hose and a straightway valve at each grout pipe to regulate flow. Packers for grouting shall be pneumatic, hydraulic, or mechanical expandable rubber packers.

F. At the point of injection or bulkhead, suitable valves and pressure gauge shall be provided so that the pressure may be monitored, and the grout flow regulated by increasing or decreasing the flow. Suitable stop valves shall be provided at the collar of the hole for use in maintaining pressure as required until the grout has set.

G. All metal pipe, standard plugs, and fittings required for grouting operations shall be minimum Schedule 40 pipe conforming to ASTM Designation A53.

## PART 3 - EXECUTION

3.01 GENERAL

A. The Engineer shall be notified at least 24 hours in advance of the start of grouting operations.

B. If out of visible contact, continuous communication shall be maintained between the Contractor's personnel at the grout plant and the injection point by radio or other means acceptable to the Engineer.

C. Grout in the mixer and holding tanks shall be continuously agitated. Portland cement grout which is not injected into the hole within 2 hours after mixing shall be removed from the mixer, holding tank and supply line and shall be discarded.

D. Grout shall be maintained at temperature above 50º F until injected. The temperatures of mixing water shall range from 50º F to 100º F when added to the grout mixer. Grout materials shall be stored at temperatures above freezing. Grouted ground shall be no colder than 41º F when grout is injected.

E. Grout holes shall be protected from becoming clogged or obstructed prior to grouting by means of a cap or other suitable device on the collar of the hole. Any hole that becomes blocked or otherwise unsuitable for its intended purpose shall be cleaned out in a satisfactory manner or replaced at the expense of the Contractor.

F. All grout hole locations shall be flagged and protected. In addition, they shall be clearly labeled for easy identification and shall be clearly visible.

G. Contact grouting shall be performed in such a manner as to reduce groundwater inflow, to fill voids, to minimize ground movement into the excavation, and to provide firm and uniform contact between the support system and the ground.

H. Equipment and lines shall be kept clean by constant circulation of grout and periodic flushing with water. Leakage from connections shall not be permitted. Plugs on ends of nearby grout holes or pipes shall be removed to permit escape of air and water and the filling of spaces with grout.

I. Once started, grouting of a hole shall not be interrupted. Grouting of a hole shall not be considered complete until that hole refuses to take grout as defined under

Paragraph 1.03.B. After grouting of a holding or any stage of a hole has reached refusal, the pressure on the hole shall be maintained by means of a stopcock or other suitable device until the grout has set. The grouting of any hole shall not be considered complete until all voids have been filled to the maximum extent practicable. After the grouting of any hole is finished, the pressure shall be maintained by means of the stop valve until the grout has set to the extent that it will be retained in the hole.

J. Check operating gauges daily to determine that they are in working order. Do not grout without appropriate gauges in place and in working order.

K. Where grouting in soil, the grouting pressure at the injection point shall not exceed 1 psi per foot of depth of soil overburden, unless otherwise proposed by the Contractor, with the Engineer's concurrence. In all cases, the grouting pressures shall be limited as necessary to avoid damage to the pipeline and avoid grout release at the ground surface.

## 3.02 CONTACT GROUTING

A. Contact Grouting for Shaft Excavations:

1. Locate grout holes as necessary to accomplish the work and to thoroughly fill the voids outside of the initial support system. Drill grout holes for contact grouting through the initial supports and into the annular space between the initial support and surrounding ground.

2. Perform contact grouting to reduce groundwater inflow, to fill voids, to minimize ground movement into the excavation, and to provide firm and uniform contact between the support system and the ground. The Contractor's ground support design engineer shall determine a refusal criteria and the maximum grout pressure that is consistent with the design of the ground support system. The Engineer may periodically request that check holes be drilled to determine if unacceptable voids exist outside of the ground support system. Additional contact grouting shall be completed at no additional cost to the Owner where checking indicates the presence of unacceptable voids.

B. Contact Grouting of Jacking (Casing) Pipe Installed by Microtunneling:

1. For grouting of jacking pipe, commence contact grouting promptly following completion of the drive. Once started for a tunnel drive, perform continuous contact grouting until contact grouting for the entire drive has been completed. Contact grouting of jacking pipe shall be completed within three (3) days of the completion of tunneling.

2. Inject grout in continuous progression of the grout holes along the length of the tunnel.

3. Attempt to hook-up and pump grout at every port. In general, contact grouting at a port will be considered completed when refusal is met per Paragraph 1.03.B (also see Paragraph 3.01.I). After grouting is finished, the valve shall be closed until grout has set. After a valve is closed following injection, the grout header and hoses shall be moved to the next port in progression.

4. Volume of contact grout injected shall be measured, recorded, and compared with the anticipated volume per foot of pipe grouted with compensation for grout wasted in lines. Submit this data as part of the grouting record submittals.

5. At the completion of grouting, remove valves after grout has set and replace valves with screw type grout plugs.

3.03 GROUT AND DRAINAGE HOLES

A. Grout ports for contact grouting of jacking pipe shall be pre-installed pipe nipples. Holes for injecting grout through jacking pipe shall be formed by casting in the pipe. New grout holes shall not be drilled through pipe walls.

B. Grout pipes shall be fixed in the holes in the casing pipe to prevent grout return around the perimeter of the pipe. Grout pipes and fittings shall be thoroughly cleaned before connecting to each grout hole. Grout pipes shall be set so that grout can flow freely to voids behind the pipe.

C. Suitable stop valves shall be provided at the collar of the grout hole for use in maintaining pressure as required until the grout has set.

3.04 FIELD QUALITY CONTROL

A. Data or notes taken by the Engineer during periodic inspections of grouting will not relieve the Contractor's responsibility in documenting grouting operations.

B. Test three cylinders for every 250 cubic feet or fraction thereof of grout placed. Minimum cylinder diameter shall be 3 inches, conforming to ASTM C39. Tests performed on grout cubes or prisms shall not be accepted for verifying strength.

C. During grouting operations, verify:

1. Hole location, depth, and spacing satisfy criteria specified herein.

2. Ensure that grouting is performed from the bottom upwards, and continuously in all aspects.

3. Maximum recommended grout pressures are not exceeded.

4. Grout mixes satisfy the criteria specified herein.

5. Grout lines are not plugged or obstructed.

6. Grouting operations are performed in the correct sequence, specified herein.

7. Closure criteria and/or refusal criteria are satisfied prior to terminating grouting of each hole.

D. Master Gauges and Meters:

1. Perform testing of all field gauges and meters no less often than weekly using master gauges and meters.

2. Perform field tests in the presence of the Engineer.

3. Verify accuracy of master gauges and meters through the use of a test laboratory no less frequently than every two months.

3.05 RECORDS

A. The Contractor shall record the stationing and the volume of contact grout pumped and grout pressure behind the jacking (casing) pipe or shaft support lining during each day of grouting at each grout hole location. The records shall be submitted to the Engineer after each day of grouting by noon on the following day.

3.06 CLEANUP

A. The Contractor shall prevent the setting of grout which may escape upon finished pipe or structure surfaces, and shall remove such grout slurry, water and all other materials, and restore the surface to its original condition.

**END OF SECTION**

**SECTION 33 01 30**

**SEWER FLOW CONTROL**

## PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the minimum requirements for furnishing all labor, supervision, tools, equipment, appliances, materials, incidental items, and the installation, operation, and maintenance needed to perform all operations in connection with the diversion of flow and bypass pumping of sanitary sewage for the installation of new sewers and manholes. The purpose of which is to provide un-interrupted sewerage service at all times and to prevent sewage overflows.

B. It is the intent of this project to divert flow within the existing sanitary sewers around the work zone where the construction requires diversion. The flows from the various laterals and side connection sewers to the sanitary sewer interceptor in the work zone shall also be bypass pumped downstream of the work zone. The design, installation, and operation of the temporary sewer flow control system shall be the Contractor's sole responsibility.

C. When working inside manholes or sewer, the Contractor shall exercise caution and comply with Occupational Safety and Health Administration (OSHA) and City requirements for working in confined spaces.

D. The Contractor shall manage, plan, and execute their operations such that there will be no backups, leaks, or unauthorized discharges of sewerage. The Contractor shall be completely responsible for the proper clean-up and any environmental remediation as may be required by the City or the Michigan Department of Environment, Great Lakes, and Energy (EGLE) for any backup, leak, spill, or sanitary sewerage overflow.

E. Contractor is responsible for procurement, installation, and monitoring of the required instrumentation.

1.02 SUBMITTALS

A. The Contractor shall provide a detailed Sewer Flow Control Plan to the Engineer for review and acceptance prior to the start of any flow control work. This plan must include descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing flow. The Sewer Flow Control Plan must be specific, including such items as schedules, locations, elevations, capacities of the equipment, materials, and all other incidental items necessary and/or required to ensure proper protection of the facilities, including protection of existing structures and pipes, and compliance with the requirements and conditions specified in these Contract Documents. The flow control plan shall be submitted to the Engineer for review and approval in accordance with Section 104.02 of the 2020 edition of the Michigan Department of Transportation Standard Specifications for Construction. No construction shall begin until all provisions and requirements have been reviewed and accepted by the Engineer.

B. For each submittal and re-submittal, the Contractor shall allow at least 14 calendar days from the date of the submittal to receive the Engineer's acceptance or request for revisions. The Engineer's comments shall be incorporated into the re-submitted plans, calculations, and descriptions. The Engineer's acceptance of the plan is required before beginning the work. Re-submittals shall be reviewed and returned to the Contractor within 14 calendar days. Required revisions will not be a basis of payment for additional compensation, extra work, or an extension of contract time. The Contractor shall include time for this entire review process in their schedule.

C. Sewer Flow Control Plan submittal shall include at a minimum:

1. Overall flow control plan and sequence of construction;

2. Flow control schedule including times when the flow control system shall be temporarily shut down and flow allowed to return to normal operations;

3. Overall plan for removal of flow control system during wet weather events and/or emergency situations;

4. Plan for providing redundancy for all aspects of the system especially the plugs;

5. Plan for providing noise control of pumping and power generation equipment;

6. Safety Program for confined space entry and procedure for entering manholes and installing plugs under live flow conditions;

7. Emergency clean-up plan should a spill occur or backups in the system occur. The plan should include contact names and 24-hour phone numbers;

8. Procedure for continuous (24-hour) monitoring of system, including verifying that plugs are sealed and lateral bypass pumping system is operating. The plan is to include type and location of level sensors, method of installation, set elevations of sensors, and continuous monitoring system. Monitoring of the system shall be performed and documented at each installation. Records of the system monitoring shall be submitted to the Engineer;

9. Maintenance of traffic plan for plug installation and removal in public roadways;

10. Sewer plug types, method of installation and removal, anchors and restraints, and hydraulic head limits;

11. Lateral bypass pump sizes, capacities, power requirements, and number of each size to be provided at each manhole including redundancy;

12. Calculations giving flow capacity provided by each pump given the system's Total Dynamic Head (TDH), including the calculations that are used to derive the system TDH. This data should also include the calculations determining what the Net Positive Suction Head available is in comparison to the Net Positive Suction Head required by each pump. Pump curves shall be submitted;

13. Number, size, material, and location of lateral bypass pumping suction and discharge piping, procedure for protecting lines, and location of bypass pumping discharge manhole;

14. Lateral bypass pumping system flushing and drainage plan;

15. Buried bypass pipe locations and details;

16. Environment protection including pump containment and leak detection;

17. Method of protecting discharge manholes or structures from erosion and damage; and,

18. Method of noise control for each pump..

## PART 2 - PRODUCTS

2.01 Flow Diversion Equipment

A. Provide materials and equipment suitable for, and known to be reliable to meet, the flow diversion requirements as shown on the Drawings and as needed for the Contractor's operations.

2.02 PLUGS

A. Plugs shall be temporary plugs that allows for quick removal in case of emergency or wet- weather situation. Plugs shall be capable of withstanding minimum static head pressure of 15 feet. Plugs shall include form or bracing, anchoring, or restraint to keep plugs properly installed. Plugs should be of the type capable of being installed under live flow conditions and in depths exceeding 35 feet as shown on the Drawings. Plugs should be able to be installed in either the incoming or outgoing pipe in a manhole and allow for quick removal under surcharged conditions. Plugs shall be clearly tagged with the Contractor's name and date of installation.

B. Pressure gages shall be installed with the plugs to continuously monitor the plugs and adjust the air pressure as needed to maintain full blockage of flow.

2.03 LEVEL SENSORS

A. Ultrasonic level sensors shall be installed, at a minimum, at each bypass pumping location. The Contractor may elect to install sensors in other locations at their expense if they so choose. The Contractor shall be responsible for the installation and maintenance of the sensors. The level sensors shall provide continuous level readings that the Contractor shall be able to review remotely to monitor the level in the system during flow diversion. The level sensors shall provide notifications and alarms to allow the Contractor time to remove the plugs should an emergency or a wet weather event occur.

2.04 PUMPING EQUIPMENT

A. The pumps must be capable of passing a minimum of a 3-inch solid. All pumps must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows.

B. Equipment used for bypass pumping shall be sufficient to handle anticipated average and peak flows from each sewer. The Contractor shall maintain sanitary sewer flows within their bypass pumping system, including all wet weather flows.

C. The locations and approximate flow rates for each of the sewer segments are as follows:

| Facility ID | Location | Dry Weather Flow (cfs) | Wet Weather Peak Flows (cfs) |
|---|---|---|---|
| MH 71-70646 | 36" on First just north of Miller | 4.7 | 33.0 |
| Con 74-70683 | 10” on Washington between First and Ashley | 1.2 | 1.4 |
| Con 74-70703 | 30” on First just south of Washington | 6.1 | 20.8 |
| MH 71-70588 | 24" on Washington | 0.8 | 5.2 |
| MH 71-70522 | 18" on Washington | 1.7 | 7.4 |

2.05 REDUNDANT EQUIPMENT:

A. The Contractor shall have redundant flow diversion equipment including, but not limited to, pumps, plugs and level sensors, available for immediate use at the job site at all times in the event of a failure.

B. The Contractor shall have redundant lateral bypass pumping equipment installed and ready for immediate operation and use in the event of an emergency or primary system breakdown or failure. The standby system shall be capable of pumping dry weather and peak flow. The standby pump(s) shall not be considered as any part of the primary system as designed for peak flow. The Contractor shall also furnish and have available onsite, and ready for operation, redundant pumping ancillary equipment in case of any failure of the pumping system including piping, electrical equipment, pipe appurtenances, etc. Redundant pumping facilities shall also include having a backup power generator in case the primary power source fails.

## PART 3 - EXECUTION

3.01 FLOW DIVERSION

A. The Contractor shall install the flow control and test the system for a minimum of 48 hours prior to the start of any other work onsite. The Contractor, City, and Engineer shall review the flow diversion during the testing period, including flow levels in the manholes. The Contractor shall not start any other work onsite until acceptance of the flow control test.

B. Residential and commercial sewer lateral location data for the project area is limited. The Contractor shall verify and document any sewer lateral locations as part of the construction.

C. The Owner will not permit water use restrictions to be used to reduce bypassed flows. The Contractor shall develop a flow diversion plan that permits the work to be completed with the least disruption of service to those served by the sewer.

D. Service laterals that enter the mainline sewer shall be bypass pumped to the downstream bypass pumping manhole or blocked if a bypass is not available and the construction is for a short duration. If a lateral is plugged and/or blocked, the Contractor is responsible for coordination with the property owner to ensure flow is minimized and to prevent a sewer backup. The Contractor is responsible for all sewer backups that occur during all bypass work.

E. The Contractor shall construct and maintain bypass pumping facilities as needed that will pump at the required flow rates. The Contractor shall provide the City with a minimum of 7 days advance notice prior to initiating the sanitary sewer bypass pumping system.

F. The Contractor is responsible for obtaining any approvals for placement of the temporary equipment and/or piping within public ways from the Agency having jurisdiction.

G. The Contractor shall provide an adequate labor force and have designated personnel onsite for maintenance and operation, and emergency back-up service, of the bypass pumping facility 24 hours per day 7 days per week during bypass operations.

H. The Contractor is to arrange for and provide all necessary temporary power, electrical service, board switches, etc. as required by DTE Energy and the National Electrical Code (NEC) current edition to provide temporary bypass pumping.

I. All bypass pumping discharge pipes shall be protected from the pipe header to the discharge structure. The Contractor shall provide necessary fittings or deflection in pipe to route pipe as necessary to minimize environmental impact and conflict with pedestrian, construction, and emergency vehicle traffic. When the bypass pipeline crosses drives or trails, or when pipeline is within any Contractor work zone/staging area, the Contractor shall place the bypass pipeline in a casing pipe and bury in temporary trenches with compacted backfill as indicated on the Drawings, as required for the Contractor’s operations, and as approved by the Engineer. All work associated with temporary bypass discharge pipe trench, including piping, fittings, deflections,

casing, spacers, trenching, and backfill shall be included in the contract pay item "Sewer Flow Control."

J. When flow in a sewer line is bypassed or plugged, sufficient precautions must be taken to protect the Contractor's operations from damage that might result from sewer surcharging. Further, precautions must be taken to ensure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved. At no time shall sewage be pumped in or allowed to flow into a catch basin, storm sewer, or open watercourse

3.02 NOISE CONTROL

A. All noise generated by the bypass pumping operation shall not exceed the sound limits as required by City Code and shall follow necessary procedures as required for temporary exemptions.

B. The Contractor shall provide a secondary sound barrier for both the primary and back-up pumps and any power generating equipment.

3.03 FLOW DIVERSION COMPLETION

A. At the end of the flow control operation, and after receipt of written permission from the Engineer, the Contractor shall remove all flow diversion and bypass pumping equipment, including level control system, temporary power equipment, and suction/discharge piping in a manner that permits the sewage flow to return to normal without overflowing to the environment, surcharging, or causing other major disturbances downstream. The Contractor shall restore all disturbed areas and structures, and restore all pavement in accordance with the Contract, and as directed by the Engineer.

B. The duration of the bypass pumping shall be determined by the Contractor as needed to perform the work under this contract while maintaining un-interrupted sewage service.

**END OF SECTION**

**SECTION 33 05 07.36**

**MICROTUNNELING**

## PART 1 - GENERAL

1.01 SUMMARY

A. The Work of this Section includes the construction of trenchless segments using microtunneling, as shown in the Contract Drawings.

B. This Section presents requirements for using a closed-face microtunnel boring machine (MTBM) with a pre-installed support system to excavate and install a 36-inch fiberglass pipe in a single pass (direct jacking) along W. Washington St. and N. First St. in Ann Arbor, Michigan.

C. Within this Section, the terms “Tunnel” and “Tunneling” refer to the trenchless installation by microtunneling.

D. Within this Section, the term “Jacking Pipe” refers to the fiberglass pipe installed via microtunneling as specified in Section 33 05 36 – Fiberglass-Reinforced Plastic Utility Pipe.

1.02 REFERENCES

A. Related Sections

1. 31 09 13 Geotechnical Instrumentation and Monitoring

2. 31 41 00 Shaft Construction and Support

3. 31 73 00 Contact Grouting

4. 33 05 36 Fiberglass-Reinforced Jacking Pipe.

B. Specifications, Codes, and Standards

1. The publications referred to hereinafter form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of referenced publications in effect at the time of the bid shall govern. In case of conflict between the requirements of this Section and the listed references, the requirements of this Section shall prevail.

a. ASCE/CI 36-15 Standard Design and Construction Guidelines for Microtunneling.

1.03 DEFINITIONS

A. Microtunnel Boring Machine (MTBM): Remote-controlled, guided, and steerable slurry shield that can provide continuous support to the excavation face. The MTBM is operated from a control container located on the ground surface. Soil excavation is achieved by a rotating cutterwheel. Excavated soil enters a slurry chamber, where it

is mixed with drilling fluid to form a slurry. Pumps cycle the slurry to the surface where a separation plant removes the solids from the slurry. The recycled fluid is returned to the face in a closed system of pumps and hoses. Drilling fluid used to convey spoil may be water; however, it may also contain acceptable additives such as bentonite that allow it to carry more solids, provide gel strength, and reduce permeability into the soils at the heading. The guidance system consists of a laser or theodolite and electronic distance measurement (EDM) device mounted in the jacking shaft communicating a reference line to a target mounted in the MTBM's articulated steering head. The target in an MTBM provides the operator with information about machine attitude and pitch and can allow for accurate steering control.

B. Intermediate Jacking Station (IJS): A fabricated steel cylinder fitted with hydraulic jacks spaced around the circumference which is incorporated into the pipeline between two specially fabricated casing or jacking pipe sections. The function of an intermediate jacking station is to distribute the jacking load along the pipe string during pipe installation. The hydraulic jacks are removed at the completion of a drive, and the gap between adjacent pipe sections is fully closed by pushing the pipes together with the main shaft jacks or another IJS. The steel cylinder remains as an extended sleeve or coupling.

C. Jacking (Casing) Pipe: Pipe jacked behind the MTBM to maintain the stability of the excavated tunnel. For one-pass microtunneling (direct jacking), the jacking pipe also acts as the product or carrier pipe.

D. Launch/Retrieval Seal or Entry/Exit Seal: A mechanical seal, usually comprised of one or more rubber flanges attached to a steel housing mounted to the jacking/receiving shaft wall. The microtunneling machine distends the flange seal as it passes through, reducing water, slurry, or lubricant inflows into the shaft during microtunneling operations.

E. Lubrication/Grout Port: A port located within the MTBM, or in the jacking pipes, fitted with a one-way valve to inject lubricant or grout into the annular space between the jacking pipe and the ground. Lubrication/grout ports within the jacking pipe are typically threaded to accept lubrication/grout fittings. Pipe plugs are inserted after grouting is completed.

F. Contact Grouting: Neat cement grout injected through grout ports into the annular space to fill voids and displace lubricant outside of the jacking pipe at completion of the microtunneling drive.

G. Obstruction: Objects located entirely or partially within the cross-section of the tunnel that prevents continued forward progress of the MTBM or jacking pipes along the design path and within allowable tolerances.

1.04 GENERAL REQUIREMENTS

H. The Contractor shall use a closed-face MTBM and jacking system to install the fiberglass pipe as shown in the Drawings and in accordance with Section 33 05 36 – Fiberglass-Reinforced Jacking Pipe.

A. The Contractor shall perform operations in accordance with ASCE/CI 36-15 Standard Design and Construction Guidelines for Microtunneling and requirements stated in this Section.

B. The Contractor shall use an MTBM suitable for tunneling in the geotechnical conditions as described in the project Geotechnical Baseline Report.

C. The Contractor shall use exit and entry seals for the launch and retrieval shafts in accordance with Section 31 41 00 - Shaft Construction and Support and as specified herein.

D. Perform tunnel excavation in a manner that limits loss of ground and limits lateral movement and settlement of the ground, structures, and utilities in the vicinity of the tunnel alignment. Take all measures necessary to protect existing structures, utilities, and facilities, including performing field verification. As a minimum, abide by the ground movement limits and criteria presented in Section 31 09 13 – Geotechnical Instrumentation and Monitoring.

E. The overcut annulus and voids outside the jacking pipe shall be contact grouted in accordance with Section 31 73 00 – Contact Grouting.

F. Dewatering is not allowed for the trenchless drive or shaft excavation where microtunneling is required, except when Soldier Pile and Lagging shaft construction is used as stated in Section 31 41 00 – Shaft Construction and Support. Sumps are allowed in shafts to remove nuisance groundwater, rainwater or slurry flow flows after breakthrough.

G. An instrumentation program shall be implemented in accordance with the Contract Drawings and Section 31 09 13 – Geotechnical Instrumentation and Monitoring.

H. The Contractor shall determine details and design of the MTBM equipment subject to the limitations specified herein and elsewhere in the Contract Documents.

I. A system of guidance and support is required for the trenchless drives as specified herein.

J. Upsizing the jacking pipe is allowed within the limits specified herein in Part 3 – Execution and with the concurrence of the Engineer.

K. It is the responsibility of the Contractor to safely construct the trenchless drive and provide the finished product within the limitations specified herein and elsewhere in the Contract Documents.

L. The Contractor shall develop a Contingency Action Plan as specified herein to address unexpected conditions and situations that may be encountered during construction.

1.05 QUALIFICATIONS

A. The trenchless superintendent shall meet all of the following experience requirements:

1. At least five years of experience supervising microtunneling, tunneling and underground construction with at least two of these projects being microtunnel construction similar to this project.

2. Successfully completed as the foreman or supervisor at least one project using a closed-face MTBM similar to the system proposed for this project and having a diameter of at least 36 inches and length of at least 1,000 ft.

B. The underground site safety officer shall meet all the following experience requirements:

1. At least seven years of site safety experience on heavy civil projects.

2. At least five years of site safety experience for excavations, with at least three years of site safety experience for underground work.

3. Specific training, certifications, and licenses as applicable for the work and in accordance with all regulations and standards.

C. The machine operator shall have at least five years of experience with the type of equipment proposed for the work and shall have successfully completed at least three microtunneling projects of similar dimensions and ground conditions within the past three years.

D. The surveyor proposed for the Work shall be a Licensed Surveyor in the State of Michigan and have a minimum of three years of experience surveying line and grade control on trenchless projects.

1.06 SUBMITTALS

A. The following pre-construction submittals shall be submitted at least 30 days prior to start of any shaft excavation unless stated otherwise:

1. Qualifications: Written documentation summarizing the qualifications and experience of the trenchless Superintendent, machine operator, Surveyor and Underground Site Safety Officer responsible for the microtunneling work. Required documentation shall be submitted no more than 30 days after Notice to Proceed with microtunneling construction.

2. Work area layout drawings: The Contractor shall submit scaled drawings showing work areas to be used for microtunneling operations, including layout of the launch and reception shafts, all major equipment, stored materials, and area for handling shaft and tunneling spoils. The Contractor's layout drawings shall show that all equipment and operations will be completely contained within the allowable work areas shown on the Contract Drawings.

3. Schedule: Submit the schedule for tunneling work identifying all major construction activities as independent items including the work hours and workdays for each activity. The schedule shall be updated and resubmitted by the Contractor every two (2) weeks, or more frequently if requested by the Engineer. The schedule shall include, as a minimum, the following activities:

a. Mobilization

b. Equipment inspection

c. Shaft construction

d. Thrust block construction

e. Jacking equipment setup

f. Portal opening, stabilization, and entry and exit seal installation for launch or retrieval of machine

g. Clean up and demobilization.

4. Contractor's underground work safety and accident prevention program for all underground work including the safety of workers and the public.

5. Permits: List of required permits and third-party approvals to perform the Work to be submitted no more than 30 days after Notice to Proceed with construction of the trenchless segments.

6. Procedure for hauling and disposal of spoils from shaft and tunneling excavation. The plan shall include disposal site, haul route, truck frequency and hours of spoil haulage. Environmental testing shall be performed in accordance with requirements of disposal sites, and local, state, or federal regulations.

7. Detailed microtunneling work plan with description and shop drawings of the complete system illustrating the design, layout, and operation of each system component including:

    a. Method of maintaining face stability including removing spoils while maintaining face stability.

    b. Procedures for measuring excavation quantities versus forward progress per length of pipe advanced and comparison of excavated volume versus theoretical volume. Include a calculation of the bulking factor for the material removed.

    c. Method of spoil transportation and removal from the face of the excavation to the shaft and from the shaft to the surface.

    d. Methods and materials used to manage sticky clays, if encountered in the bedrock, including at the face, transport system and separation plant.

    e. Monitoring and Instrumentation: methods, procedures, and frequencies for surveying the alignment and grade of each drive.

    f. Datalogger collection system used to collect MTBM parameters. The computer recorded data shall be referenced to time and distance and shall be recorded at time intervals of 30 seconds or less.

g. Guidance and Control: Equipment and procedures for guiding and controlling the alignment and grade of the MTBM. The submittal shall include the methods and equipment for tracking of the MTBM along the alignment.

h. Methods for personnel access and layout of utilities inside of the tunnel.

i. Equipment spreads, crew make-ups, and anticipated cycle times.

j. Equipment and methods for controlling friction, including overcut, annulus, and slurry outside the jacking pipe.

k. Lubrication system including port locations, fluid design and properties, supply pipe size and injection frequency.

l. Provisions for controlling groundwater.

8. Tunneling Equipment: Detailed description and shop drawings for the MTBM and system to be used including:

   a. The make and model number of the equipment along with any modifications.

   b. Scaled drawings and design for the equipment.

   c. Torque, rotation speed range, and no-load or “dry” torque reading.

   d. Cutterhead description, including types of tools, number and configuration (include photographs or drawings).

   e. Size of the overcut outside the jacking pipe.

   f. Articulation and steering capability

   g. Cutterhead jets/ports.

   h. Details of the Contractor’s proposed survey system including control points, equipment, methods, and frequencies.

9. Jacking System Design. The submittal shall include design of the entire pipe jacking system and, if utilized, intermediate jacking system including the pipe, jacking frame, and thrust restraint showing at a minimum:

   a. Capacity, number, and arrangement of main jacks.

   b. Details of the thrust ring, thrust block, jacking frame, jacking controls, pressure gages, and jack calibration data (pressure vs. force relationship for each stage of the jacks)

10. Lubrication System. Description of the system to reduce pipe friction including injection locations and frequency, pumping pressures, slurry design, and method for maintaining slurry in the annulus.

11. Calculations: Submit calculations in a neat, legible format. Assumptions used in calculations shall be clearly stated and shall be consistent with the ground conditions described in the Geotechnical Baseline Report, and conditions anticipated by the Contractor. All calculations shall be prepared by or under the direct supervision of a Professional Engineer licensed in the State of Michigan, who shall stamp and sign calculations.

    a. Provide an estimate of the maximum jacking force expected to complete each drive, accounting for lateral earth pressures at the tunnel face and frictional resistance along the pipe string.

    b. Calculations to confirm that the proposed jacking pipe can withstand the anticipated jacking forces while maintaining a minimum factor of safety of 2.0. Coordinate with the submittal required by Section 33 05 36 – Fiberglass-Reinforced Plastic Utility Pipe.

    c. Calculations demonstrating that the ground behind the thrust block can safely transfer the maximum planned jacking forces exerted by the main jacks to the ground during pipe installation with a factor of safety of at least 1.5 with consideration to the passive earth pressure of the ground and without excessive deflection or displacement of the thrust block and jacking frame or shaft excavation support system. Coordinate with the submittal required by Section 31 41 00 – Shaft Construction and Support. The thrust block capacity submittal shall be coordinated between the Contractor, shaft subcontractor, and pipe jacking subcontractor to ensure an adequate jacking system is provided to complete the work and to ensure the shoring system is designed to withstand the maximum planned jacking forces.

    d. Forces applied to the ground shall not exceed the allowable passive earth pressure, with an applicable minimum factor of safety of 2.0 for the regular condition and a minimum factor of safety of 1.5 for the maximum possible forces after delays (set-up).

12. Plan for personnel entry into the jacking pipe including provisions for ventilation, temperature control, lighting, electrical safeguards, monitoring, and warning systems. Include ventilation design, calculations and drawings stamped and signed by a Professional Engineer registered in the State of Michigan.

13. Material specifications and shop drawings of jacking pipe showing the pipe wall thickness, fiberglass type, and the maximum allowable axial force. A pipe certification of compliance shall be submitted. Descriptions and details of pipe joints and method of joining pipes. Coordinate with the submittal required by Section 33 05 36 – Fiberglass-Reinforced Jacking Pipe.

14. Descriptions and details of pipe ports for lubrication, if applicable, including shop drawings showing locations, sizes, and plugs for abandonment. Coordinate with the submittal required by Section 33 05 36 – Fiberglass-Reinforced Jacking Pipe and Section 31 73 00 – Contact Grouting.

15. Equipment and procedures for monitoring the jacking operation including jacking loads and loads on the jacking pipe.

16. Submit a description of surveying methods to be used to set the guidance system positions and a description of procedures to check and reset or realign the guidance system during construction.

17. Submit a description of methods to ensure that thrust block, shaft portal openings, and jacking frame are installed on proper line and grade. Submit results of line and grade survey stamped by a surveyor meeting the qualifications stated herein to ensure that the jacking setup is installed properly prior to launch of each drive. Submit results of all check surveys performed on surveying system, with check surveys to be performed a minimum of once per week. Confirm that these systems can achieve the required pipeline line and grade within the specified tolerances.

18. Contingency Plans: The following problem scenarios may be encountered during microtunneling operations. This list of scenarios is not comprehensive, and the Contractor shall include others that may be anticipated. The Contractor shall submit a contingency plan or plans providing courses of action for dealing with each problem scenario while satisfying the specifications. These plans shall include the observations and measurements required to clearly identify the cause of the problems, and state when Contractor shall implement actions stated in contingency plans. Contingency plans shall also identify specific measures to stop or modify the means, methods, equipment, and materials to immediately control and rectify the situation and continue Work.

    a. Jacking forces reaching the design capacity of the jacking pipe, tunneling equipment, frame, or anchorages. Contractor shall evaluate the use of a lubrication system, if not already implemented, for this scenario.

    b. Thrust block deforming excessively under loads due to inadequate ground support behind the thrust block.

    c. Tunnel face instability.

    d. Damaged or out of compliance jacking pipe during installation.

    e. Dramatic or sudden increase in torque due to large obstruction at heading.

    f. Excavated volumes significantly exceeding pipe volume installed.

    g. Evidence of subsidence, heaving, utility movement, or indications of excessive settlement or ground movement beyond specified limits.

    h. Damage to existing buildings, facilities or utilities.

    i. Line and/or grade exceeding tolerance.

    j. Inadvertent release of slurry to the ground surface or nearby waterways.

B. Construction Submittals

Manually recorded observations should be made at intervals of not less than one time per pipe, and whenever conditions change.

1. Daily jacking records: Submit jacking records to the Engineer by noon on the day following the shift for which the data or records were taken. These records shall include, at a minimum:

    a. The underground activities on site include excavation, ground support and grouting.

    b. The crews for each activity with number of people on the crew by craft.

    c. The date, starting time, and finish time for each activity and crew.

    d. Description of the ground encountered, position of different ground layers, and description of ground behavior.

    e. Any unusual conditions, breakdowns, and delays.

    f. Record of starting and ending stations.

    g. Any movement of the guidance system.

    h. Machine inclination and roll.

    i. Pressure, location, and volume of any lubricant pumped.

    j. Problems encountered with the tunneling machine or other components or equipment.

    k. Tunneling Logs: Operational parameters of the MTBM including torque and thrust, rotation rate, slurry pressure, circulation rates, and thrust for the jacking pipe.

    l. Volume of ground removed for each jacking pipe push or interval of five feet or less.

    m. Jacking logs:

        - Results of monitoring of the jacking force at the jacking frame and the jacking pipe.
        - Installed pipe number and corresponding tunnel length
        - Lubrication volume pumped and the lubrication ports opened
        - Downtime duration and reason for delay
        - Installed pipe number and corresponding length
        - Rate of advance
        - Cutterhead Speed and Torque

- Slurry Flow Rates and Pressures
- Bypass value position
- Use of any Cutting or High-Pressure Nozzles
- Earth and hydrostatic pressure
- Applied Face Pressure
- Steering Jack Positions
- Line and Grade Offsets

2. Results of all material tests specified herein. Test results shall be submitted within one week after completion of each test.

3. MTBM recorded data parameters recorded in 30-second intervals including:

    a. Deviation of the MTBM from the required line and grade of the pipeline, normally by reference to a laser beam.

    b. Grade and roll of the MTBM

    c. Pipe Number and corresponding total tunnel length

    d. Face pressure or method of calculating face pressure with other parameters

    e. Jacking load

    f. Torque and RPM of the cutter head

    g. Instantaneous jacking rate (rate of advance) and total distance jacked

    h. Indication of steering direction

    i. For slurry systems, the following is also required

        i. Volume of slurry flow in both the supply and return sides of the slurry loop

        ii. Indication of slurry bypass valve position

        iii. Indication of pressure of the slurry in the slurry chamber

4. Slurry Additives: The Contractor shall provide records of all slurry additives including any bentonite and polymers. The time and volume, or weight, of the additive shall be noted. Measurements of mud weights, specific gravity and viscosity will be made at the beginning, middle, and end of each shift, and submitted with the daily logs. Measurements will be made on slurry samples taken from the slurry tanks and noted accordingly.

C. Submit the following post-construction submittal no later than 7 days after the completion of trenchless construction for each tunnel drive:

1. Survey of the line and grade of the installed jacking pipe, manholes and other permanent facilities.

1.07 DESIGN CRITERIA

A. Tunneling Equipment:

1. Excavation and Face Support Equipment: The Contractor shall use a Closed-Face, remotely operated MTBM to excavate the tunnel, support the face, and support the tunnel perimeter in front of the jacked pipe. The equipment shall be designed and manufactured to effectively excavate the ground and provide ground control in the specific ground conditions present on this project and be compatible with the Contractor's means, methods, and materials.

a. The MTBM shall be closed-face slurry machine.

b. The MTBM shall be equipped with a system for continuous and controlled removal of cuttings from the cutting chamber while maintaining soil or slurry pressure at the face.

c. Slurry machines shall have the ability for removal of cuttings from the cutting chamber through the closed slurry system while maintaining continuous slurry pressure.

2. The machine shall have a watertight articulation joint between two segments of the shield. The shield shall be steerable in both the vertical and horizontal directions to allow the operator to maintain line and grade within the specified tolerances.

3. MTBM Monitoring: The MTBM shall have a guidance control system using a laser or optical system which is monitored continuously and accurately observes the MTBM's vertical and horizontal displacement from the laser beam or control line which has been accurately set to the required alignment and grade of the tunnel. The guidance system shall be designed to function at the maximum required drive length without loss of accuracy or reliability of function. A display showing the position of the machine in relation to design line-and-grade shall be provided at the control panel to allow the operator to continuously monitor line and grade deviations.

4. Face and Ground Control: The MTBM shall maintain face control at all times including during excavation and during shutdown periods. The equipment shall control the volume of excavated material removed at the tunnel face and shall coordinate excavation with the advance rate to avoid over excavation. The equipment shall prevent the loss of ground throughout the tunnel construction sequence, including at the face and the tail. The equipment shall prevent ground loss between the MTBM and the jacked pipe.

5. The cutterhead shall have a reversible drive system so that it can rotate in either direction and shall have other suitable provisions to minimize rotation or roll of the machine during installation.

6. The maximum radial overcut shall be limited to one (1) inch.

7. Fluid outside the jacking pipe: The MTBM shall have the means to inject fluid over and around the rear of the MTBM and along the pipe length of the jacking pipe to fill the overcut annulus, reduce ground movement onto the pipe, and lower the friction developed on the sides of the pipe during jacking. The injection system shall be such that it can automatically be controlled from the operator position.

8. Instrumentation and Monitoring: The MTBM shall be equipped with a computerized data acquisition system for collecting information as described herein, including but not limited to:

    a. line, grade, pitch and yaw

    b. torque

    c. jacking force

    d. lubrication/slurry delivery and pressure

    e. slurry or face pressure

9. Measurement of ground removed: Provide equipment and instrumentation to allow accurate measurement of the quantity of material removed from the tunnel excavation.

B. Jacking System:

1. Provide a total jacking system (main jacks and intermediate jacking stations) with a capacity that exceeds the maximum anticipated jacking force by at least 20 percent.

2. A thrust block shall be used to transfer jacking loads to the ground behind the jacking shaft. The thrust block face shall be constructed perpendicular to the proposed pipe alignment. The thrust block shall be designed to withstand the maximum jacking forces developed by the main jacks, without excessive deflection or displacement. The Contractor shall structurally connect shaft support components to achieve required thrust reaction capacity, and/or shall use grouting behind shaft walls to achieve sufficient thrust reaction capacity as necessary.

3. The jacking hydraulic circuit shall be set to relieve pressure at the maximum safe working capacity of the pipe as stipulated by the Contractor or the design load for the jacking pit thrust block, whichever is less. The jacking system shall exert a uniform load on the pipe ring and at a speed commensurate with the speed of excavation advance.

4. Provide the maximum anticipated construction loads, including the maximum anticipated jacking force, and incorporate the anticipated loads into the jacking pipe design.

5. Provide IJSs:

    f. When the maximum anticipated jacking force exceeds 80 percent of the maximum allowable jacking force.

    g. When the main jacks do not exceed the maximum anticipated jacking force by at least 20 percent.

C. Slurry Plant: The slurry separation plant shall be designed to achieve the rates of spoil separation and slurry cleaning required for planned production rates. The separation plant must fit within the allowable work areas shown on the Drawings. Excavated slurry pits or ponds will not be allowed. All excavated materials and slurry shall be discharged and completely contained in tanks, trucks, or other approved containers. Onsite disposal is not permitted.

D. Ancillary equipment: The Contractor shall determine the equipment used for all ancillary work, including but not limited to spoil removal, water control, material transfer, and underground utilities.

E. Entry/Exit Seals: Provide a watertight seal at the entry and exit locations designed to withstand the hydrostatic and earth pressures in addition to the slurry, lubrication, and ground improvement methods, if applicable. A sufficient length of jacking pipe shall be provided such that the seal remains engaged with the jacking pipe.

1.08 QUALITY CONTROL AND QUALITY ASSURANCE

A. Failure to meet the qualification requirements is failure to fulfill the Contract and the Contractor will be required to obtain a subcontractor that meets the qualification requirements.

B. In addition to the provision of operational data referred to elsewhere in this specification, the Contractor shall comply with the following:

1. The Contractor shall establish and maintain quality control for all underground work to assure compliance with the contract requirements and maintain records of quality control for materials, equipment, and construction operations.

2. The Contractor shall keep and maintain at the construction site a complete set of field drawings for recording as-built conditions. It shall have marked or noted thereon all field information, properly dated, recording as-built conditions. This set of field drawings shall be kept up to date during the course of the project.

C. The Contractor shall establish a quality assurance and quality control (QA/QC) plan for all materials used in tunneling. The QA/QC plan shall detail tests, testing frequency, and acceptance criteria. The Contractor shall maintain QA/QC records for materials, equipment, and construction operations.

D. In addition to the tests required to be performed by the Contractor, the Contractor shall take samples and/or allow access to obtain samples of the grout and grout materials, as determined by the Owner.

E. Provide access to the Engineer and furnish all necessary assistance and cooperation to aid the Engineer in observations, measurements, data, and sample collection, including, but not limited to the following:

1. The Engineer shall have full access to the launch and reception shafts prior to, during, and following all microtunneling operations. This shall include, but not be limited to, visual inspection of installed pipes, and verification of line and grade. Provide safe access in accordance with all safety regulations.

2. The Engineer shall have full access to the bentonite lubrication plant prior to, during, and following all microtunneling operations. This shall include but not be limited to full access to visually inspect storage and mixing tanks, lubricant pressures and pumping rates, and the amount and type of lubricants on site.

F. The Contractor shall immediately notify the Owner, in writing, if any problems that would cause a schedule delay or a change to the submitted process/procedure are encountered with equipment or materials.

G. All drawings and submittals requiring any civil or structural design shall be signed by a professional civil or structural engineer registered in the State of Michigan.

H. Dewatering outside of the shaft shoring is prohibited for the construction of permanent structures, except for Soldier Pile and Lagging application as stated in Section 31 41 00 – Shaft Construction and Support. Maintain the existing groundwater levels while constructing both temporary and permanent structures and pipeline connections.

1.09 SAFETY

A. The Contractor shall stop work, stabilize the excavation, and notify the Engineer in the event that construction activities result in any of the following conditions:

1. Potentially dangerous.

2. May damage existing facilities and structures.

3. Obstructions or ground conditions that substantially impede the construction.

B. Following initial activities to stabilize the excavation, the Contractor shall perform explorations as necessary to determine the extent and nature of the conditions. The explorations shall be submitted to the Engineer for approval prior to starting the Work.

C. Following the explorations, the Contractor shall develop an action plan to continue the Work in a safe and controlled manner while protecting existing facilities and structures. The action plan shall be submitted to the Engineer for approval prior to starting the Work.

D. No gasoline powered equipment shall be permitted in jacking and receiving shafts. Diesel, electrical, hydraulic, and air-powered equipment is acceptable, subject to applicable local, state, and federal regulations.

E. If personnel will enter the pipe, the Contractor shall develop an emergency response plan for rescuing personnel trapped underground in a shaft excavation or pipe. Keep all equipment required for emergency response on-site, in accordance with the jurisdictional agency.

## PART 2 - PRODUCTS

2.01 MATERIALS

A. The jacking pipe shall be designed by the Contractor for all loading conditions experienced during construction. The jacking pipe shall be in accordance with Section 33 05 36 – Fiberglass-Reinforced Plastic Utility Pipe.

B. Lubrication outside the jacking pipe used during jacking to reduce friction and control the ground shall be designed by the Contractor. The lubrication shall be non-toxic and shall not release environmental contaminants into the ground or groundwater either directly or from degradation over time.

C. Contact grouting used to fill gaps outside of the jacking pipe at the completion of the microtunneling drive shall be non-toxic and in compliance with Section 31 73 00 – Contact Grouting.

## PART 3 - EXECUTION

3.01 GENERAL

A. Set the MTBM to be jacked on the planned alignment and grade, properly braced to support the jacking pipe, and direct it in the proper line and grade required on the Contract Drawings. Line up the jacking assembly in the direction and grade of the jacking pipe.

B. Do not begin underground work until:

1. Required submittals have been provided, reviewed, and approved or accepted.

2. Shaft excavations, stabilization, and shoring have been satisfactorily completed.

3. The jacking frame and thrust block have been properly set in place to match the line and grade required in the Drawings.

4. The required ground stabilization methods outside of the entry and exit seals have been implemented.

5. All required geotechnical instrumentation has been installed and initial measurements have been obtained.

6. A pre-construction conference presenting the proposed means and methods has been conducted. Arrange this conference and inform the Owner of the time and

place of the conference in advance of shaft construction, as specified in Section 31 41 00 – Shaft Construction and Support.

7. All pre-construction surveys have been completed.

8. Survey control has been established for the jacking pipe and has been verified by the Engineer.

C. Perform underground work in a manner that limits loss of ground and limits settlement of the ground surface, structures, and utilities above and adjacent to excavations. Take measures as necessary to protect existing structures, utilities, and facilities. The Contractor shall be responsible for verifying the locations of all underground facilities in the vicinity of the shafts and tunnel.

D. Maintain clean working conditions at all times at the job site. All excavated material, slush, grout spills, water, and any excess material shall be removed from the excavation in a timely manner.

E. Provide safe access for the Engineer at all times during active underground work. Access shall be for, but not be limited to, the following: to inspect and observe the work, perform independent line and grade surveys, monitor instrumentation, and install additional instrumentation. Access shall include the use of transportation facilities used by the Contractor's personnel within the shafts and jacking pipe.

F. Perform all underground work in accordance with all current applicable regulations and codes of federal, state, and local agencies. In the event of a conflict, comply with the strictest or most restrictive applicable requirements.

G. Verify field conditions prior to commencement of Work, including layout and field measurements, and notify the Engineer of discrepancies.

H. Furnish all necessary equipment, power, water, and utilities for the Work, including pipe lubricant mixing and pumping, conveyance and disposal of spoil, and other associated work consistent with the methods of construction.

I. During construction operations, and until the work shafts are backfilled and the fill material is compacted, traffic barricades and warning lights to safeguard traffic and pedestrians shall be furnished and maintained by the Contractor.

J. Tolerances: Excavate to the lines and grades designated on the Drawings and as indicated below:

1. The Microtunnel alignment shall be within one (1) inch of the planned line and grade requirements shown on the Contract Drawings.

2. The jacking pipe alignment shall not change by more than one (1) inch per 25 ft.

3. If the line and/or grade of the jacking pipe is offset by more than the specified tolerances, the Contractor shall adjust, repair, and make changes as necessary to achieve the specified tolerances. Should the jacking pipe be outside the above

tolerance requirements, then the leading edge of the pipe, shall be returned to the plan line and/or grade at a rate of not more than one (1) inch per 25 ft of advance.

4. Steering corrections made to the jacking pipe shall be carried out in such a manner that the joint angle of any two adjacent pipes or segments does not exceed allowable limits as defined by the Manufacturer.

K. If the jacking pipe is off-line and/or grade so as to require redesign of structures for connections, acquisition of easements, or backfilling and re-excavation, the Contractor shall be responsible for doing all additional work without additional cost to the Owner. If the jacking pipe does not meet the specified tolerances for line and/or grade and, in the opinion of the Engineer, re-design of the tunnel or any structure is required, the Contractor shall be responsible for all redesign and any increase in construction at no additional cost to the Owner.

3.02 TUNNELING, JACKING AND EXCAVATION

A. Tunneling shall be conducted to minimize movement of the ground in front of and surrounding the jacking pipe and to control the loss of ground, surface settlement, and heave of the ground surface. Control the advance rate and volume of material excavated to avoid over-excavation, loss of ground, and heave of the ground surface.

B. Carefully control and monitor the volume of excavated material removed. Compare theoretical and actual volumes of excavated material removed. Adjust the advance rate and excavation rate to avoid over-excavation. Investigate potential voids created by over-excavation.

C. During shutdowns or any other interruptions in the work, provide complete positive support for the face by positioning the head firmly against the face. Exercise the machine daily to prevent the buildup of jacking forces when restart is required. Exercise daily if the shutdown or interruption is greater than 72 hours.

D. Each pipe section shall be jacked forward as the excavation progresses in such a way as to provide complete and adequate support to the surrounding ground at all times.

E. Avoid damage to pipe sections and joints during transport, handling, and jacking. In the event of damage to a pipe section or pipe joint, the Contractor shall notify the Engineer within the day of observation of the damage. Damaged jacking pipe shall not be used unless permitted in writing by the Engineer prior to installation.

F. The Contractor shall limit the jacking force to stay at or below the safe jacking capacity of the jacking pipe to provide the minimum factor of safety, as indicated in Section 33 05 36 – Fiberglass-Reinforced Jacking Pipe.

G. The jacking loads shall be continuously monitored and recorded at the jacking frame.

H. Lubricant shall be applied to the external surface of the pipe to fill the overcut annulus, support the ground, and reduce skin friction. The fluid shall be suitable for the particular ground conditions described in the Geotechnical Report.

I. The Contractor shall, at all times, monitor and record the volumes, pressures, and location of lubricant pumping to ensure that the annulus around the pipe is completely filled with lubricant.

J. The MTBM shall be operated in Closed Mode at all times and locations. Operate the MTBM such that there is continuous, full-face support of the ground at the tunnel face, and isolation of the excavation chamber.

1. To be in Closed Mode a slurry machine shall have full slurry filling the chamber and in contact with the ground in front of the cutter head, and the slurry shall be pressurized to counteract ground and groundwater loads to stabilize the ground.

2. Maintain slurry pressure to stabilize the ground, and to prevent ground heave and hydrofracturing.

3.03 GROUND STABILIZATION

A. Use methods and equipment that stabilize and support the ground at all times for shafts, tunneling, and all excavation work.

B. During periods of work stoppage, such as, but not limited to nights and weekends, stabilize the working face with the head to prevent ground loss and movement of ground into the jacking pipe and excavations.

3.04 WATER AND GROUNDWATER CONTROL

A. The Contractor shall control the inflow of water into the jacking pipe and MTBM during construction.

3.05 JACKING PIPE AND MTBM SIZE

A. The Contractor may oversize the jacking pipe upon approval of the Engineer. If the jacking pipe is oversized:

1. The jacking pipe crown shall be as shown on the Contract Drawings with the invert lowered as necessary for the chosen diameter.

2. The Contractor shall bear all costs for the larger pipe and completing the project with the larger pipe.

3. The Contractor shall be responsible and shall bear all costs for design and construction of affected project components including but not limited to manholes and connections.

3.06 EXCAVATED MATERIAL HANDLING AND DISPOSAL

A. The Contractor shall identify a spoil disposal site and shall be responsible for all transportation and disposal costs of the spoils.

B. Hauling and disposal of materials shall be in accordance with all Federal, State, and local laws, regulations, and ordinances.

C. All roads used for hauling shall be kept free of debris and open for use by others. Spillage and obstructions on the road resulting from hauling shall be immediately removed.

3.07 GROUTING AND FINISHING

A. Any overcut annulus and voids outside the Jacking Pipe shall be contact grouted as specified in Section 31 73 00 – Contact Grouting following completion of tunneling. Contact grouting shall be completed within three days of the completion of tunneling.

3.08 INSTRUMENTATION

A. The Contractor shall develop and implement an instrumentation program as shown on the Contract Drawings and as specified in Section 31 09 13 – Geotechnical Instrumentation and Monitoring.

3.09 SURVEY

A. Following completion, survey the horizontal position and elevation of the jacking pipe invert at intervals of 20 ft or less.

B. After installation of the jacking pipe, provide the Engineer with access to the pipe for visual inspection and for verification of the line and grade.

3.010 GROUND MOVEMENTS

A. Ground movements shall be limited to prevent damage to all structures, facilities, and utilities. The Contractor shall be responsible for and bear all costs associated with ground movements. As a minimum, the Contractor shall not exceed the ground movements specified in Section 31 09 13 – Geotechnical Instrumentation and Monitoring.

B. In the event that the ground movement criteria are exceeded, the Contractor shall, in accordance with requirements of Section 31 09 13 – Geotechnical Instrumentation and Monitoring and the submitted Contingency Plan, immediately adjust work procedures and perform necessary ground improvements to reduce settlement to within specified limits.

C. The Contractor shall be responsible for and bear the cost for all damages to all facilities caused by underground construction, including but not limited to bores, shafts, grouting, and associated phenomena including but not limited to settlement, heave, grout contamination, and hydrofracturing. The liability for damages shall include, but not be limited to, direct costs of repair or replacement and loss of use.

3.011 WRITTEN DAILY LOGS.

A. Maintain and submit written daily logs as required in paragraph 1.06.B.

3.012 CLEANUP AND RESTORATION

A. Following completion of work, remove all equipment, unused materials, and debris from the site.

B. Clean the inside of the jacking pipe leaving an interior free of soil, debris, and other deleterious materials.

C. Repair all damages and deficient conditions.

**END OF SECTION**

**SECTION 33 05 16**

**PRECAST CONCRETE UTILITY STRUCTURES**

## PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sanitary vaults and appurtenances with:
   1. Pre-cast concrete structures.
   2. Water-proofing.
   3. Pipe Penetration Seals.
   4. Anchor bolts and anchors.

1.2 REFERENCES

A. Where applicable, the latest editions of the following standards shall be considered a part of these specifications. In case of conflict, these specifications shall take precedence over the listed standard.
   1. American Association of State Highway and Transportation Officials (AASHTO)
   2. ACI 304 – Guide for Measuring, Mixing, Transporting and Placing Concrete
   3. ACI 318 - Building Code Requirements for Reinforced Concrete
   4. ASTM C478 - Specification for Precast Reinforced Concrete Manholes Sections
   5. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
   6. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures
   7. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
   8. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures
   9. ASTM C923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
   10. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
   11. CRSI Manual of Standard Practice

1.3 QUALITY ASSURANCE

A. Pre-cast vaults shall conform to appropriate reference standards stated herein and to the standards set forth in the National Precast Concrete Association (NPCA) Quality Control Manual. The manufacturer of the pre-cast concrete structures shall be certified by NPCA's Plant Certification Program.

B. Water-Proofing Manufacturer: Minimum 10 years experience in the production and sales of self-adhesive sheet membrane water proofing.

C. Water-Proofing Installer: Minimum 3 years experience specializing in performing the Work of this Section.

1.4 SUBMITTALS

A. For standard precast concrete units, the precast concrete producer will supply cut sheets showing conformance to project drawings and requirements and to applicable ASTM

specifications listed in this specification. The Precast concrete producer shall certify that such products will meet the ASTM specifications.

B. For proprietary precast concrete units, the precast concrete producer may supply standard plans or informative literature. Supporting calculations and design details shall be submitted. The Precast concrete producer shall warrant that such products will perform the intended task.

C. The calculations and submittal drawings shall be sealed and signed by a PE licensed in Michigan.

1.5 SHOP DRAWINGS

A. The plans for custom-made precast concrete units shall be shop drawings furnished by the precast concrete producer for approval by the Engineer. These drawings shall show complete design, installation, and construction information in such detail as to enable the Engineer to determine the adequacy of the proposed units for the intended purpose. Details of steel reinforcement size and placement as well as supporting design calculations, if appropriate, shall be included. The drawings shall include a schedule, which will list the size and type of precast concrete units at each location where they are to be used. The precast concrete units shall be produced in accordance with the approved drawings.

B. The manufacturer of the pre-cast structures shall provide the design of any poured-in-place concrete base for manholes.

C. The pre-cast concrete products shop drawings shall be sealed and signed by a PE licensed in Michigan.

D. Provide shop drawings for vault appurtenances identified in Section 1.

**PART 2 - PRODUCTS**

2.1 PRE-CAST CONCRETE STRUCTURES

A. Work includes proposed structures and modifications to existing precast structures; along with precast riser sections for either type of work.

B. Design Criteria - Design units in accordance with:
1. ACI 304 and 318
2. AASHTO H-20 loading
3. CRSI Manual of Standard Practice
4. Applicable ASTM Standard(s).
5. Design Soil Bearing = 2,000 psf.

C. Concrete
1. Minimum compressive strength 5,000 psi at 28 days; air entrainment of 6 percent, +2 percent.
2. Materials - Portland Cement: ASTM C150, Type I - Normal, II - Moderate, or III – High Early Strength. Aggregates - ASTM C33 or C330.
3. Reinforced steel meeting ASTM A615 or A616; certified Grade 60.
4. Welded wire fabric conforming to ASTM A185.
5. Admixtures Air-entraining: ASTM C260, Master Builders Micro-Air, or as approved.
6. Chemical: ASTM C494 Type A - Water-Reducing, Type B - Retarding, Type C - Accelerating, Type D - Water-Reducing and Retarding, Type E - Water-Reducing and Accelerating, Type F - Water-Reducing, High Range, Type G - Water-Reducing, High

Range and Retarding; containing no chlorides; Master Builders, W.R. Grace, or as approved.

7. Fly Ash: ASTM C618 Class F or C with loss on ignition less than 3 percent.
8. Joints with tongue-and-groove design; sealed water-tight with polyurethane, butyl rope mastic or equal sealant.
9. Plastic Adhesive Waterstop: Federal Specification SS-SS-210A; single- component, self-sealing plastic adhesive type, extruded rope form between two protective silicone treated papers, 1 inch square cross section, 1 inch lap splice, furnish with primer; Synko-Flex Products Synko-Flex, or as approved.
10. Minimum Wall Thickness: 6".

2.2 WATER-PROOFING

A. Type: Elastomeric sheet membrane water-proofing with protective cover.

B. Manufacturers: W.R. Grace & Co. - Conn., Bituthene System 3000, or Engineer approved equal.

C. Location: All concrete joints and penetrations shall be covered with membrane.

D. Membrane:
   1. Self-adhesive, cold-applied composite sheet consisting of rubberized asphalt and cross-laminated, high density polyethylene film.
   2. Membrane Characteristics:

| PROPERTY | TYPICAL VALUE | TEST METHOD |
|---|---|---|
| Thickness | 60 mils | ASTM D3767 Method A |
| Tensile Strength, membrane | 325 psi (minimum) | ASTM D412 |
| Tensile Strength, film | 5000 psi (minimum) | ASTM D412 |
| Elongation, ultimate failure of rubberized asphalt | 300% (minimum) | ASTM D412 |
| Peel Strength | 9.0 lbs/in width | ASTM D903 |
| Puncture Resistance, membrane | 50 lbs (minimum) | ASTM E154 |
| Resistance to Hydrostatic Head | 200ft of water | ASTM D5485 |
| Exposure to Fungi in Soil, 16 weeks | Unaffected | GSA-PBS 07115 |
| Permeance | 0.05 grain/sq ft/hr/in Hg | ASTM E96, Section 12 – water method |
| Water Absorption | 0.1% maximum | ASTM D570 |

E. Accessories: Provide surface conditioner, tape and other accessories required for a complete and proper installation.

F. Protective Cover:
   1. Protection Board: 1-inch thick extruded polystyrene with plastic film laminate on both sides, with a minimum compressive strength of 10 psi.
   2. Manufacturers:
      a. Dow Chemical Co., Styrofoam Brand Protection Board.
      b. Tenneco Building Products, Amocor PB4 Waterproofing Protection Board.
      c. Or as approved.

2.3 CASTINGS

A. All castings shall meet the requirements for the City of Ann Arbor sanitary sewer frame and cover.

2.4 ANCHORS BOLTS AND ANCHORS

A. Anchor Bolts Cast-In-Concrete:
   1. Comply with Type 316 stainless steel.
   2. 4 inch minimum hook.

B. Anchors:
   1. General Requirements:
      a. Type 316 stainless steel for anchors exposed to weather, in contact with aluminum components, or in submerged conditions.
      b. Zinc-plated, ASTM B633, for anchors in all other conditions.
   2. Expansion Anchors:
      a. Manufacturers:
         1) Hilti Corporation, Kwik Bolt II.
         2) ITW Ramset/Red Head, Trubolt Wedge Anchor.
         3) The Powers Rawl Company, Inc., Power-Stud.
         4) Or as approved.
      b. Comply with Federal Specification FF-S-325 Group II, Type 4, Class I.
      c. Minimum Embedment: 4 inches, unless otherwise indicated.
   3. Sleeve Anchors:
      a. Manufacturers:
         1) Hilti Corporation, Sleeve Anchor.
         2) ITW Ramset/Red Head, Dynabolt Sleeve Anchor.
         3) The Powers Rawl Company, Inc., Lok/Bolt.
         4) Or as approved.
      b. Comply with Federal Specification FF-S-325 Group II, Type 3, Class 3.

**PART 3 - EXECUTION**

3.1 GENERAL

A. Install materials and equipment in accordance with manufacturer's instructions.

3.2 VAULT

A. Set vault level.

B. Interior floor of vault shall slope to sump with minimum 0.25 inch per foot slope. If interior floor slope cannot be achieved, when setting vault apply topping material to slope floor 1% to 2% (1/8 to 1/4 inch per foot) to sump with a minimum topping thickness of 1". Apply SikaDur 32, Hi-Mod bonding agent to existing substrate; roughen and clean surface of concrete per manufacturer guidelines. Concrete shall be finished with steel trowel equal to existing floor, apply concrete curing compound as required.

3.3 WATER-PROOFING

A. Install membrane water-proofing and protective cover on the exterior surfaces from grade level down to footer, and terminating 6 inches out onto the top of the footer, unless otherwise directed on the Drawings. Exposed surfaces shall not be waterproofed.

B. Roll out membrane. Minimize wrinkles and bubbles.

C. Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.

D. Lap sides and ends in accordance with membrane manufacturer's instructions.

E. Reinforce membrane with multiple thickness of membrane material over joints whether joints are static or moving.

F. Seal membrane and flashings to adjoining surfaces.

G. Seal items penetrating membrane and install counter flashing membrane material.

H. Protect membrane from damage by adhering protection board over membrane surface. Scribe and cut boards around projections and interruptions.

3.4 EQUIPMENT MOUNTING

A. Install plumb and level, free from distortion or defects, and at the elevations indicated.

B. Anchor all equipment securely

C. Coordinate locations with ENGINEER in field

3.5 ANCHOR BOLTS AND ANCHORS

A. Use expansion anchors in precast or cast-in-place concrete.

B. Use sleeve anchors in masonry work.

END OF SECTION 33 05 17

**SECTION 33 05 36**

**FIBERGLASS-REINFORCED JACKING PIPE**

## PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The WORK specified in this Section includes the requirements for furnishing and installation of all Centrifugally Cast Fiberglass Reinforced Polymer Mortar Pipe (CCFRPM), gaskets, and accessories as designated in the Contract for use with microtunneling methodology described in Section 33 05 07.36 – Microtunneling.

B. In general, the Work of this Section shall include furnishing the pipe and fittings; the laying, jointing and jacking the pipe; connecting to manholes, inlets, and other structures; furnishing and placing of all accessories, appurtenant materials, stoppers, and markers; and the furnishing of all drawings, testing, samples, and all labor, materials and equipment necessary to complete the Work as specified, shown, ordered and directed.

1.02 REFERENCES

A. Related Sections

1. 33 05 07.36 – Microtunneling

B. Reference Specifications, Codes, And Standards

The publications and standards listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the abbreviation only. Unless otherwise stated, the most recent version or edition of each publication or standard is implied.

1. American Society for Testing and Materials (ASTM):

a. D638 – Test Method for Tensile Properties of Plastics.

b. D790 - Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

c. D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel- Plate Loading.

d. D3262 - Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe.

e. D3681 - Test Method for Chemical Resistance of Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe in a Deflected Condition

f. D4161 - Standard Specification for “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.

g. F477 - Specifications for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

2. American Water Works Association (AWWA):

a. M45 – Fiberglass Pipe Design.

1.03 QUALIFICATIONS

A. The designer shall have at least five years of experience, all in the last ten years, in the design of CCFRPM for jacking. The design shall be stamped and sealed by a Professional Engineer registered in the State of Michigan.

1.04 SUBMITTALS

A. Product Data: The Contractor shall submit shop drawings showing pipe dimensions, joint details, grout hole details and other pertinent product data including manufacturers catalog cuts with printed specifications.

B. Calculations: The Contractor shall submit design calculations for the proposed pipe and joints. Calculations for the joints shall demonstrate that the axial jacking forces with the required factor of safety as stated in Section 33 05 07.36 – Microtunneling necessary to complete the work required for this project can be transmitted through the joints within tolerance limits of misalignment. For pipe alignment tolerance limits, refer to specification Section 33 05 07.36 – Microtunneling.

C. Quality Control:

1. Quality control program for pipe manufacturer, including names and qualifications of quality control personnel for acceptance by the Engineer.

2. Description of procedures for maintaining and checking tolerances for pipe dimensions.

3. The Contractor shall submit test results with respect to the physical characteristics of the CCFRPMP. These tests shall be done at no additional cost to the Owner and shall include the following:

a. Tests performed in accordance with ASTM D3262.

b. Tests performed on joints in accordance with ASTM D4161.

c. Pipe stiffness tests in accordance with ASTM D2412. Submit material safety data sheets to the Engineer for each chemical grout used.

d. Submit demonstration pipe test program results prior to pipe production.

1.05 DESIGN CRITERIA

A. The Contractor is fully responsible for the design of CCFRPM that meets or exceeds the design requirements of this Specification and that is specifically designed for installation by microtunneling.

B. The CCFRPM shall be designed to withstand the maximum jacking loads that the Contractor anticipates will be exerted on the CCFRPM, including any non-uniform load distributions. The pipe shall be designed with a safety factor on axial load capacity of at least 2.0. These loads shall be in addition to soil and groundwater loadings. The pipe shall have a minimum pipe stiffness of 140 psi.

C. The jacking pipe shall be designed to carry the full weight of the soil above it, all applicable surcharge loads, as well as the external water pressure. For geotechnical information, the Contractor is referred to the Geotechnical Baseline Report and Supplemental [Geotechnical] Data Package.

1.06 QUALITY ASSURANCE

A. The Owner or other designated representative shall be entitled to inspect pipes or witness the pipe manufacturing.

B. Manufacturer's Notification to Customer: Should the Owner request to see specific pipes during any phase of the manufacturing process, the manufacturer must provide the Owner with adequate advance notice of when and where the production of those pipes will take place.

1.07 TESTING

A. Pipe shall be inspected at the point of manufacture by an independent testing laboratory engaged by the Owner, at no cost to the Contractor. Pipe without marking as specified herein and tested pipe without the testing laboratory's mark of acceptance shall not be delivered to the site of the Work. The pipe manufacturer shall keep the laboratory informed as to when pipe is to be made and ready for inspection.

B. Provide test results for the following tests:

1. Pipes: Pipes shall be manufactured and tested in accordance with ASTM D3262.

2. Joints: Joints shall meet the requirements of ASTM D4161.

3. Stiffness: Minimum pipe stiffness when tested in accordance with ASTM D2412 shall normally be 140 psi.

4. Stain Corrosion: The extrapolated 50-year strain corrosion value shall not be less than 0.9% as determined in accordance with ASTM D3681 and ASTM D3262

C. Pipe for testing shall be furnished and tested by the Contractor at no cost to the Owner or the testing laboratory. Centrifugally cast fiberglass reinforced polymer mortar pipe for microtunneling shall be tested and witnessed by the testing laboratory observer engaged by the Owner. Acceptance of centrifugally cast fiberglass reinforced polymer

mortar pipe shall be made on the basis of material tests and inspection of the manufactured pipe for visual defects and imperfections. The number of specimens of pipe sections required for the basis of acceptance shall be a minimum of one percent of the length furnished, but not less than 3 specimens of pipe of each size furnished unless otherwise permitted by the Engineer. Material tests shall include hydrostatic and permeability tests.

D. The Owner or their designated representative shall be entitled to witness the pipe manufacturing.

E. In-plant hydrostatic tests shall be performed on pipe produced for this project in accordance with the hydrostatic test for “Fiberglass” pipe joints using flexible elastomeric seals, ASTM D4161. The hydrostatic tests shall be performed at a frequency of at least 1 test in every 50 consecutive pipes produced, with a minimum of 50 pipes produced between each test. The pipe and joints for this project shall be tested to 2 bar (29 psi test pressure).

F. Failure of the joints and pipe to meet test requirements as specified under ASTM D4161 and ASTM F477 shall, at the discretion of the Owner, cause the pipe to be rejected.

G. All pipes used for hydrostatic testing shall not be used for installation for this project and shall be furnished by the Contractor at no additional cost to the Owner.

H. All expenses relative to inspection, including any travel costs, shall be paid by the Owner. All expenses relative to testing shall be paid by the Contractor.

1.08 DELIVERY AND STORAGE

A. Packaging, handling, and shipping shall be done in accordance with the manufacturer’s instructions.

B. Acceptance at Site:

1. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer. Such inspection may be made at the place of manufacture, or on the site after delivery, or at both places, and the pipes shall be subject to rejection at any time on account of failure to meet the specification requirements, even though sample sections may have been previously accepted. Sections rejected after delivery to the job shall be visibly and clearly marked for identification and shall be removed from the job in a timely manner. All sections that have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted by the Engineer, or removed and replaced, at no additional cost to the Owner.

2. At the time of inspection, the sections shall be carefully examined for compliance with ASTM designations specified herein and with the approved manufacturer's drawings. All sections shall be inspected for general appearance, dimension, tolerance, blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

3. Imperfections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that a strong and permanent repair is achievable. The pipe shall be repaired by an authorized representative of the pipe manufacturer. Repairs shall be carefully inspected by the Engineer before final approval.

1.09 STORAGE AND PROTECTION:

A. Care shall be exercised in handling, transporting, and placing pipe to prevent damage to the pipe. No interior hooks or slings shall be used in lifting pipe. All handling operations shall be done with an exterior sling or with a suitable forklift.

B. Pipes shall be stored in an orderly manner so that there will be a minimum of rehandling from the storage area to the final position in the tunnel and so that there is a minimum of obstruction and inconvenience to any kind of traffic. Deliveries shall be scheduled so that the progress of the work is at no time delayed. Storage of pipe shall be restricted to the staging areas as shown on the Drawings.

## PART 2 - PRODUCTS

2.01 MATERIALS

A. Resin Systems: The manufacturer shall use only polyester resin systems with a proven history of performance in this particular application. The historical data shall have been acquired from a composite material of similar construction and composition as the proposed product.

B. Glass Reinforcements: The reinforcing glass fibers used to manufacture the components shall be of the highest quality commercial grade E-glass filaments with binder and sizing compatible with impregnating resins.

C. Silica Sand: Sand shall be a minimum of 98% silica with a maximum moisture content of 0.2%.

D. Additives: Resin additives, such as curing agents, pigments, dyes, fillers, thixotropic agents, etc., when used, shall not detrimentally affect the performance of the product.

E. Elastomeric Gaskets: Gaskets shall meet ASTM F477 and be supplied by qualified gasket manufacturers and be suitable for the service intended.

F. Epoxy Cement: Epoxy cement for grout hole PVC plugs shall be LOCTITE EA E-00CL by Henkel, or equivalent, and approved by the CCFRPM manufacturer.

2.02 DIMENSIONS

A. Diameters:

1. The actual outside diameter shall be in accordance with ASTM D3262 and the size requirements as indicated on the Contract Drawings.

2. The nominal pipe diameter shall be 36 inches.

3. All measurements shall have a tolerance of ± 0.1%.

B. Lengths: Pipe shall be supplied in nominal lengths of 10 or 20 feet. Actual supplied length shall be determined by the Contractor consistent with the means and methods of construction, and shall nominally be +1, -4 inches. At least 90% of the total footage of each size and class of pipe, excluding special order lengths, shall be furnished in nominal length sections.

C. Roundness: The CCFRPM shall be round within 0.1% of the outside diameter.

D. Wall Thickness: The minimum wall thickness, measured at the bottom of the spigot gasket groove where the wall cross-section has been reduced, is to be determined from the maximum jacking load. The minimum factor of safety against jacking force is 2.0 based on straight alignment.

E. End Squareness: Pipe ends shall be square to the pipe axis with a maximum tolerance of 1/16 inch.

2.03 MANUFACTURE

A. Pipes: Manufacture pipe by the centrifugal casting process to result in a dense, nonporous, corrosion-resistant, consistent composite structure. The interior surface of the pipes exposed to sewer flow shall provide crack resistance and abrasion resistance. The exterior surface of the pipes shall be comprised of a sand and resin layer, which provides UV protection to the exterior. Pipes shall be Type 1, Liner 2, Grade 3 per ASTM D3262.

B. Joints: The CCFRPM shall be connected by gasket-sealed flush bell and spigot joints that do not materially increase the CCFRPM outside diameter or decrease the CCFRPM inside diameter. The bell (banding collars) shall be physically bonded to a pipe end using a fiberglass resin wrap. Gluing alone is insufficient. The gasket(s) shall meet the requirements of ASTM F477. Unless otherwise specified, the pipe shall be field connected with stainless steel couplings or bell-spigot joints that utilize elastomeric sealing gaskets as the sole means to maintain joint water tightness. The joints must meet the performance requirements of ASTM D4161. The joint shall have approximately the same O.D. as the pipe, so when the pipes are assembled, the joints are essentially flush with the pipe's outside surface. Joints at tie-ins, when needed, may utilize gasket-sealed closure couplings. The joints shall be leak-free under the following conditions:

1. External pressures up to 2 bars (200 kPa) from bentonite or other lubricant, injection, slurry system operation or groundwater head.

2. Gaps between the pipe ends shall not exceed 1/2 inch.

3. Joints between pipes shall be protected by the installation of a fiber board or plywood compression ring to distribute jacking loads evenly. The maximum thickness of the compression ring shall be 1/2 inch.

C. Grout Holes: The CCFRPM shall be supplied with factory-installed grout connections of diameter, quantity, and orientation compatible with the microtunneling lubrication

operation. Grout holes shall be fitted with either countersunk threaded corrosion-resistant steel plugs or PVC plugs fastened securely with epoxy to prevent infiltration of displaced earth during the jacking process. As a minimum, each pipe shall be supplied with 2-inch diameter grout holes spaced at 60 degrees (staggered at 10, 12, and 2 o'clock) on center, regularly spaced between 6-8 feet along the length of the pipe.

D. Fittings: Flanges, elbows, reducers, tees, wyes, laterals and other fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays. Properly protected standard ductile iron, fusion- bonded epoxy- coated steel and stainless-steel fittings may also be used.

E. Acceptable Manufacturer: HOBAS Pipe USA, Flowtite Technology, or approved equal.

## PART 3 - EXECUTION

3.01 INSTALLATION

A. Pipe Installation: The installation of pipe and fittings shall be in accordance with the project plans and specifications and the manufacturer's requirements.

B. Pipe Handling: Unloading, handling, and installation of pipe and fittings shall be in accordance with the project plans and specs and the manufacturer's requirements. CCFRPM shall be handled without the use of hooks or devices which might damage the tongue or groove or inside of the pipe. Use textile slings, other suitable materials or a forklift. Use of chains or cables is not recommended.

C. Before pipe is lowered into the jacking shaft, it shall be checked for roundness and shape so that joints can be properly made. Any pipe unduly out of round or out of shape will be rejected.

D. When the pipe is ready for installation, the joint surfaces shall be thoroughly clean of all dirt and foreign material. Care shall be used in entering the tongue into the groove so that the gasket will not be deformed or displaced. The joint components and the pipe ends shall be clean.

E. Jointing:

1. Clean ends of pipe and joint components.

2. Apply joint lubricant to the bell interior surface and the elastomeric seals. Use only lubricants approved by the pipe manufacturer.

3. Use suitable equipment and end protection to push the pipes together.

4. Do not exceed forces recommended by the manufacturer for joining or pushing pipe.

F. Jacking operations shall be performed in accordance with Section 33 05 07.36 – Microtunneling.

G. Each CCFRPM pipe section shall be jacked forward as the MTBM advances in such a way that the joints maintain their integrity and the continuity of the CCFRPM train is maintained.

H. Any pipe, which has been damaged or delaminated during installation, shall be pushed or pulled out and replaced, or repaired in-place using glass fiber fabrics and suitable thermoset resins in accordance with repair requirements by the manufacturer. The cost of replacement, repairing, or installation of a new pipe length shall be at no additional cost to the Owner.

I. Field Tests:

1. Infiltration / Exfiltration Test: maximum allowable leakage shall be per local specifications requirements.

2. Low Pressure Air Test: Each reach may be tested with air pressure (max 5 psi). The system passes the test if the pressure drop due to leakage through the pipe or pipe joints is less than or equal to the specified amount over the prescribed time period.

3. Deflection: Maximum allowable long-term deflection is typically 3% of the initial diameter.

## 3.02 PIPE ACCEPTANCE INSPECTION AND TESTING

A. After installation, inspect pipelines for obstructions and clean pipe. Provide all the necessary facilities for the inspection and cleaning. Dispose of all waste, including water.

B. Acceptance Inspection: Inspect the pipeline and repair any visual damage, defects, or leakage in the pipeline, manholes, and special structures. Leakage is defined as visible free movement of fluid into or out of the pipeline. Provide all labor and equipment to perform the remedial work. Submit a Repair Plan to the Engineer for approval prior to performing remedy and repair work.

C. Test pipelines by either joint method:

1. Individual Joint Tests - Hydrostatic: Provide all labor, materials, and equipment to perform the tests and retest as necessary. Provide equipment that is capable of accurately monitoring and recording the requested test information. Perform testing on all joints that experience a minimum static groundwater pressure of 3.5 psi or less measured at the crown of the pipe unless additional testing is required by the Engineer.

a. Perform the pipe joint test by placing a portable bulkhead or other sealing device at the joint and then introducing water under pressure into the annular space between the bulkhead and the joint gasket.

b. Pressurize the joint and test for a minimum of 15 minutes, maintaining the required hydrostatic head at the crown of the pipe throughout the duration of the test. The hydrostatic head for test purposes shall exceed the maximum estimated groundwater level at the joint being tested by at least 72 inches. Record the test duration and resulting leakage of each joint. Determine the allowable leakage at a joint according to the following formula:

$$Allowable\ Leakage = 0.0004 \times D \times L$$

Where:

*Allowable Leakage* = Allowable leakage in gallons per hour per joint.

*D* = Nominal pipe diameter in inches.
*L* = Average of the lengths of the two abutting segments in feet.

2. When actual leakage exceeds the allowable, determine the cause and remedy it before the pipeline is accepted. Correct any visible leaks in the pipeline, manholes and special structures.

3. Acceptance of the pipeline is based on a final inspection of the entire line conducted with the Engineer.

**END OF SECTION**

**SECTION 33 05 76**

**FIBERGLASS MANHOLES**

## PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the minimum requirements for furnishing all labor, supervision, tools, equipment, appliances, materials, incidental items, and the installation of closed bottom glass-fiber-reinforced polyester (fiberglass) sanitary sewer manholes.

1.02 REFERENCES

A. American Society for Testing Materials (ASTM):

1. ASTM D3753 - Standard Specification for Glass-Fiber Reinforced Polyester Manholes

2. ASTM C581 - Practice for Determining Chemical Resistance of Chemical Thermosetting Resins Used in Glass-Fiber Reinforced Structures Intended for Liquid Service

3. ASTM D2412 - Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel Plate Loading

4. ASTM D695 - Test Methods for Compressive Properties of Rigid Plastics

5. ASTM D2584 - Test Method for Ignition Loss of Cured Reinforced Resins

6. ASTM D790 - Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and electrical Insulating Materials

7. ASTM D2583 - Test Method for Indentation Hardness of Rigid Plastics by means of a Barcol Impressor

B. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO H-20 - Axle Loading

1.03 SUBMITTALS

A. Shop Drawings:

1. Details of all manhole system components confirming that the manholes conform to the specified requirements.

2. Fabrication Drawings showing:

3. Manhole elevations.

4. Wall thickness.

5. Pipe layout including invert elevations and size.

6. Gasket details for tee riser connection.

7. Concrete base details including concrete mix design and reinforcement layout.

8. Design of pipe connection assemblies and any additional products utilized to make the connection.

9. Details of manhole ladders, attachments and supports.

10. Drop connection details.

11. Chimney riser details.

12. Castings.

B. For each submittal and re-submittal, the Contractor shall allow at least 14 calendar days from the date of the submittal to receive the Engineer's acceptance or request for revisions. The Engineer's comments shall be incorporated into the re-submitted plans, calculations, and descriptions. The Engineer's acceptance of the plan is required before beginning the work. Re-submittals shall be reviewed and returned to the Contractor within 14 calendar days. Required revisions will not be a basis of payment for additional compensation, extra work, or an extension of contract time. The Contractor shall include time for this entire review process in their schedule.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Do not drop or impact the fiberglass manholes.

B. Lift manhole with two slings on spreader bar in horizontal position or an appropriately sized timer or steel beam, 8-inches longer than the cone top opening, inserted crosswise inside the manhole to the underside of the collar with a rope or chain attached to backhoe or other lifting device.

C. Use of chains or cables in contact with manhole surface is prohibited

**PART 2 - PRODUCTS**

2.01 FIBERGLASS MANHOLES

A. Manufacturers

1. L.F. Manufacturing, Inc.

2. Containment Solutions, Inc.

3. Or approved equal.

B. Description

1. Fiberglass reinforced polyester manhole riser shall be manufactured from commercial grade polyester resin or other suitable polyester or vinyl ester resins with fiberglass reinforcements. Unless otherwise approved, manhole risers shall be one-piece units manufactured to meet or exceed all Specifications of ASTM D3753.

2. The resins used shall be a commercial grade unsaturated polyester resin or other suitable polyester or vinyl ester resin.

3. The fiberglass manhole and all related components shall be fabricated from corrosion proof material suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as other gases associated with the wastewater collection system.

4. The reinforcing materials shall be commercial Grade “E” type glass in the form of continuous roving and chop roving, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.

5. The inner surface exposed to the chemical environment shall be a resin-rich layer of 0.010- to 0.020- inch thickness. The inner surface layer exposed to the corrosive environment shall be followed with a minimum of two passes of chopped roving of minimum length 0.5-inch (13 mm) to maximum length of 2.0-inch (50.8 mm) and shall be applied uniformly to an equivalent weight of 3-oz/ft. Each pass of chopped roving shall be well rolled prior to the application of additional reinforcement. The combined thickness of the inner surface and interior layer shall not be less than 0.10-inch (2.5 mm).

6. After the inner layer has been applied the manhole wall shall be constructed with chop and continuous strand filament wound manufacturing process, which insures continuous reinforcement and uniform strength and composition. The cone section, if produced separately, shall be affixed to the barrel section at the factory with resin-glass reinforced joint resulting in a one-piece unit. Seams shall be fiberglassed on the inside and the outside using the same glass-resin jointing procedure. Field joints are not approved.

7. For a UV inhibitor the resin on the exterior surface of the manhole shall have gray pigment added to a minimum thickness 0.125-inches.

8. Fiberglass manholes must have the ability to be height adjustable with the use of a height adjustment ring. Height adjustment can be made as a field operation without the use of uncured resins or fiberglass lay-ups. Fiberglass manholes must maintain all load and soundness characteristics required by A.S.T.M. D3753 after height adjustment has occurred.

C. Configuration

1. Manway reducers shall be concentric with respect to the larger portion of the manhole diameters through 72-inches.

2. Manway openings shall accommodate standard ring and cover as required by the Owner. The manhole shall provide an area from which a typical ring and cover plate can be supported without damage to the manhole.

D. Stubouts and Connections

1. All proposed connection details shall be submitted and approved by the Engineer.

2. For the mainline sewer connections, install plain end pipe stubouts to the manhole with resin and glass-fiber reinforced lay-up. Belled fittings (if required) shall meet the same performance requirements of the sewer pipe to be installed unless otherwise directed by the Engineer. Resin and fiberglass shall be of the same type and grade as used in the fabrication of the fiberglass manhole.

3. Joints for side sewer and drop connections, sizes 4-inch to 12-inch, shall be made by means of Inserta-Tee watertight compression connection or Kor-N-Seal boots. Side connections larger than 12-inch shall be by integral stubouts.

4. Inserta-Tee installation shall be in strict accordance with manufacturer's written instructions utilizing installation equipment approved for use by the manufacturer of the Inserta-Tee fitting. Use of equipment that does not meet this requirement is expressly prohibited.

5. Kor-N-Seal boots shall be installed by the manhole riser manufacturer using fiberglass reinforced pipe stubouts for the Kor-N-Seal boot sealing surface..

6. Manway openings shall accommodate standard ring and cover as required by the Owner. The manhole shall provide an area from which a typical ring and cover plate can be supported without damage to the manhole.

E. Tee Based Manholes

1. Tee based fiberglass manhole risers will be required to have resin fiber-reinforced bottom flange. All fiberglass manhole risers manufactured with a fiberglass bottom flange will have a minimum width of 3-inches. The manhole riser bottom flange shall be a minimum of ½-inch thick. An appropriate coupling shall be installed into the manhole riser bottom to facilitate connection to a fiberglass tee base. The coupling shall be sealed with a fiberglass lay-up and shall have an integral rubber gasket.

2. A fiberglass sloped bench area shall be installed in the manhole riser by the manufacturer. The invert will be formed using a non-corrosive material and completely enclosed in a minimum 1/4-inch layer of fiberglass chop and shall be sloped toward the coupling in the bottom of the manhole riser.

3. Manhole riser shall be fully compatible with the pipe tee and Contractor is responsible for all coordination between the manhole riser and pipe manufacturers.

F. Closed Bottom Manholes

1. Closed bottom fiberglass manholes will be required to have resin fiber-reinforced bottom. Manholes greater than 15 feet deep shall include a minimum of two fiberglass channel stiffening supports. Manholes manufactured with a fiberglass bottom shall have a minimum 3-inch-wide anti-flotation ring. The manhole bottom shall be a minimum of ½-inch thick.

2. A fiberglass enclosed invert and bench area shall be installed at the factory in the manhole by the manufacturer. The invert will be formed using a non-corrosive material and completely enclosed in a minimum 1/4-inch layer of fiberglass chop.

G. Fabrication Tolerances

1. Manhole riser lengths shall be in 6-inch increments +/- 2-inches.

2. Tolerance of inside diameter shall be +/- 1 percent of required manhole riser diameter.

H. Load Rating

1. The complete manhole riser shall have a minimum dynamic-load rating of 16,000 lbs. when tested in accordance with ASTM D3753 8.4 (note 1). To establish this rating the complete manhole shall not leak, crack, or suffer other damage when load tested to 40,000 lbs. and shall not deflect vertically downward more than 0.25-inch at the point of load application when loaded to 24,000 lbs.

I. Physical Properties

1. All fiberglass manholes shall meet the following physical properties:

| **Physical Property** | **Hoop Direction** | **Axial Direction** |
|---|---|---|
| Tensile Strength (psi) | 18,000 | 5,000 |
| Tensile Modules (psi) | $0.6 \times 10^6$ | $0.7 \times 10^6$ |
| Flexural Strength (psi) | 26,000 | 4,500 |
| Flexural Modules (psi) | $1.4 \times 10^6$ | $0.7 \times 10^6$ |
| Compressive (psi) | 18,000 | 5,000 |

J. Soundness

1. In order to determine soundness, the manufacturer shall apply an air or water pressure test to the manhole test sample. Test pressure shall not be less than 3-psig or greater than 5-psig. While holding at the established pressure, inspect the entire manhole for leaks. Any leakage through the laminate is cause for failure of the test. Refer to A.S.T.M. 3753 8.6.

K. Stiffness

1. The manhole riser cylinder shall have the minimum pipe-stiffness values shown in the table below when tested in accordance with ASTM D3753 8.5 (note 1).

| LENGTH – FT | F/AY – PSI |
|---|---|
| 3 – 6.5 | 0.72 |
| 7 – 12.5 | 1.26 |
| 13 – 20.5 5 | 2.01 |
| 21 – 25.5 | 3.02 |
| 26 – 35 | 5.24 |

2.02 ACCESSORIES

A. Ladders: No ladders shall be installed in the manholes.

2.03 SOURCE QUALITY CONTROL

A. Each completed manhole shall be examined by the manufacturer for dimensional requirements, hardness, and workmanship. All required ASTM D3753 testing shall be completed, and records of all testing shall be kept, and copies of test records shall be presented to the Owner upon formal written request within a reasonable time period.

B. All tests shall be performed as specified in ASTM D3753, Section 8, Titled “Test Methods”. See ASTM D3753, Section 8, Note 5, for test method D790 and test method D695.

C. As a basis of acceptance, the manufacturer shall provide an independent certification which consists of a copy of the manufacturer’s test report and accompanied by a copy of the test results stating the manhole has been sampled, tested, and inspected in accordance with the provisions of this Specification and meets all requirements.

2.04 IDENTIFICATION

A. Each manhole shall be marked on the inside and outside with the following information:

1. Manufacturer’s name or trademark.

2. Manufacturer’s serial number.

3. Manhole Length.

4. ASTM Designation.

**PART 3 - EXECUTION**

3.01 PREPARATION

A. Excavation at manhole location should be at least wide enough to accommodate the concrete slab specified and to provide working room around manhole. Verify the depth of manhole is sufficient to allow at least one course of brick or one concrete ring for

adjustment of ring and cover at top of final grade. Pipe cut-outs at the flowline are made in manhole prior to setting manhole in place over pipe in trench. Quarter marks have been provided on barrel to facilitate alignment of cut-outs.

B. Lift manhole per manufacturer's recommendations.

3.02 TEE BASED MANHOLE INSTALLATION

A. Shall be installed onto a fiberglass tee base. Manhole riser bottom shall rest on concrete encasement of tee base to prevent point loading gasketed coupling installed in bottom of manhole riser.

B. Installation details of the tee base shall be coordinated with the fiberglass pipe manufacturer.

3.03 CLOSED BOTTOM MANHOLE INSTALLATION

A. Manholes shall have a poured reinforced concrete base at least one foot deep and at least two feet larger than the fiberglass manhole outside diameter. The fiberglass manhole shall be lowered into the wet concrete and brought to plumb. Pour reinforced concrete over the anti-flotation flange. The concrete shall be a minimum of one foot deep and two feet from outside wall of the manhole.

3.04 BACKFILL

A. Unless shown otherwise on Drawings and approved by the Engineer, sand, crushed stone, or pea gravel shall be used for backfill around the manhole for a minimum distance of one foot from the outside surface and extending from the bottom of the excavation to the top of the reducer section. Suitable material chosen from the excavation may be used for the remainder of the backfill. The material chosen shall be free of large lumps or clods, which will not readily break down under compaction. This material will be subject to approval by the Engineer.

B. Backfill shall be placed in layers of not more than 12 loose measure inches and mechanically tamped to 95 percent Standard Proctor Density, unless otherwise approved by the Engineer. Backfill shall be placed in such a manner as to prevent any wedging action against the fiberglass manhole riser structure.

3.05 SITE QUALITY CONTROL

A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer. Such inspections shall be made at the place of manufacture, or at site of delivery, and the sections shall be subject to rejection on account of failure to meet any of the Specification requirements. Sections rejected after delivery to the job site shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected, and if already installed shall be acceptable if repaired or removed and replaced at the Contractor's expense.

**END OF SECTION**

# APPENDIX

# Ann Arbor High Level Trunkline Capacity Improvements

GEOTECHNICAL BASELINE REPORT

Stantec

Prepared for:
Ohm Advisors

Prepared by:
Stantec Consulting Ltd.

Final 9/17/25

Project/File:
2075157602

Stantec Consulting Ltd.

| Revision | Description | Author | Date | Quality Check | Date | Independent Review | Date |
|---|---|---|---|---|---|---|---|
| A | 90% Draft | I. Abdullayev | 8/14/25 | A. Ruiz | 8/14/25 | S. Fradkin | 8/14/25 |
| 0 | Final | I. Abdullayev | 9/17/25 | A. Ruiz | 9/17/25 | S. Fradkin | 9/17/25 |
| | | | | | | | |

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## Acronyms/ Abbreviations

bgs – below ground surface

PGR – Preliminary Geotechnical Report

SDP – Supplemental Data Package

GBR – Geotechnical Baseline Report

RGI – Report of Geotechnical Investigation

MTBM – Micro Tunnel Boring Machine

# 1 INTRODUCTION

## 1.1 Project Overview

The proposed project involves the construction of a new gravity sanitary sewer line on the west side of downtown Ann Arbor, extending down First Street from Miller Avenue to West Washington Street and then down West Washington Street from First Street for approximately 520 feet where the new gravity sewer will connect to existing infrastructure. The sewer line will feature a Fiberglass Reinforced Plastic (FRP) pipe diameter of 36 inches. The alignment begins along Washington Street heading east, then makes a 90-degree turn north onto First Street, continuing up to Miller Avenue (Figure 1.1-1). Depth from ground surface to the tunnel crown ranges from approximately 7 to 32 feet.

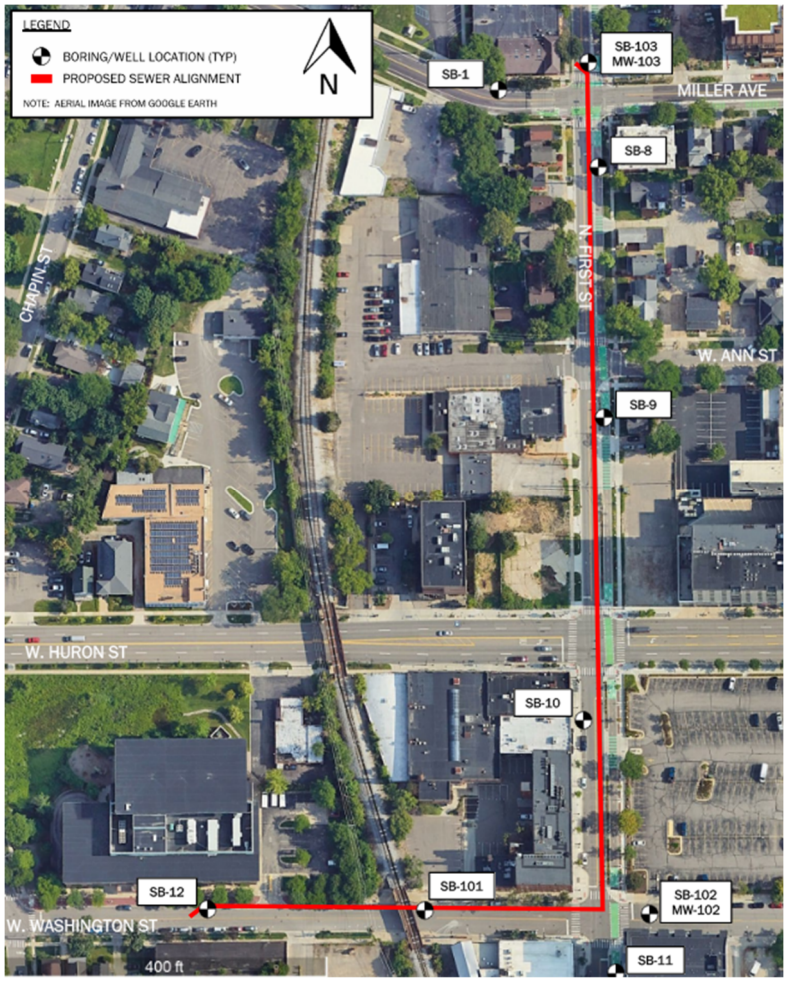



*Figure 1.1-1 Ann Arbor Sewer Line Project Area –*

## 1.2 Purpose and Use of the Geotechnical Baseline Report

This Geotechnical Baseline Report (GBR) has been prepared for the Ann Arbor High Level Trunkline trenchless crossing, and it is a part of the Contract Documents for the project. The principal purposes of this GBR are to:

- Assist the Contractor in evaluating ground conditions and requirements for excavation and excavation support.
- Establish contractual statements, referred to as baselines, of the geotechnical site conditions anticipated (or assumed) to be encountered during construction of the trenchless segments and associated shafts covered by the GBR.
- Provide guidance to the Owner and the Engineer in administering the Contract and serve as the basis for evaluation and resolution of claims for changed conditions or differing site conditions, consistent with requirements of the General Conditions.

More specifically, the baseline statements included in the GBR will be used when evaluating Contractor claims of changed conditions or differing site conditions and applying the changed conditions or differing site conditions clause of the General Conditions. Further, the GBR is the sole document for geotechnical interpretation of the available data, and in the event of apparent conflicts, discrepancies, or inconsistencies with any other geotechnical data made available to the Contractor, the GBR takes precedence in reconciliation of the conflict.

The baseline statements also serve as a mechanism for apportioning risk between the Owner and the Contractor. Risks associated with subsurface conditions that are consistent with or less adverse than the stated baseline conditions are allocated to and are the responsibility of the Contractor. Risks associated with subsurface conditions that are more adverse than the baseline conditions are accepted by the Owner.

The GBR describes the geotechnical and construction considerations that formed the basis of design for the subsurface components of the Project. The report includes descriptions of the trenchless segments and associated shafts to be constructed; interpretations of the geological and geotechnical information obtained for the Project; a summary of expected geotechnical and groundwater conditions to be encountered; a summary of how these expected conditions have been reflected in the Project design; and a discussion of design and construction considerations. The GBR also identifies key project constraints and select requirements that must be addressed by the Contractor during tender preparation and subsequent construction.

The GBR should be read in conjunction with the Preliminary Geotechnical Report (PGR), Supplemental Data Package (SDP), and Dewatering Supplement Letter (DSL) which are included in Appendices B through D.

This GBR presents the design team’s best judgment of soil, groundwater, and environmental conditions expected to be encountered in the surface and subsurface excavations addressed by this GBR. The geotechnical baseline statements presented herein were developed using engineering judgment to interpolate between boreholes and extrapolate beyond the borehole records and laboratory test data to

delineate the specific subsurface conditions represented by the baseline statements, with consideration for apportioning risk as discussed herein. The actual conditions encountered in the field are expected to be within the ranges discussed; however, the distribution of geologic conditions encountered will likely vary from those presented in this report.

The behaviour of the geologic materials present in the project excavations will be influenced by the Contractor's selected equipment, means, methods, and level of workmanship. The discussions in the GBR are based on assumed construction means, methods, equipment, and a level of workmanship assumed to be consistent with typical contracting and construction practice in the area at the time of construction. As appropriate to specific discussions within this GBR, such assumptions are stated. In using this GBR, the Contractor is required to consider how its selected means, methods, and equipment differ from those assumed and the resulting impacts on behaviour of the geologic materials present in the excavations.

Some of the technical concepts, terms, and descriptions in this GBR may not be fully understood by the Contractor. It is recommended that Contractor tenderers engage a geotechnical engineer or engineering geologist with local experience who is familiar with the topics covered by this report and the types of construction contemplated for the project to review and explain the information in the GBR to assure a complete understanding of the reported information.

## 1.3 Limitations

This GBR was prepared for the trenchless drives and associated shaft construction in accordance with generally accepted geotechnical engineering practices common to the project area. The GBR only applies to trenchless construction and associated launch and reception shafts and does not apply to any open-cut construction or other associated facilities to be constructed adjacent to or in the immediate vicinity of the proposed trenchless segments. Descriptions of anticipated conditions were developed consistent with the standard of care commonly used in the profession.

No warranty is included by the Owner, Stantec, or any other team subconsultants, either express or implied, that the actual conditions encountered will conform exactly to the baseline statements or other descriptions of subsurface conditions stated herein. Rather, the Contractor should anticipate some variation between conditions described in this Report and the conditions encountered during construction.

# 2 SOURCES OF GEOLOGICAL INFORMATION

The primary sources of geotechnical information for this report are from the following:

- Preliminary Geotechnical Report (PGR) for the Miller-Chapin Sanitary Relief Sewer, dated April 9, 2024, prepared by Materials Testing Consultants (MTC). **Appendix C**
- Supplemental Data Package (SDP) for the Miller-Chapin Sanitary Relief Sewer , dated January 10, 2025, prepared by Materials Testing Consultants (MTC). **Appendix D**
- Dewatering Supplement Letter (DSL) for the Miller-Chapin Sanitary Relief Sewer, dated September 16, 2025, prepared by Materials Testing Consultants (MTC). **Appendix E**
- Report of Geotechnical Investigation (RGI) prepared by G2 Consulting Group for the Fairfield Inn & Suites project, dated March 2, 2020. **Appendix F**

# 3 OVERVIEW OF SUBSURFACE INVESTIGATION PROGRAM

Field Investigations were performed in two different stages. Geotechnical exploration data from these investigations is represented in the PGR and SDP reports. The subsurface investigation program included geotechnical drilling and groundwater table monitoring, and geotechnical and environmental laboratory testing. Additional environmental lab tests were later performed as part of the DSL.

## 3.1 Project Subsurface Investigations

The first phase of the geotechnical investigation included 12 conventional soil test borings, five of which were located along the selected First and Washington street alignments. The other seven borings were drilled along an alignment dropped from consideration. The boring depths ranged from 26 ft to 50 ft below the existing ground surface along the potential sewer line alignments. Appendix B shows the locations of the five borings. In the second stage of the investigation, one additional soil boring was drilled along the First Street alignment, and two additional borings were drilled along the Washington Street alignment. Table 3.1-1 summarizes the borings along the First and Washington street alignments.

*Table 3.1-1 List of borings drilled along the First and Washington street alignments*

| ALIGNMENT | INVESTIGATION PHASE | BORING ID | DRILLING DEPTH (FT) |
|---|---|---|---|
| FIRST STREET | Phase 1 | SB-8 | 26 |
| | Phase 1 | SB-9 | 50 |
| | Phase 1 | SB-10 | 50 |
| | Phase 1 | SB-11 | 45 |
| | Phase 2 | SB-102 | 50 |
| | Phase 2 | SB-103 | 30 |
| WASHINGTON STREET | Phase 1 | SB-12 | 30 |
| | Phase 2 | SB-101 | 30 |

In both stages of the investigation, drilling was performed by using conventional hollow-stem auger methods to advance the boreholes. Temporary monitoring wells were installed in Borings SB-102 and SB-103 at the completion of drilling. Boring logs and detailed soil descriptions can be found in the PGR and SDP.

In addition to the above-mentioned borings, logs of two additional borings from the RGI report were used to supplement the subsurface information available along the First Street tunnel alignment. These borings are:

- Boring B – 1 was drilled to 45 ft bgs and mainly composed of mix of sand with trace silt and gravel, gravel with silt, silt with trace clay and sand, and silty clay with trace of gravel and occasional silt seams.

Boring B – 2 was drilled to 45 ft bgs and mainly composed of mix of gravel and sand with trace silt, silty clay with trace sand and gravel, silt with trace clay and sand, and clayey sand with trace silt and gravel.

## 3.2 Laboratory Testing

### 3.2.1 Geotechnical Laboratory Testing

Soil samples were recovered from the borings at regular intervals by means of the Standard Penetration Test (SPT), ASTM D1586. The recovered soil samples were sealed, labeled and transported to the drilling company's laboratory where the following geotechnical tests were performed on selected samples:

- ASTM D422 "Test Method for Particle-Size Analysis of Soils"
- ASTM D1140 "Test Methods for Determining the Amount of Material Finer than 75-μm (No. 200) Sieve in Soils by Washing"
- ASTM D2216 "Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass"
- ASTM D2974 "Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils"

The samples subjected to the grain-size testing were reclassified according to ASTM D2487 procedures "Standard Test Method for Classifications of Soils for Engineering Purposes" based on test results. The

ASTM D2487 and D2488 classifications are included on the boring logs which can be found in the PGR and SDP.

### 3.2.2 Environmental Sampling and Testing

Environmental sampling and testing program composed of three primary components was performed:

- **Field Screening for VOCs and Flammable Gasses:**
  Screening for Volatile Organic Compounds (VOCs) and flammable gases was conducted on initial soil samples using a Photoionization Detector (PID). Notably, Boring SB-10, located along the Washington Street alignment, exhibited VOC concentrations exceeding 50 parts per million (ppm).
- **Laboratory Analysis of Soil Samples:**
  Composite and soil grab samples were analyzed for VOCs, Polynuclear Aromatic Hydrocarbons (PNAs), and the Michigan 10 metals. Contaminated soils containing both VOCs and PNAs were identified in Boring SB-12 along Washington Street, and in Borings SB-10 and SB-11 along the First Street alignment.
- **Groundwater Sampling and Analysis:**
  Groundwater samples were collected during both phases of the geotechnical investigation to assess the presence of VOCs, PNAs, and Michigan 10 metals.
  - In Phase 1, groundwater samples from Borings SB-10 and SB-11 (First Street) and SB-12 (Washington Street) showed contamination with VOCs and PNAs. Groundwater could not be collected from Borings SB-8, SB-9, and SB-10 along Washington Street due to insufficient water volume.
  - In Phase 2, samples were obtained from Borings SB-12 and SB-101 (Washington Street), and from SB-11, MW-102, and MW-103 (First Street). VOC contamination was detected in MW-102, while groundwater from SB-101, MW-102, and MW-103 showed the presence of Michigan 10 metals.
  - In the supplemental testing, samples from Borings SB-102 and SB-103 were tested for 1,4-Dioxane, which was not detected.

Detailed information regarding the environmental sampling, testing procedures, and corresponding results for all activities described above can be found in the PGR, SDP, and DSL. Groundwater treatment and soil disposal requirements can be found in the project specifications.

# 4 GROUND CHARACTERIZATION

## 4.1 General

This section outlines the anticipated subsurface conditions for the Ann Arbor High Level Trunkline trenchless segments and associated shafts. It provides a summary of the geological setting and stratigraphy of the project area, based on information provided in the PGR and SDP. The discussion includes relevant geotechnical baseline parameters and characterizes the ground conditions expected during trenchless construction. This section should be read in conjunction with the Geological Profile presented in the Appendix.

## 4.2 Regional and Local Area Geologic Setting

Ann Arbor is in a glaciated area where the surficial soils include ground moraines (glacial till), glacial outwash, and recessional or end moraine deposits. Ann Arbor is underlain by outwash deposits and recessional moraine deposits mapped as the Fort Wayne Moraine. Based on geologic mapping by the Michigan Geologic Survey, the project site is in an area in which the surface soils are outwash deposits, which are typically granular soils comprised of sands, gravels, cobbles and potentially boulders. It is expected the outwash overlies glacial till and moraine deposits. The thickness of individual units and lateral extent are variable due to the direct deposition of this material from glacial meltwater streams and glacial ice at the front of retreating glaciers. The Map of Bedrock Topography of the Southern Peninsula of Michigan indicates bedrock in the project vicinity to be at approximately El. 700, on the order of 90 to 125 ft below site grades, which is well below the depth of interest for this project.

## 4.3 Overburden Stratigraphy

The project site consists of a thoroughly developed urban area with the potential sewer alignments running in close proximity to existing infrastructure. The tunnel alignment is divided into two segments (see Appendix B):

1. **Washington Street Alignment** – from Station 100+47 to Station 105+70
2. **First Street Alignment** – from Station 150+70 to Station 161+30

Note that the tunnel stationing differs for the two segments. The two segments intersect at the shaft located at the intersection of Washington Street and First Street.

The subsurface conditions along the Washington Street alignment generally consist of urban fill which is mainly composed of poorly graded sand with varying amounts of fines and gravel, underlain by native sand with variable amounts of gravel and silt underlain by lean clay deposits. A discontinuous layer of gravel with sand, silt and occasional cobbles is present at the east end of the alignment. At Boring SB-12, the uppermost layer consists of 3 inches of asphalt overlying 5 inches of concrete while Boring SB-101 features a surface layer composed of 4 inches of asphalt underlain by an 8-inch gravel base.



The subsurface conditions along the First Street alignment primarily consist of urban fill made up of poorly graded sand with silt and gravel, with isolated areas of clayey sand and clayey sand containing organic material, underlain by native sand with varying amounts of gravel and silt, and deeper layers of lean clay followed by silt and sandy silt. Starting at Station 153+50, these silt and sandy silt layers become interbedded within the clay, a condition that persists through to the north end of the alignment. From Station 158+00 onward, sand layers become less prominent, and the subsurface profile is primarily composed of native fill overlying clay, which encloses the silt and sandy silt strata. Apparently discontinuous gravel deposits were also encountered at several locations along this alignment, including at the south end in the vicinity of the shaft at Washington and First Streets and in the vicinity of Sta. 155+00. Asphalt pavement thickness in this area varies between 3.5 and 8 inches. At Borings SB-103, SB-10, and SB-11, the asphalt layer is underlain by a gravel base ranging from 5.5 to 7 inches thick, while the asphalt is underlain by 4 inch concrete in SB-102. Poor sampler recovery and drilling difficulty was frequently noted at various depths along the general tunnel alignment, mostly because of the presence of coarse gravel or cobbles. Boulders may present where cobbles are noted.

### 4.3.1 Soil Types

The subsurface soils identified during the geotechnical exploration have been classified to establish baseline conditions based on their expected behavior during construction activities. A total of five distinct soil groups were delineated through this evaluation: (1) Fill, (2) Sand with Fines, (3) Gravel with Sand and Fines, (4) Clay, and (5) Silt / Sandy Silt.

- **Fill** – Subsurface exploration revealed that the fill materials across the site are predominantly composed of poorly graded sand, typically containing silt and gravel, with occasional clay inclusions. Organic matter was encountered in Boring B1, while bituminous concrete debris was observed in Boring B2. Standard Penetration Test (SPT) N-values range from 3 to 49, indicating a relative density classification from very loose to dense. Specifically, the fill in Borings SB 102, SB 10, SB 9, SB 8, and B2 is generally medium dense to dense, whereas in Borings SB 12, SB 101, SB 103, and B1, the material is predominantly very loose to loose.

- **Sand with Fines** –. Sandy soils encountered across the site are predominantly poorly graded sand, with grain sizes ranging from coarse to fine, reflecting the variable sorting typical of glacial deposition. Trace to minor quantities of silty fines were identified in Borings SB12, SB102, SB10, SB9, and SB103, while clayey fines were present in SB101, SB10, and SB103. Gravel, ranging from trace to moderate amounts and comprising both coarse and fine particles, was observed in SB101, SB102, SB10, SB9, SB103, B1, and B2. Additionally, fibrous peat lenses were encountered in SB12, suggesting localized organic content. Standard Penetration Test (SPT) N-values ranged from 4 to 53, corresponding to relative densities from very loose to very dense. The sandy soils in Borings SB101, SB102, SB9, SB103, B1, and B2 are generally medium dense to very dense, whereas those in SB12, SB101, and SB103 are predominantly very loose to loose, indicating variability in compaction and strength characteristics across the site.

- **Gravel with sand and fines** –.The gravelly soils across the site consist of mixtures of gravel and sand with varying silt content and occasional cobbles, exhibiting a broad gradation from coarse to fine particles.. Trace to few silty fines were noted in borings B-1, B-2, and SB-102 ,. Standard Penetration Test (SPT) N-values ranged from 28 to 84, corresponding to relative densities from medium dense to very dense.

- **Clay** – The cohesive soils encountered across the site are primarily composed of lean clays and silty clays, characterized by a predominance of clayey fines and minor inclusions of sand, gravel, and silt. The lean clays typically contain mostly clayey fines, with trace to few amounts of coarse to fine sand and coarse to fine gravel. Silty clays are also present, containing trace sand and gravel, and are occasionally interbedded with silt seams or lenses, which were specifically observed in Borings SB103 and B1. Standard Penetration Test (SPT) N-values ranged from 7 to 81, corresponding to relative densities from firm to hard.

- **Silt/ Sandy Silt –** The silty soils encountered across the site are primarily composed of silt with varying amounts of sand and trace clay, forming a fine-grained, low-plasticity matrix. These soils are generally dominated by silty fines, with little to few fine sand particles present throughout. In some locations, trace amounts of clay were noted, indicating low plasticity. Occasional clay seams and lenses were observed in isolated zones, specifically in SB10 and SB9. Standard Penetration Test (SPT) N-values ranged from 7 to 55, corresponding to relative densities from firm to hard.

  Table 4.3-1 summarizes the soil classifications and their corresponding characteristics as described above.

*Table 4.3-1 Soil Type, Description, Consistency and Relative Density in Project Boreholes.*

| SOIL TYPE | DESCRIPTION | COLOR CODE | SPT-N Value | | | | | Density | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Max | Avg | STDEV.S | Count | Fine | Coarse |
| Existing Fill | Poorly Graded Sand with Clay ***(SP-SC),*** Poorly Graded Sand with Silt and Gravel ***(SP-SM),*** Poorly Graded Sand with Gravel ***(SP)*** | | 3 | 49 | 22 | 15 | 20 | Very Loose to Medium Dense | Stiff |
| Sand with Fines | Poorly Graded Sand with Silt with lenses of peat, little gravel, clay ***(SP/PT)***, Sand with trace of Silt ***(SP),*** Sand with Silt and Gravel ***(SP-SM)***, Poorly Graded Sand with silt fines ***(SP)***, Clayey Sand with Gravel ***(SC)***, Poorly Graded Sand with Clay and Gravel ***(SP-SC)*** | | 4 | 53 | 19 | 15 | 33 | - | Loose to Dense |
| Gravel | Poorly Graded Gravel with Silt and Sand ***(GP-GM)***, Sandy Gravel with Silt ***(GM)***, Gravel and Sand with Silt Trace ***(GM)*** | | 28 | 84 | 51 | 18 | 32 | - | Dense |
| Clay | Lean Clay, Silty Clay, Sandy Lean Clay ***(CL)*** | | 7 | 81 | 32 | 19 | 11 | Firm to Hard | - |
| Silt/Silty Sand | Silt with Sand ***(ML)***, Silty Sand ***(SM)*** | | 7 | 55 | 25 | 14 | 20 | Very Stiff to Hard | - |

Throughout the GBR report and Appendix B, a consistent color code has been used for each of the soil types.

## 4.4 Strata Boundaries

The geological profile provided in Appendix B illustrates the approximate location of each stratum, interpreted from the geological logs. The baseline expectation is that actual stratum boundaries should be expected to be where shown on the profile with a deviation of approximately ±1 foot at any point along the alignment.

## 4.5 Groundwater Conditions

The groundwater levels observed in borings at the time of drilling along the Washington and First Street alignments are summarized in Table 4.5-1. Groundwater levels may fluctuate due to seasonal variations such as precipitation, snowmelt, nearby river or drain levels and other factors that may not be evident at the time of measurement. During the construction, the baseline expectation is that actual groundwater levels should be expected to be as shown on the geological profile in Appendix B with a deviation of approximately ±3 at any point along the alignment.

*Table 4.5-1 Summary of Groundwater Conditions*

| Boring No. | Groundwater Depth (ft) | Groundwater Elevation (ft) |
|---|---|---|
| SB-8 | 13 | 785.9 |
| SB-9 | 30 | 781.5 |
| SB-10 | 21 | 793.4 |
| SB-11 | 20 | 792.0 |
| SB-12 | 5 | 793.4 |
| SB-101 | 8 | 792.4 |
| SB-102 | 21 | 796.3 |
| SB-103 | 16 | 776.9 |
| B-1 | 24 | 790.0 |
| B-2 | 23 | 790.0 |

The intermediate shaft in West Washington Street (Sta. 103+80) is anticipated to encounter poorly graded sand (SP), clayey sand (SC), silty sand (SM), and bottom out in lean clay (CL). The following hydraulic conductivities may be used for dewatering design (UFC/NAVFAC, 2022).

Hydraulic Conductivity

| Soil Type | Upper Bound (cm/sec) | Lower Bound (cm/sec) |
|---|---|---|
| Poorly graded Sand (SP) – coarse | $5x10^{-1}$ | $1x10^{-2}$ |
| Poorly graded Sand (SP) – fine | $5x10^{-2}$ | $5x10^{-4}$ |
| Clayey Sand (SC) | $1x10^{-3}$ | $1x10^{-6}$ |
| Silty Sand (SM) | $1x10^{-2}$ | $1x10^{-4}$ |
| Clay (CL) | $1x10^{-6}$ | $3x10^{-8}$ |

The reception shaft at the intersection of West Washington Street/North First Street (Sta. 150+70) is anticipated to encounter poorly graded sand (SP), poorly graded gravel and silty gravel (GP/GM), silty sand (SM), and bottom out in lean clay (CL). The following permeabilities may be used for dewatering design (UFC/NAVFAC, 2022).

Hydraulic Conductivity

| Soil Type | Upper Bound (cm/sec) | Lower Bound (cm/sec) |
|---|---|---|
| Poorly graded Sand (SP) – coarse | $5x10^{-1}$ | $1x10^{-2}$ |
| Poorly graded Sand (SP) – fine | $5x10^{-2}$ | $5x10^{-4}$ |
| Poorly graded Gravel (GP) | 2 | $2x10^{-1}$ |
| Silty Sand (SM) | $1x10^{-2}$ | $1x10^{-4}$ |
| Clay (CL) | $1x10^{-6}$ | $3x10^{-8}$ |

References:

Cashman, P.M. and Preene, M., 2012. Groundwater Lowering in Construction, a Practical Guide to Dewatering, Second Edition, August 6, 2012.

United Facilities Criteria (UFC) (NAVFAC), 2022. Soil Mechanics (DM 7.1) UFC 3-220-10, 2022, February 2022.

# 4.6 Anticipated Tunneling Conditions

## 4.6.1 Soft Ground Behavior Concept

This section discusses concepts used for characterizing tunnel behaviour in soft ground. Standup time and Tunnelman's ground classification provide an indication of ground behaviour that can be expected if the tunnel face is unsupported during excavation (Federal Highway Administration, 2009). These parameters often are used as guidelines in selecting suitable excavating, tunnelling, and ground support methods. They provide an indication of the potential for exposed ground instability when unsupported. An understanding of potential instability or standup time is important when selecting equipment, means, and methods for providing stability, face support, and mitigation of settlement damage risks.

## 4.6.2 Standup Time

Standup time is the approximate time available after exposure of soil in a shaft face, tunnel heading, or tunnel perimeter until significant inward soil movement (sloughing, squeezing, raveling, flowing, or collapse) occurs, causing excess lost ground or mining of a significantly larger soil volume than is being replaced by the tunnel lining system. Standup time depends on a combination of the following factors:

- Soil type.
- Soil density or degree of cementation for granular soils.
- Groundwater head, hydraulic gradients, or seepage pressure acting on the soil exposed at the face.

- Relative cohesion, overload factor, or stability number, N =γH/Su, defined as the ratio of the total vertical stress to a soil's undrained shear strength or cohesion.

Table 4.6-1 list the general ground behavior lists general ground behavior descriptions for Tunnelman's ground classifications in soil.

*Table 4.6-1 Tunnelman's Ground Classification*

| **Classification** | | **Behavior** | **Typical Soil Types** |
|---|---|---|---|
| Firm | | Heading can be advanced without initial support, and final lining can be constructed before ground starts to move. | Loess above water table; hard clay, marl, cemented sand and gravel when not highly overstressed. |
| Raveling | Slow raveling<br>---<br>Fast raveling | Chunks of flakes of material begin to drop out of the arch or walls sometime after the ground has been exposed, due to loosening or to over-stress and "brittle" fracture (ground separates or breaks along distinct surfaces, opposed to squeezing ground), In fast raveling ground, the process starts within a few minutes, otherwise the ground is slow raveling. | Residual soils or sand with small amounts of binder may be fast raveling below the water tale, slow raveling above. Stiff fissured clays may be slow or fast raveling depending upon degree of overstress. |
| Squeezing | | Ground squeezes or extrudes plastically into tunnel, without visible fracturing or loss of continuity, and without perceptible increase in water content. Ductile, plastic yield and flow due to overstress. | Ground with low frictional strength. Rate of squeeze depends on degree of overstress. Occurs at shallow to medium depth in clay of very soft to medium consistency. Stiff to hard clay under high cover may move in combination of raveling at excavation surface and squeezing at depth behind surface. |
| Running | Cohesive – running<br>---<br>Running | Granular materials without cohesion are unstable at a slope greater than their angle of repose (approx. 30° – 35°). When exposed at steeper slopes they run like granulated sugar or dune sand until the slope flattens to the angle of repose. | Clean, dry granular materials. Apparent cohesion in moist sand, or weak cementation in any granular soil may allow the material to stand for a brief period of time before it breaks down and runs. Such behavior is cohesive running. |
| Flowing | | A mixture of soil and water flows into the tunnel like a viscous fluid. The material can enter the tunnel from the invert as well as from the face, crown, and walls, and can flow for great distances, completely filing the tunnel in some cases. | Below the water table in silt, sand, or gravel without enough clay content to give significant cohesion and plasticity. May also occur in highly sensitive clay when such material is disturbed. |

| | | |
|---|---|---|
| Swelling | Ground absorbs water, increases in volume, and expands slowly into the tunnel. | Highly preconsolidated clay with plasticity index in excess of about 30, generally containing significant percentages of montmorillonite. |

Standup time is of most concern before adequate ground support is applied to the exposed soil. Combinations of the following may provide ground support during tunnelling:

- Ground improvement ahead of the tunnel.
- Pressure exerted on the cut soil at the heading by slurry or remolded soil during slurry shield or earth pressure balance tunneling.
- Heading resistance by closed doors of a TBM cutterhead or breasting in a shield when not tunneling.
- Perimeter resistance by the tunnel shield and casing pipe.
- Perimeter pressure from bentonite lubricant injected into the overcut annulus for lubrication and ground stabilization with pipe jacking.
- Perimeter resistance by the initial tunnel lining (pipe, precast concrete segments, liner plate, ribs and lagging, timber sets, etc.).
- Perimeter resistance by grout and the lining after contact grouting or after tail gap grouting associated with precast concrete segment lining installation

### 4.6.3 Ground Conditions

Both the Washington and First Street alignments will traverse three different soil types including sand with fines, clay, and silt/sandy silt either fully or in combination. Based on the soil profile presented in Appendix B the tunnel alignment is delineated into zones where ground conditions and behavior are anticipated to be different (see Table 4.6-2).

Table 4.6-2 Represents the soil types, corresponding stations, average SPT-N values, relative density/stiffness which are anticipated to be encountered along the tunnel alignment, and Tunnelman's classification of anticipated ground.

*Table 4.6-2 Anticipated Ground Condition along the Tunnel Alignment*

| Zones | Station | | Soil Type | SPT-N Value | | | | | Relative Stiffness | Tunnelman's Classification |
|---|---|---|---|---|---|---|---|---|---|---|
| | From | To | | Min | Max | Avg. | Sdev.S | Count. | | |
| 1 | 100+50 | 103+60 | Sand with Fines | 4 | 19.0 | 10.3 | 6.7 | 7.0 | Very Loose to medium Dense | Fast Raveling/Flowing |
| 2 | 103+60 | 105+70 | Sand with Fines | 9 | 18.0 | 14.0 | 4.6 | 3.0 | Loose to Medium Dense | Fast Raveling/Flowing |
| | | | Clay | 18 | 32.0 | 25.3 | 7.0 | 3.0 | Very Stiff to Hard | Squeezing |
| 3 | 150+70 | 151+69 | Clay | 26 | 32.0 | 29.0 | 4.2 | 2.0 | Very Stiff to Hard | Squeezing |
| 4 | 151+69 | 153+57 | Clay | 10 | 32.0 | 23.5 | 9.4 | 4.0 | Stiff to Hard | Squeezing |
| | | | Silt/ Sandy Silt | 16.0 | 20.0 | 18.0 | 2.8 | 2.0 | Very Stiff | Slow Raveling |
| 5 | 153+57 | 155+02 | Silt/ Sandy Silt | 16.0 | 25.0 | 21.2 | 3.6 | 5.0 | Very Stiff | Slow Raveling |
| 6 | 155+02 | 155+90 | Sand with Fines | 13.0 | 13.0 | 13.0 | 0.0 | 1.0 | Medium Dense | Fast Raveling/Flowing |
| | | | Silt/ Sandy Silt | 21.0 | 25.0 | 23.3 | 2.1 | 3.0 | Very Stiff | Slow Raveling |
| | | | Clay | 15.0 | 27.0 | 21.0 | 8.5 | 2.0 | Stiff to Very Stiff | Squeezing |
| 7 | 155+90 | 158+75 | Silt/ Sandy Silt | 55.0 | 59.0 | 56.3 | 2.3 | 3.0 | Hard | Slow Raveling |
| 8 | 158+75 | 160+29 | Silt/ Sandy Silt | 18-50/5" | 19-50/5" | - | - | - | Very Stiff to Hard | Slow Raveling |
| | | | Clay | 33.0 | 33.0 | 33.0 | 0.0 | 1.0 | Hard | Squeezing |
| 9 | 160+29 | 160+98 | Clay | 26.0 | 33.0 | 29.5 | 4.9 | 2.0 | Very Stiff to Hard | Squeezing |
| | | | Sand with Fines | 5 | 52 | 32 | 24.3 | 3 | Loose to Very Dense | Fast Raveling/Flowing |
| 10 | 160+98 | 161+25 | Sand with Fines | 5 | 52 | 32 | 24.3 | 3 | Loose to Very Dense | Fast Raveling/Flowing |

**NOTES:** The ending station of Zone 2 at 105+70 is equal to the starting station of Zone 3 at 150+70. This change happens due to the 90-degree turn at the intersection of First and Washington Streets.

To evaluate the relative stiffness of the ground along the tunnel alignment and determine Tunnelman's classification, Standard Penetration Test (SPT-N) values were utilized. Where possible, three or more SPT-N values were considered for each assessment location: one at tunnel level, one above, and one below. In cases where this distribution was not available, the nearest available SPT-N value was used to represent the ground conditions. Where refusal was recorded during the SPT, it was interpreted as an indication of very stiff to hard ground conditions, consistent with standard geotechnical practice.



Based on geotechnical investigation results, it is anticipated that the entire tunnel alignment will be below the groundwater table except for the northernmost approximately 300 feet of the First Street alignment where the groundwater table will be between the tunnel crown and invert. According to the Tunnelman's Ground Classification System, the presence of groundwater significantly impacts the behavior of the ground:

- Above Groundwater Table – Hard clay, Cemented Sand, and Gravel are expected to act as firm ground when not highly overstressed while residual soils or sand with small amounts of binder may be slow raveling. Sand with low density may be fast ravelling to running.
- Below Groundwater Table - Residual soils or sand with small amounts of binder may be fast raveling. Granular soils with no fines will be flowing. Stiff Fissured Clays may be slow or fast raveling depending upon degree of overstress. Granular soils such as gravel with no fines will be flowing.

## 4.7 Anticipated Shaft Conditions

The following contains an assessment of Tunnelman's Ground Classifications for the expected strata found at the two launch shafts, two intermediate shafts, and one reception shaft. The stated classifications provide an expectation of ground behavior, assuming ground improvement measures are not used to improve standup time of the ground, unless stated otherwise. It is noted that the Contractor is required to dewater or otherwise improve the ground as required by the Contract Documents.

### 4.7.1 Launch Shaft at Sta. 100+47

Ground Conditions that are anticipated to be encountered and corresponding ground classification are summarized below:

- **Fill Material:** Extends about 7 feet from the ground surface to approximately elevation 792 feet. Fill material primarily consists of poorly graded sand with clay, with SPT N-values ranging from 3 to 8, indicating a very loose to loose consistency. In this zone five poor sample recovery recorded potentially due to the presence of coarse gravel and cobbles. Fill layer is expected to behave as raveling to running ground.

- **Sand Layer**: From a depth of 7 feet to below the shaft invert, reaching approximately elevation 780 feet, the subsurface consists of poorly graded sand with trace silt. From the top of the layer to about 13 feet, frequent lenses of fibrous peat were observed. At the depth of the tunnel the SPT N-values range from 4 to 8, also indicating a very loose to loose consistency. Sand layer is anticipated to behave as flowing and running ground.

### 4.7.2 Intermediate Shaft at Sta. 103+80

Expected subsurface conditions at this location and corresponding ground classification are summarized below:



- **Fill Material**: Extends from the surface to a depth of approximately 4 feet (approximately elevation 800 feet). The fill comprises poorly graded sand with silt and gravel, exhibiting an SPT N-value of 10, indicative of loose relative density. Fill layer is expected to behave as raveling to running ground.
- **Sand Layer**: From about 4 feet to 22 feet deep (elevation 782 feet), the subsurface consists predominantly of poorly graded sand with silt and gravel. SPT N-values range from 6 to 18, indicating loose to medium-dense conditions. In this zone one poor sample recovery was recorded potentially due to the presence of coarse gravel and cobbles. Sand layer is anticipated to behave as flowing and running ground.
- **Clay Layer**: From about 22 feet to below expected shaft invert at about 23 feet deep (approximately elevation 780 feet), the material transitions to lean clay with SPT N-value of 9 near to the shaft invert, and 18 and 21 below invert, indicating potential stiff to very stiff consistency. Clay layer is expected to behave as firm to squeezing.

### 4.7.3 Reception Shaft at Sta. 150+70

The shaft is located at the intersection of Washington and First Street, just prior to the tunnel's redirection onto First Street, at Station 150+70. Expected subsurface conditions at this site and associated ground classification are summarized below:

- **Fill Material**: Extends to a depth of approximately 3 feet (elevation 812 feet), consisting of poorly graded sand with silt and gravel. SPT N-values range from 11 to 30, indicating medium-dense conditions. Fill layer is expected to behave as raveling to running ground.
- **Sand Layer**: From about 3 feet to about 13 feet deep (approximately elevation 802 feet), the subsurface remains primarily poorly graded sand with silt and gravel. SPT N-values range from 29 to 35, indicating medium-dense to dense conditions. In this soil layer poor sample recovery was recorded potentially due to the presence of coarse gravel and cobbles. Sand layer is anticipated to behave as slow raveling ground.
- **Gravel Layer**: From about 13 feet to about 24 feet deep (approximately elevation 791 feet), the material changes to poorly graded gravel with silt and sand with occasional cobbles. SPT N-values range from 28 to 50, indicating medium-dense to dense conditions. Gravel layer is expected to behave as firm to running ground.
- **Sand Layer**: From about 24 feet to about 31 feet deep (approximately elevation 783 feet), the subsurface reverts to poorly graded sand with silt and gravel. SPT N-values range from 23 to 45, again indicating medium-dense to dense conditions. Sand layer is anticipated to behave as firm to flowing ground.
- **Clay Layer**: From approximately 31 feet to just below shaft invert at about 34 feet deep (approximately elevation 780 feet), lean clay is encountered with SPT N-values between 12 and

14, suggesting stiff ground conditions. Clay layer is expected to behave as firm to slow raveling ground.

- **Silt Layer**: At approximately 34 feet deep the ground is expected to change to silt with SPT N-Values ranging from 19 to 27 suggesting, indicating very stiff conditions. The silt layer is expected to behave as firm to slow raveling ground.

### 4.7.4 Intermediate Shaft at Sta. 155+45

This intermediate shaft is located along First Street at station 155+45. Expected ground conditions at this shaft location and Tunnelman's Ground Classification are summarized below:

- **Fill Material**: Extends to a depth of approximately 6 feet (elevation 808), consisting silty and clayey sand with trace of gravel. SPT N-values range from 4 to 12, indicating loose to medium dense conditions. Fill layer is expected to behave as raveling to running ground.
- **Sand Layer**: From 6 feet to 12 feet deep (elevation 802 feet), the subsurface composed of sand with trace silt and gravel. SPT N-values range from 12 to 53, indicating dense to very dense conditions. Sand layer is anticipated to behave as firm ground.
- **Gravel Layer**: From 12 feet to 23 feet deep (elevation 791 feet), the material changes to gravel and sand with trace silt. SPT N-values range from 69 to 84, indicating very dense conditions. Gravel layer is expected to behave as firm to slow raveling ground.
- **Clay Layer**: From 23 feet to 30 feet deep (elevation 784 feet), the subsurface composed of silty clay with trace sand and gravel. SPT N-values is 15, indicating stiff conditions. The clay layer is expected to behave as squeezing to slow raveling ground.
- **Silty/Sandy Silt Layer**: From 30 feet to 35 feet deep (elevation 779 feet), the subsurface composed of silt with trace clay and sand. SPT N-values range from 21 to 25, indicating very stiff conditions. Silt and Sandy Silt layer is expected to behave as flowing to raveling ground.
- **Clay Layer**: From 35 feet to 38 feet deep (elevation 776 feet), the subsurface composed of silty clay with trace sand and gravel with the closest SPT N-values indicating very stiff conditions. Clay layer is expected to behave as slow raveling to squeezing ground.

### 4.7.5 Launch Shaft at Sta. 161+30

Ground conditions that are anticipated to be encountered at the launch Shaft and corresponding ground classifications are summarized below:

- **Fill Material:** Extending from the surface to a depth of approximately 7 feet (elevation 786 feet), the fill consists primarily of poorly graded sand with silt and gravel. An SPT N-value of 8 indicates the material is in a loose state. In this soil layer, three poor sample recovery was recorded

potentially due to the presence of coarse gravel and cobbles. Fill layer is expected to behave as raveling to running ground.

- **Clay Layer:** Between 7 feet and 8 feet deep (elevation 785 feet), the subsurface is predominantly lean clay. The SPT N-value of 7 suggests a firm consistency. Clay layer is expected to behave as firm ground.
- **Sand Layer:** From 8 feet to 10 feet (elevation 783 feet), the material transitions to sand with trace amounts of silt and gravel. The SPT N-value of 8 indicates loose soil conditions. Sand Layer is expected to behave as raveling to running ground.

- **Clay Layer**: Between 10 feet and 14 feet (elevation 779 feet), the subsurface returns to lean clay, with an SPT N-value of 26, signifying a very stiff condition. Clay layer is expected to behave as firm ground.

- **Sand Layer:** From 14 feet to 21 feet (elevation 772 feet), the soil comprises a mixture of poorly graded sand with clay and gravel, as well as clayey sand. SPT N-values range from 5 to 52, indicating loose to very dense conditions. Sand layer is expected to behave as raveling ground.

# 5 SHAFT CONSTRUCTION CONSIDERATIONS

## 5.1 Shaft Geometry

The specifications allow for the Contractor to select the size and shape of the shaft excavations subject to the limitations shown on the Drawings and the requirements stated in the Specifications. All shafts must be able to accommodate the permanent structures required inside each shaft and must be able to accommodate the requirements for excavation, groundwater control, and tunneling operations.

While launch and reception shaft locations have been assumed as denoted on the Drawings, the Specifications allow the Contractor's to determine which of the shafts will serve as the actual launch and reception shafts subject to constraints and limitations stated in the Specifications or shown on the Drawings. The descriptions herein are based on the assumed locations for the launch and reception shafts as shown on the Drawings. If the Contractor elects to swap the two shafts at any crossing location or change shaft sizes and/or depths from those shown on the Drawings, consideration should be given to the potential for impacts associated with different shaft dimensions from those assumed herein.

## 5.2 Shaft Excavation Support Systems

The Specifications provide for the Contractor to select and design excavation support systems for the launch, intermediate, and reception shaft excavations consistent with the Contractor's selected means and methods of shaft construction. The design and construction must minimize the potential for ground loss and settlement around the shaft excavations and protect adjacent structures consistent with Specification requirements. Anticipated subsurface conditions at the shaft locations were described above in *Section 4.7*, and can be seen in Appendix B.

Acceptable support of excavation methods are described in the sub-sections following, including Method 1 for Secant Piles, Method 2 for Sheet Piles, Method 3 for Caisson Sinking, and Method 4 for Soldier Pile and Lagging with dewatering. Method 4 is intended only for locations where penetrations through the shaft shoring for existing utilities make Methods 1 through 3 infeasible.

### 5.2.1 Method 1 - Secant Piles

A circular shaft excavation geometry is preferred for this methodology, although a rectangular shaft could be constructed as well with secant piles. The method involves blind drilling holes that may be approximately three feet in diameter to a predetermined depth below invert level and then filling the holes with concrete. In the first phase of installation every other secant pile (primary pile) is installed. The spacing between these holes is set so that when the remaining holes are drilled, they will overlap with the primary holes to create a contiguous structure.

This method is expected to be a viable option for the shafts because it provides pre-support of the excavation which is favorable in the silt, clay, silty sand, and clayey sand ground conditions expected for significant portions in each shaft. This method also provides a watertight structure.

### 5.2.2 Method 2 - Sheet Piles

Sheet pile shafts are constructed by driving prefabricated steel sections into the ground typically through percussive or vibratory methods. Each steel section interlocks with the previously installed sheet pile to form the sheet pile wall. Some of the required shaft depths are within the typical depth range for which sheet pile installation is suitable, however for deep excavations, bracing is often required, and splices may be needed to connect sheets. One concern relative to the use of sheet piles is the potential for encountering obstructions such as coarse gravel or cobbles during driving of the sheet piles. Also, if present, obstructions such as boulders have the potential to bend the piles and cause split interlocks, either of which would allow instability, lost ground, and settlement to develop.

This method is a viable support option for the shafts, but it should be noted that gravels were encountered in the fill layer during the geotechnical investigation.

### 5.2.3 Method 3 - Caisson Sinking

Caisson sinking involves installing sections of the shaft ring in stages and allowing the shaft to sink while soil is excavated from within the shaft. The caisson is sunk by either self-weight of the shaft rings, or by applying vertical force to the shaft through the use of hydraulic jacks or other means. The leading (cutting) edge of the shaft is usually beveled and slightly larger than the shaft diameter to allow for easier sinking. Caisson sinking is often performed in the wet in that water levels within the shaft are kept at a similar elevation to the ground water table to balance uplift forces in the soil at the bottom of the shaft. Once the shaft is excavated to the required depth, a tremie plug is poured to provide uplift resistance and a working surface before water is finally removed from the inside of the shaft. It is expected that caissons will need to be constructed in the wet to prevent uplift and heave in the soil at the bottom of the shaft as it is advanced.

Caisson sinking is expected to be a viable shaft construction method for the shafts, although the Contractor needs to give special consideration to the ground and groundwater characteristics. The Contractor will need to carefully consider any overcut with respect to potentially inducing settlements that could exceed the threshold limits for horizontal and vertical ground movement described in the project specifications.

### 5.2.4 Soldier Pile and Lagging

Soldier piles and lagging shoring types are only intended for use on this project at locations where penetrations through the shaft shoring for existing utilities make Methods 1 through 3 infeasible. External dewatering will be required with the use of soldier pile and lagging shoring methods.

Typically, steel H-piles are drilled or driven at regular intervals along the perimeter of a shaft. If refusal is encountered, the piles can be offset and re-driven. Lagging consisting of wood, steel sheets, shotcrete, or precast concrete panels is inserted behind the front pile flanges as the excavation proceeds. The lagging effectively resists the load of the retained ground and transfers load to the vertical piles. The walls can be designed as cantilever walls but are frequently designed with internal bracing in the form of walers or external bracing in the form of tiebacks. A drawback to this method is that the ground must be exposed between the time of excavation and placing lagging unless steel sheets are used that slide down as the excavation is advanced.

## 5.3 Entry and Exit Portals (Tunnel Eyes)

Excessive ground loss and instability of the excavation are possible at the entry and exit portals without appropriate measures in place. A mechanical seal is required at the entry and exit portals to prevent ingress of groundwater and lost ground as the tunnelling equipment is advanced through the shaft support. In addition, localized ground support (portal stabilization) using ground improvement or other acceptable means immediately outside of the shaft support is also required to prevent water and soil from entering the excavation, which would result in voids and settlement around the shaft. The specifications require the Contractor to implement measures, consistent with its selected means and methods, to prevent groundwater infiltration and ground loss at entry and exit portals.

# 6 TUNNEL CONSTRUCTION CONSIDERATIONS

## 6.1 Microtunneling

In microtunneling, a Microtunnel Boring Machine (MTBM) is employed to excavate the ground at the front of the machine while simultaneously jacking the pipe (casing) behind it. This method utilizes a pressurized face tunneling technique in which slurry is circulated to the machine's face to balance ground and groundwater pressures and to remove spoils. The MTBM is remotely controlled from the surface, achieving tight line and grade accuracy within +/- 1 inch in typical installations. Microtunneling is effective in both rock and soil conditions, with maximum drive lengths of 3,300 feet or more, depending on ground conditions, equipment, diameter and other factors. The process requires a launch shaft for jacking the pipe using a jacking frame and a reception shaft for receiving the tunneling equipment.

Given its capability to operate below the groundwater table in both soil and rock, microtunneling is considered a feasible method and is the only trenchless method allowed by the Specifications for the project. Additionally, the pressurized face significantly reduces the risk of settlement compared to other tunneling methods.

# 7 INSTRUMENTATION AND MONITORING AND PROTECTION OF EXISTING STRUCTURES

## 7.1 Protection of Structures

The Contractor is required to design and execute the work in a manner that protects property along the tunnel alignments and in the vicinities of the shaft and structure locations from damage due to ground movements and construction-related vibrations. Structures of concern include nearby buildings, streets, highways, foundations, and subsurface utilities. The potential for damage to structures and facilities in proximity to shafts and the tunnel alignment can be minimized by:

- Selection of a tunnelling method that minimizes the risk of ground loss around the tunnel and shafts and limits both settlement and heave at the ground surface.
- Proper control of groundwater pressures at the tunnel face.
- Proper and timely installation of jacking pipe, and/or excavation support, including proper and complete grouting of the annular space around the installed support, which will aid in mitigating the potential for lost ground and ground settlement
- Investigation of groundwater and soil conditions around or in advance of excavations by probing at selected locations and performing pre-excavation grouting where required. Dewatering may also be considered by the Contractor.



- Proper design and construction of sealed excavation support systems where required.
- Designing appropriate control of water and excavation support systems at other locations.
- Performing the work as described in the Specifications, shown on the Drawings, and, where applicable, as designed by the Contractor.
- Stable excavation support and ground improvement, as needed, at launch and reception portals including the use of launch and reception seals where required
- Timely installation of geotechnical instrumentation as required by the Specifications and Drawings (refer to following section) and subsequent monitoring of groundwater levels and ground movements, as well as movements of structures and utilities, at a frequency as specified to the on-going work to allow prompt remedial action if necessary

It is likely that settlements in excess of limits allowed by the specifications will develop if adequate ground and groundwater control measures and care are not employed. The Contractor's shaft support designer and microtunneling designer should consider excavation support system stiffness, shape, excavation and installation methods, surcharge loads, and expected ground and groundwater conditions when designing excavation support systems and tunnelling system to limit ground movements and meet ground movement limits.

## 7.2 Geotechnical Instrumentation

The Contractor is required to install and monitor various forms of instrumentation along the trenchless excavation alignments and at launch, intermediate and reception shafts, as shown on the Drawings, to monitor ground movements induced by excavation activities. Specific types of instruments for monitoring and requirements for installation and monitoring are described in the Specifications and shown in the Drawings. Instrumentation is to be installed prior to any excavation activities taking place to establish baseline measurements, monitored continuously throughout construction, and monitored upon completion to establish post-construction measurements for the instruments.

Measurements obtained should be compared against threshold values provided in the Specifications and increased monitoring frequency may be required if surface deformations appear or threshold values are reached. If ground movements meet or exceed the specified limits, the Contractor must promptly implement remedial measures in accordance with the Specifications to minimize damage to adjacent facilities and notify all required parties. Remedial measures may include modification of tunnel, shaft and structure excavation methods and excavation support, modification of control of water methods, and implementation of ground.

# 8 CLOSURE

This report has been prepared for The City of Ann Arbor and their agents. The City of Arbor shall at all times be entitled to fully use and rely on this report, including all attachments, drawings, and schedules, for the specific purpose for which the report was prepared, in each case notwithstanding any provision, disclaimer, or waiver in the report that reliance is not permitted.

The City of Arbor shall at all times be entitled to provide copies of the report to City Council, City of Ann Arbor regulatory boards, City of Ann Arbor employees, officers, agents, affiliates, advisors, consultants, parties contracting with The City of Arbor, lenders and assignees and other governmental authorities and regulatory bodies having jurisdiction, each of whom shall also be similarly entitled to fully use and rely on the report in the same manner and to the same extent as The City of Calgary for the specific purpose for which the report was prepared.

No other third party may use or rely on this report without the express written consent of Stantec and the City of Ann Arbor. Any use of or reliance on this report by a party that is not expressly permitted pursuant to the foregoing paragraphs is the sole responsibility of such party. The Statement of General Conditions are provided in Appendix A. It is the responsibility of The City of Ann Arbor, who is identified as “the Client” within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec should any of these not be satisfied. The Statement of General Conditions addresses the following:

- Purpose of this report
- Basis of the report
- Standard of care
- Interpretation of site conditions
- Varying or unexpected site conditions
- Planning, design or construction

**STANTEC CONSULTING LTD.**




Digitally signed by Fradkin, Steve
DN: CN="Fradkin, Steve", OU=Internal, OU=users, OU=stantec, DC=corp, DC=ads
Date: 2025.09.17 19:15:16-04'00'

**Albert D. Ruiz**, PE
Principal, Tunnel Practice
Tel: (602) 245-6067
albert.ruiz@stantec.com

**Steve Fradkin**, PG
Senior Principal, Tunnel Practice Leader
Tel: (262) 422-3264
steve.fradkin@stantec.com

# **Appendix A** Statement of General Conditions

Stantec

PURPOSE OF THE REPORT: This report has been prepared to provide information for design and construction of the proposed water forcemain as detailed in the project understanding section of the report. The soil parameters and design recommendations have been provided based on our understanding of the development and nature of the construction. Any use of or reliance on this report by any party for a development that varies in nature from this project is the sole responsibility of such party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec's present understanding of the site-specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behaviour. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec will not be responsible to any party for damages incurred as a result of failing to notify Stantec that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec cannot be responsible for site work carried out without being present.

# **Appendix B** Geologic Profile

# WASHINGTON STREET

09-09-29-213-018
ANN ARBOR YMCA
400 W WASHINGTON ST.
ANN ARBOR, MI 48104

09-09-29-213-004
WATCO (AA RAILROAD)
4058 CHRYSLER DR.
TOLEDO, OH, 43608

09-09-29-213-017
REAL INV NO 9 LTD
311 W HURON ST.
ANN ARBOR, MI 48103

09-09-29-213-012
SOUTH FIRST ASSOC
120 S FIRST ST.
ANN ARBOR, MI 48103

09-09-29-211-003
CITY OF ANN ARBOR
415 W WASHINGTON ST.
ANN ARBOR, MI 48104

09-09-29-211-002
WATCO (AA RAILROAD)
4058 CHRYSLER DR.
TOLEDO, OH, 43608

09-09-29-211-001
WF 301, LLC
301 W WASHINGTON ST.
ANN ARBOR, MI 48104

SB-12

SB-101

STA. 105+00

## LEGEND

| MAJOR DIVISIONS | | | | TYPICAL NAMES |
|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE | CLEAN GRAVELS WITH LESS THAN 15% FINES | GW | WELL-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | | GP | POORLY-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | GRAVELS WITH 15% OR MORE FINES | GM | SILTY GRAVELS WITH OR WITHOUT SAND |
| | | | GC | CLAYEY GRAVELS WITH OR WITHOUT SAND |
| | SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LESS THAN 15% FINES | SW | WELL-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP | POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP-SM | POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL |
| | | SANDS WITH 15% OR MORE FINES | SM | SILTY SANDS WITH OR WITHOUT GRAVEL |
| | | | SC | CLAYEY SANDS WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OL | ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OH | ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| HIGHLY ORGANIC SOILS | | | PT/OL | PEAT AND OTHER HIGHLY ORGANIC SOILS |

## LEGEND

- FILL
- CLAY
- SAND WITH FINES
- SILT/SANDY SILT
- GRAVEL WITH SAND AND FINES

SB-12 (7.7' L OFFSET)

SB-101 (~4' L OFFSET)

EXISTING GRADE AT SANITARY

EX FO

| | |
|---|---|
| 799.78 | 100+00 |
| 799.44 | +25 |
| 799.21 | +50 |
| 798.85 | +75 |
| 798.66 | 101+00 |
| 798.58 | +25 |
| 798.68 | +50 |
| 798.70 | +75 |
| 798.60 | 102+00 |
| 798.55 | +25 |
| 798.77 | +50 |
| 799.03 | +75 |
| 799.63 | 103+00 |
| 800.30 | +25 |
| 801.81 | +50 |
| 803.33 | +75 |
| 804.98 | 104+00 |
| 806.67 | +25 |
| 808.39 | +50 |
| 810.07 | +75 |
| 811.70 | 105+00 |
| 813.18 | +25 |
| 814.21 | +50 |

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HIGH-LEVEL TRUNKLINE CAPACITY IMPROVEMENTS
WASHINGTON STREET

FIGURE 1

SCALE PLAN: 1" = 20'
PROFILE: 1" = 4'

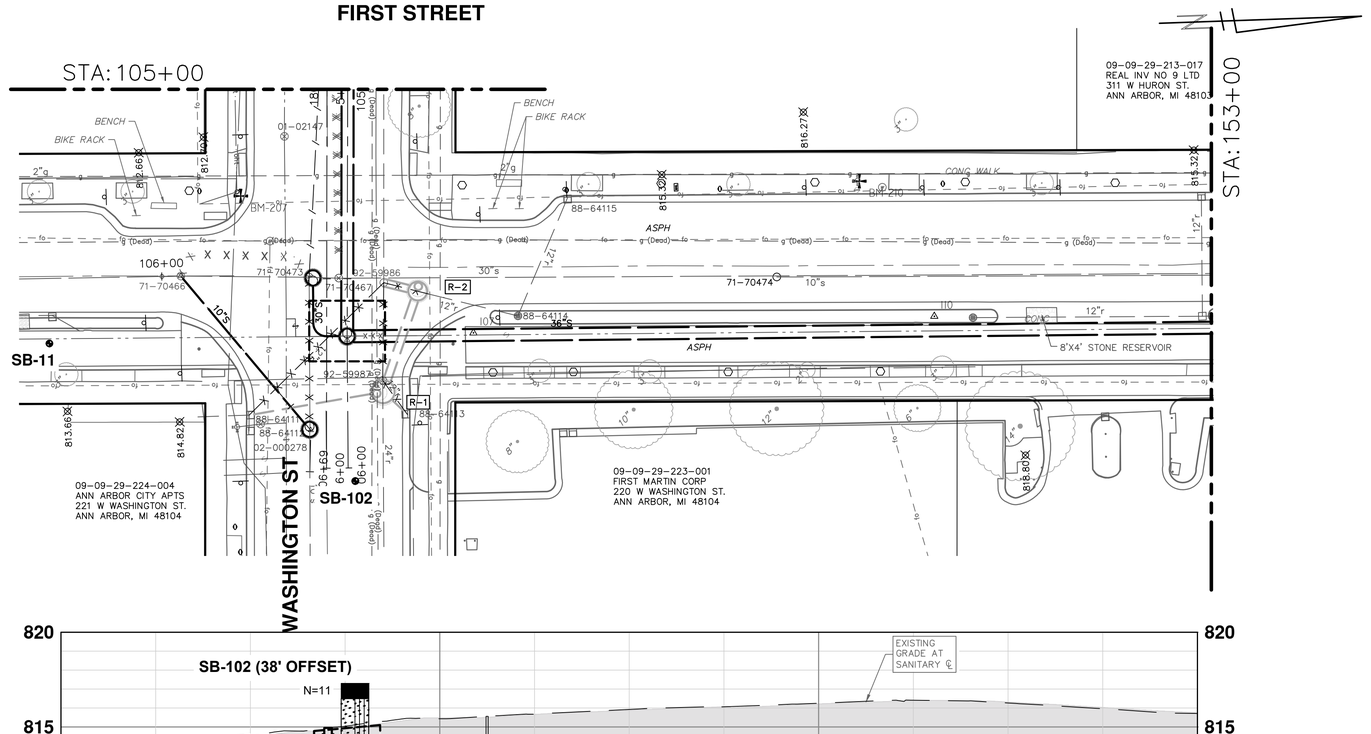
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0028-24-0010-25

SHEET No.
1 OF 4

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# FIRST STREET




## LEGEND

- FILL
- CLAY
- SAND WITH FINES
- SILT/SANDY SILT
- GRAVEL WITH SAND AND FINES

| MAJOR DIVISIONS | | | | TYPICAL NAMES |
|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE | CLEAN GRAVELS WITH LESS THAN 15% FINES | GW | WELL-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | | GP | POORLY-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | GRAVELS WITH 15% OR MORE FINES | GM | SILTY GRAVELS WITH OR WITHOUT SAND |
| | | | GC | CLAYEY GRAVELS WITH OR WITHOUT SAND |
| | SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LESS THAN 15% FINES | SW | WELL-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP | POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | SANDS WITH 15% OR MORE FINES | SP-SM | POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL |
| | | | SM | SILTY SANDS WITH OR WITHOUT GRAVEL |
| | | | SC | CLAYEY SANDS WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OL | ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OH | ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| HIGHLY ORGANIC SOILS | | | PT/OL | PEAT AND OTHER HIGHLY ORGANIC SOILS |





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FIRST STREET

FIGURE 2

SCALE PLAN: ######## PROFILE: 1" = 4'

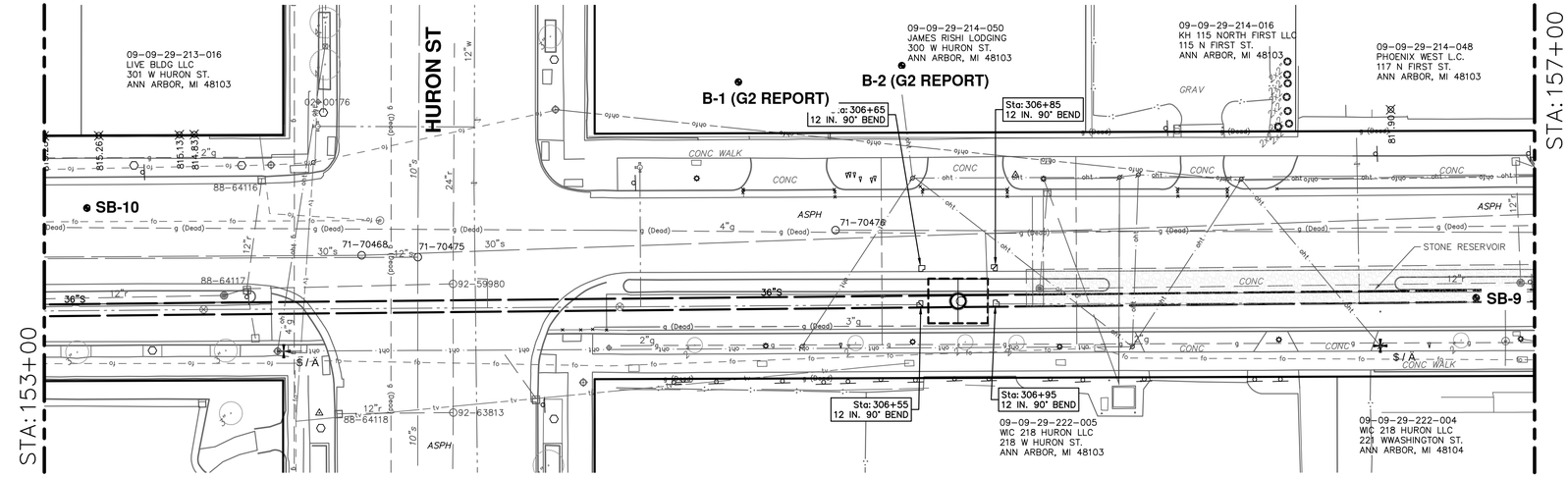
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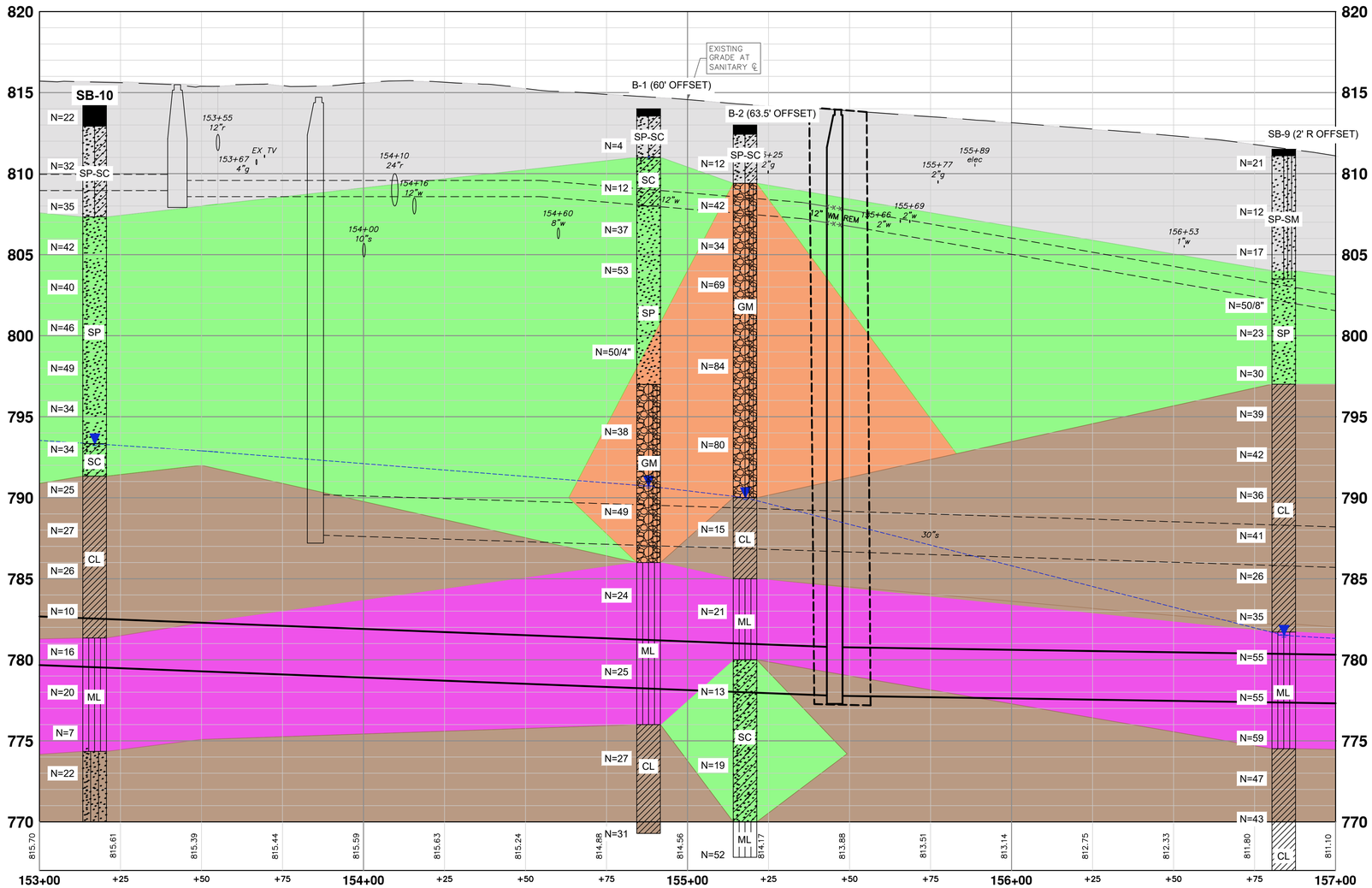
SHEET No. 2 OF 4

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## LEGEND

- FILL
- CLAY
- SAND WITH FINES
- SILT/SANDY SILT
- GRAVEL WITH SAND AND FINES

| MAJOR DIVISIONS | | | | TYPICAL NAMES |
|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS LARGER THAN NO. 200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE | CLEAN GRAVELS WITH LESS THAN 15% FINES | GW | WELL-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | | GP | POORLY-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | GRAVELS WITH 15% OR MORE FINES | GM | SILTY GRAVELS WITH OR WITHOUT SAND |
| | | | GC | CLAYEY GRAVELS WITH OR WITHOUT SAND |
| | SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LESS THAN 15% FINES | SW | WELL-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP | POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | SANDS WITH 15% OR MORE FINES | SP-SM | POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL |
| | | | SM | SILTY SANDS WITH OR WITHOUT GRAVEL |
| | | | SC | CLAYEY SANDS WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OL | ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OH | ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| HIGHLY ORGANIC SOILS | | | PT/OL | PEAT AND OTHER HIGHLY ORGANIC SOILS |

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FIRST STREET

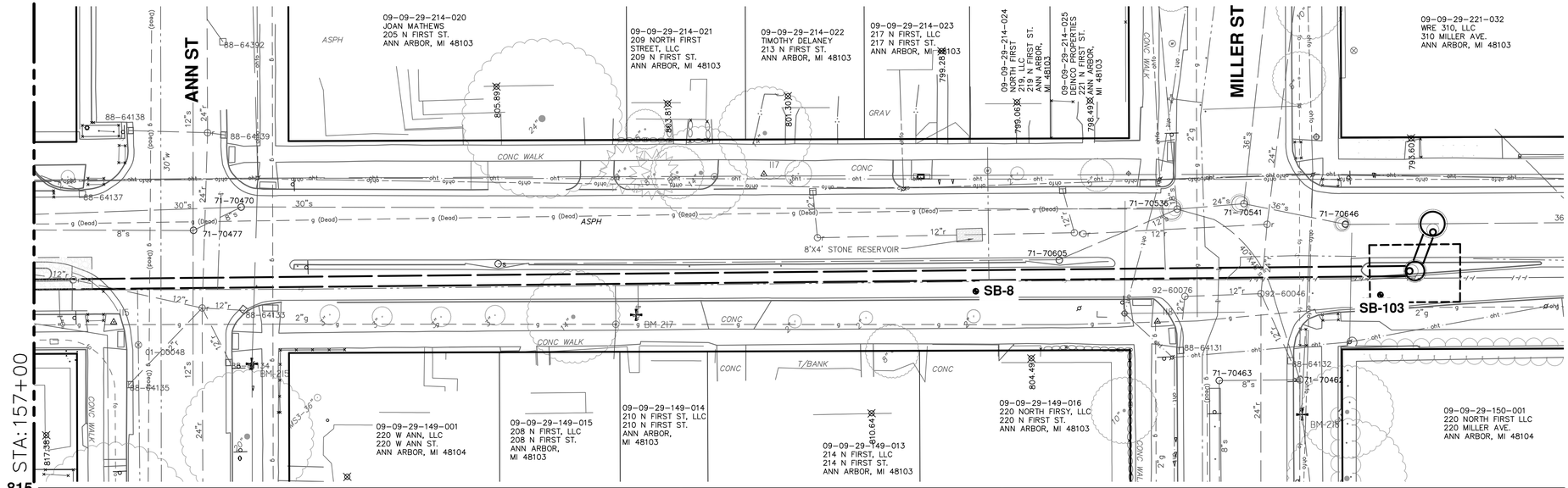
FIGURE 3

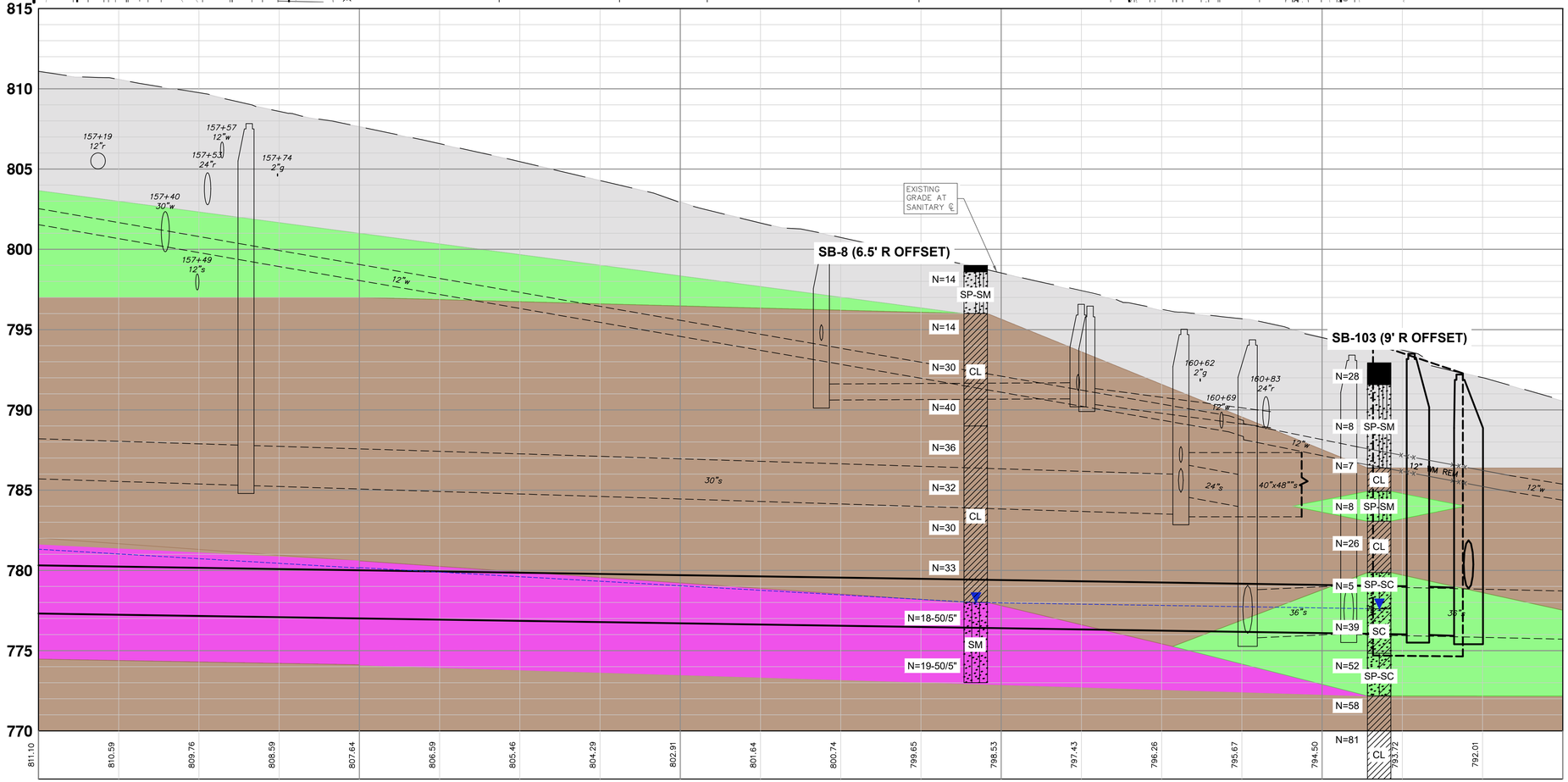
SCALE PLAN: 1" = 20' PROFILE: 1" = 4'

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SHEET No. 3 OF 4

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## LEGEND

- FILL
- CLAY
- SAND WITH FINES
- SILT/SANDY SILT
- GRAVEL WITH SAND AND FINES

| MAJOR DIVISIONS | | | | TYPICAL NAMES |
|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE | CLEAN GRAVELS WITH LESS THAN 15% FINES | GW | WELL-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | | GP | POORLY-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | GRAVELS WITH 15% OR MORE FINES | GM | SILTY GRAVELS WITH OR WITHOUT SAND |
| | | | GC | CLAYEY GRAVELS WITH OR WITHOUT SAND |
| | SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LESS THAN 15% FINES | SW | WELL-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP | POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | SANDS WITH 15% OR MORE FINES | SP-SM | POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL |
| | | | SM | SILTY SANDS WITH OR WITHOUT GRAVEL |
| | | | SC | CLAYEY SANDS WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OL | ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OH | ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| HIGHLY ORGANIC SOILS | | | PT/OL | PEAT AND OTHER HIGHLY ORGANIC SOILS |

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FIRST STREET

FIGURE 4

SCALE PLAN: 1" = 20' PROFILE: 1" = 4'

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SHEET No. 4 OF 4

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# **Appendix C** Preliminary Geotechnical Report Miller-Chapin Sanitary Relief Sewer

April 9, 2024
Project No. 241082R

OHM Advisors
355 South Zeeb Road, Suite A
Ann Arbor, MI 48103

Attention: Chris Elenbaas, P.E.

Reference: Preliminary Geotechnical Report
Miller-Chapin Sanitary Relief Sewer
Ann Arbor, Michigan

Dear Mr. Elenbaas:

We have completed a preliminary geotechnical investigation for the above-referenced project. The purpose of this investigation has been to identify the general subsurface soil conditions at select locations along two potential sewer alignments, analyze the conditions relative to the conceptual construction and to provide preliminary considerations for the installation of the new sewer. This work has been performed as described in our proposal dated February 13, 2024.

Presented herein are descriptions of our understanding of the design considerations, the geotechnical investigation, encountered conditions and preliminary engineering considerations. The Appendix contains the report limitations and data collected during this investigation.

## DESIGN CONSIDERATIONS

### Available Information

We have been provided the following documents and information for use in this investigation:

- Conceptual site plans showing the potential sewer alignments, manhole locations, invert depths and anticipated trenchless installation areas received from Mr. Chris Elenbaas, P.E. of OHM Advisors on January 4, 2024 and February 12, 2024.
- Site plans indicating the locations of existing subsurface utilities near the proposed boring locations, received from Mr. Chris Elenbaas, P.E. of OHM Advisors on January 11, 2024 and February 22, 2024
- Telephone and email conversations with Mr. Chris Elenbass, P.E. of OHM Advisors and Ms. Tracy Anderson, P.E. of the City of Ann Arbor regarding the proposed construction, soil boring locations, pipe installation methods and project considerations.

Project Description

The proposed project will consist of a new sanitary relief sewer on the west side of downtown Ann Arbor between Miller Avenue and West Washington Street. The proposed inner sewer pipe diameter will be on the order of 30 to 36 inches. Two potential alignments are being considered: one along the west side of the project site near Chapin Street and one to the east along First Street. Potential invert depths along the Chapin Street alignment generally range from 8 to 18 ft. Potential invert depths along the First Street alignment generally range from 7 to 32 ft.

A combination of open-cut and trenchless installation methods is being considered along the Chapin Street alignment, with predominantly trenchless installation considered along most of the First Street alignment. The potential alignments and anticipated trenchless installation areas are shown on the attached Boring Location Plan, Figure No. 1. The potential profile of the sewer along each alignment is shown on the attached Generalized Subsurface Profiles, Figures No. 4 and 5.

It is understood that the current design is conceptual. Additional soil borings will be required as part of a final phase geotechnical study once the alignment and invert depths have been finalized.

## INVESTIGATION METHODOLOGY

Field Investigation

Subsurface conditions were investigated by 12 conventional soil test borings. Boring depths ranged from 25 ft to 50 ft below the existing ground surface along the potential sewer alignments. Boring locations are shown on the attached plan, Figure No. 1.

One of our engineers staked the approximate boring locations in the field. Boring elevations were approximated by GPS, except for Boring SB-11 which was estimated from the 2017 contour map available in the Washtenaw County GIS database. The elevations used in this report are given in feet and are based on NAVD88 datum with boring coordinates based on the Michigan State Plane South coordinate system. If more precise location and elevation data are desired, a registered professional land surveyor should be retained to locate the borings and determine their ground elevations.

The drilling was performed using conventional hollow-stem auger methods to advance the boreholes. The boreholes were backfilled to the original ground surface with compacted soil cuttings or sealed with cement-bentonite grout, where appropriate, and patched with asphalt cold patch after drilling completion.

Soil samples were recovered at regular intervals by means of the Standard Penetration Test (SPT), ASTM D1586. The SPT test involves the use of a 140-lb hammer with a 30-inch drop

to drive a standard 2.0-inch O.D. split spoon sampler. The number of hammer blows required to drive the sampler 12 inches, after seating 6 inches, is termed the soil N-value and provides an indication of the soil's relative density and strength parameters at the sample location. SPT blow counts in 6-inch increments are recorded on the boring logs. The drill rig was equipped with an automatic hammer system which delivers a more consistent driving energy to the sampler compared to the rope and cathead system.

Recovered samples were sealed, labeled and transported to our laboratory. All soil samples will be discarded after sixty days unless a longer hold time is specifically requested.

The recovered soil samples were reviewed by an engineer and technically classified according to the methods of ASTM D2488 "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)". Estimates of the unconfined compressive strength of the cohesive samples were made using a calibrated penetrometer. A copy of the test boring logs along with a description of the terminology used on the logs and a chart of the ASTM D2488 group symbol names are provided in the Appendix.

Environmental Sampling and Testing

Each soil sample recovered from the test borings was screened with a Photoionization detector (PID) to evaluate the possible presence of Volatile Organic Compounds (VOCs). The PID detected VOCs over the 50 ppm detection limit in samples from Borings SB-3, SB-6, and SB-10. PID results are noted on the boring logs provided in the Appendix.

Composite or grab soil samples were collected from each soil boring and analyzed for VOCs, Polynuclear Aromatic Hydrocarbons (PNAs), and Michigan 10 metals. We prepared Table 1 to compare analytical soil test results to generic Michigan Department of Environment Great Lakes and Energy (EGLE) criteria. Soil contaminated with metals, PNAs and VOCs was encountered in Borings SB-2, SB-3, SB-5, SB-6, SB-10, SB-11 and SB-12. The analytical test results and comparison table are provided in the Appendix. The locations where soil samples exceeded EGLE criteria are shown on the attached plan, Figure No. 2.

Groundwater samples were collected from 8 of the test borings where groundwater was encountered in sufficient quantity to recover a sample. Where appropriate, a temporary screen point was set in the borehole below the encountered groundwater surface and a peristaltic pump was utilized to recover the groundwater samples. Groundwater samples were analyzed for VOCs, PNAs, and Michigan 10 metals. Groundwater samples were not collected from Borings SB-8, SB-9 and SB-10 because an insufficient groundwater quantity was encountered to collect a sample. In addition, PNA analysis was not performed on groundwater samples from Borings SB-1 and SB-4 because only a limited quantity of groundwater was recovered.

We prepared Table 2 to compare analytical groundwater test results to generic EGLE criteria. Groundwater contaminated with metals, PNAs and VOCs was encountered in Borings SB-1

through SB-4 and SB-6. The analytical test results and comparison table are provided in the Appendix. The locations where groundwater samples exceeded applicable EGLE criteria are shown on the attached plan, Figure No. 3.

Laboratory

Selected samples were subjected to various laboratory tests, including:

- ASTM D422 "Test Method for Particle-Size Analysis of Soils"
- ASTM D1140 "Test Methods for Determining the Amount of Material Finer than 75-μm (No. 200) Sieve in Soils by Washing"
- ASTM D2216 "Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass"
- ASTM D2974 "Test Methods for Determining the Water (Moisture) Content, Ash Content, and Organic Material of Peat and Other Organic Soils"

The samples subjected to the grain-size testing were reclassified according to ASTM D2487 procedures "Standard Test Method for Classifications of Soils for Engineering Purposes". The ASTM D2487 and D2488 classifications are included on the boring logs.

Results of the laboratory tests have been summarized in a table and on the Particle Size Distribution Reports provided in the Appendix.

## INVESTIGATION RESULTS

Regional Geology

The *Map of the Surface Formations of the Southern Peninsula of Michigan,* published by the State of Michigan, indicates the site is in an area of moraines. Soil conditions typically are found to be unsorted layers of sand, silt, and/or clay in this type of geologic area. The thickness of individual units and horizontal alignment are variable due to the direct deposition of this material from glacial ice drift. Some areas are more sorted and contain more distinct sand, silt and/or clay strata while in other areas the soil can consist of silty sand, clayey sand, etc. The *Map of Bedrock Topography of the Southern Peninsula of Michigan* indicates bedrock to be at approximately el 700, on the order of 90 to 125 ft below site grades.

Site and Subsurface Conditions

The project site consists of a thoroughly developed urban area with the potential sewer alignments running in close proximity to existing infrastructure. Much of the Chapin Street alignment follows the historic Allen Creek drain bed. Subsurface conditions along the Chapin Street alignment generally consisted of sandy urban fill over native sand and gravel, with occasional silt and clay deposits encountered near the bottom of the soil profile. The soils

encountered near the anticipated sewer invert depth generally consisted of sand and gravel with relatively few silty fines (SP, SP-SM, GP-GM).

Subsurface conditions along the First Street alignment generally consisted of sandy urban fill and native sand over a lean clay deposit. Silt and sand was generally encountered below the clay, with the exception of Boring SB-12 which encountered predominantly sandy soil with relatively few fines. The soils encountered near the anticipated sewer invert depth varied between lean clay (CL) and silt (ML) or silty sand (SM), with poorly graded sand (SP) encountered at the west end of the alignment.

Poor sampler recovery and drilling difficulty was frequently noted at various depths along both alignments. Poor sampler recovery and drilling difficulty, where noted, may be due to coarse gravel or cobble. Boulder may be present where cobble is noted. In addition, Auger refusal occurred in Boring SB-8 at a depth of 26 ft (el 772.9). Auger refusal may be due to possible coarse gravel, cobble, or boulder.

The groundwater levels encountered at each boring location are summarized in the following table. Groundwater levels may fluctuate due to seasonal variations such as precipitation, snowmelt, nearby river or drain levels and other factors that may not be evident at the time of measurement. Groundwater levels may be different at the time of construction.

*Summary of Groundwater Conditions*

| Boring No. | Groundwater Depth (ft) | Groundwater Elevation |
|---|---|---|
| SB-1 | 8.5 | 782.0 |
| SB-2 | 11.5 | 784.9 |
| SB-3 | 10 | 787.8 |
| SB-4 | 9 | 787.0 |
| SB-5 | 4.5 | 792.7 |
| SB-6 | 9.5 | 789.7 |
| SB-7 | 4.5 | 797.7 |
| SB-8 | 13 | 785.9 |
| SB-9 | 30 | 781.5 |
| SB-10 | 21 | 793.4 |
| SB-11 | 20 | 792 |
| SB-12 | 5 | 793.4 |

A graphical summary of the encountered subsurface soil and groundwater conditions is presented on the attached Generalized Soil Profiles, Figures 4 and 5. Detailed descriptions of the encountered subsurface soil and groundwater conditions are included on the boring logs provided in the Appendix.

PRELIMINARY GEOTECHNCIAL CONSIDERATIONS

Based on the results of our subsurface investigation, the primary geotechnical considerations expected to impact the project design and construction include the following:

- Construction in close proximity to existing infrastructure
- Groundwater control
- Disposal of contaminated soil and groundwater
- Dense to very dense soils with cobble and boulder
- Variable soil conditions between clay, silt and sand

A combination of Open Cut and trenchless sewer installation methods is expected along the Chapin Street alignment. We have considered Auger Bore (also known as Bore and Jack) methods will be employed to protect existing infrastructure in areas where Open Cut methods are expected to be too disruptive.

Trenchless sewer installation methods are expected along most, if not all, of the First Street alignment. Auger Bore or Microtunneling methods may be considered for this alignment.

Each sewer installation method presents inherent advantages and disadvantages. Geotechnical considerations for each method are summarized in the following sections.

Open Cut Excavation

Open Cut excavation is the most common method of utility installation. Generally, local Contractors can readily install utilities using trench boxes for supporting excavations less than 20 ft. However, trench box support may not provide sufficient earth retention in areas of close proximity to existing infrastructure such as buildings, drain crossings, utilities, or where significant surcharge loads are applied near the excavation. More significant temporary earth retention systems will likely be required in these areas or where excavation depths exceed 20 ft.

All temporary earth retention systems should be designed by qualified personnel in accordance with applicable regulatory requirements. The support and protection of all soil, structures and utilities outside of the right-of-way/contract limits and existing utilities and structures within the right-of-way limits are the responsibility of the Contractor. Considering the potentially sensitive nature of nearby structures, precautions against excessive ground vibration should be taken by the Contractor during construction. We recommend the prohibition of vibratory earth retention such as, but not limited to, steel sheet pile.

Open Cut excavation is expected to require extensive dewatering where groundwater is present at or above the pipe invert. Based on groundwater levels noted in our investigation, we anticipate the need for dewatering on the order of 5 to 15 ft for open-cut installation along the Chapin Street alignment.

General Trenchless Considerations

Auger Bore or Microtunneling methods appear to be feasible options for qualified, experienced contractors. Some risk of settlement from excess soil removal exists with any trenchless installation, particularly where the preliminary test borings encountered loose granular soils or obstructions. However, this risk can be controlled through the selection of an experienced contractor, appropriate installation procedures and implementation of a detailed monitoring plan. These measures are of particular importance where trenchless installations are planned beneath existing infrastructure such as pavements, railways, and existing utilities.

The construction monitoring plan should include full-time observation and documentation of the trenchless installation as well as continuous settlement monitoring. Appropriate alert and work stoppage levels should be developed to allow for evaluation of the root cause of settlement and implement alternative installation methods and stabilization measures as necessary.

The specific means and methods of construction including, but not limited to, selection of drilling equipment and tooling, drilling pressures and operational parameters, selection and implementation of dewatering procedures and monitoring of the crossing operations should be selected by the Contractor to complete the installations in a safe manner while protecting the integrity of the ground surface and while complying with any applicable permit requirements. Entry and exit pits will be necessary to complete the work which will be the responsibility of the Contractor to design, install and maintain.

The presence of varied soil types including transitions from clay to sand and silt may result in challenges including, but not necessarily limited to, split face drilling conditions and the possibility for perched groundwater. These factors should be considered by the Contractor, including selection of appropriate means and methods for control of these factors should they be encountered. Transitions between granular and cohesive soils will likely be encountered along the First Street alignment, while the Chapin Street alignment is expected to be maintained within primarily granular soils.

Obstructions are likely to be encountered during trenchless installations along both potential alignments where coarse gravel and cobble were noted in the boring logs. Underground voided areas may develop along the installation route if obstructions (especially boulder size) are cleared outside the crossing path. The contractor must keep track of the station where these obstructions are removed so that grouting from the ground surface into the potentially voided zone can be completed as needed. We recommend a “per unit” bid item for obstruction removal be included in bid solicitations.

Auger Bore (Bore and Jack) vs. Microtunneling Methods

Auger Bore consists of simultaneously pushing steel casing and removal of soil from the face of the lead section of casing by means of an auger which moves the soil through the casing

and into the jacking pit where it is removed. Auger Bore pits are typically constructed at manhole structures and pit spacing is generally dependent on soil conditions and pipe diameter. For the anticipated 30 to 36 inch pipe diameter, a jacking and receiving pit spacing of 350 ft is anticipated to be feasible based on conversations with specialty contractors. Larger pipe diameters may allow for increased distance between jacking and receiving pits, with reports of Auger Bore lengths of 600 ft between pits successfully accomplished in the past. Braced solider pile with wood lagging or braced sheeting are typically utilized for pit construction. Compared to Microtunneling, Auger Bore pits are generally at a closer spacing. Obstructions such as cobble or boulder may impede auger advancement or result in auger refusal. Typically, obstruction removal by hand is required. If the obstruction cannot be removed by hand, an emergency access shaft will be required to remove the obstruction.

Microtunneling initially consists of construction of launching and receiving shafts at opposite ends of the tunneling alignment. Shafts are expected to be constructed using secant augercast piles with a tremie seal at the floor of the pit for groundwater control. Following shaft installation, hydraulic jacks located within the launch shaft are used to push the microtunnel boring machine (MTBM) through the sidewall of the shaft and into the soil along the pipe alignment while the cutting head of the machine removes material. Slurry is used to cool and lubricate the cutting head while allowing material to be transported to the surface. The MTBM is remotely controlled with a guidance system to provide line and grade control.

Greater spacing between access pits is possible when compared to Auger Bore installation. Contractors indicate a spacing of 500 to 700 ft between shafts to be reasonable considering a 30-inch sewer. The use of a 46-inch carrier pipe (or larger diameter sewer pipe) may allow for shaft spacing of 1,000 ft or more to be utilized.

Microtunneling is generally capable of crushing or removing coarse material. Contractors report success at tunneling directly through 3 to 4 ft diameter boulders, however, material larger than the crushing cone of the MTBM presents a risk for delays and refusal. Large obstructions may require the construction of additional access pits in order to remove the obstruction at the head of the MTBM.

Microtunneling consists of the use of specialized equipment and is typically the least economical option when compared to Open Cut and Auger Bore methods, however, unique project requirements, such as the need for extensive dewatering, may make microtunneling an economically feasible option. Additional considerations for Microtunneling include a relatively large staging area for equipment and a need for disposal of excavated material and slurry generated in the installation process.

Dewatering

Dewatering will be necessary when pipe inverts are at or below the water table for the Open Cut and Auger Bore installation methods. Dewatering requirements for Microtunneling are expected to be significantly less. Dewatering for Auger Bore is expected to be required around

the jacking and receiving pits and is likely to be needed along the pipe run. The encountered groundwater levels and anticipated invert elevations are summarized in the following table.

*Summary of Groundwater and Invert Depths and Elevations*

| Alignment | Boring No. | Anticipated Invert Depth (ft) | Anticipated Invert Elevation | Groundwater Depth (ft) | Groundwater Elevation | Groundwater Head over Sewer Invert (ft) |
|---|---|---|---|---|---|---|
| Chapin Street | SB-1 | 13 | 778.3 | 8.5 | 782.0 | 3.7 |
| | SB-2 | 16 | 780.1 | 11.5 | 784.9 | 4.8 |
| | SB-3 | 17 | 781.5 | 10 | 787.8 | 6.3 |
| | SB-4 | 14 | 782.2 | 9 | 787.0 | 4.8 |
| | SB-5 | 17 | 783.4 | 4.5 | 792.7 | 9.3 |
| | SB-6 | 15 | 784.3 | 9.5 | 789.7 | 5.4 |
| | SB-7 | 17 | 785.5 | 4.5 | 797.7 | 12.2 |
| First Street | SB-8 | 19 | 776.0 | 13 | 785.9 | 9.9 |
| | SB-9 | 31 | 779.2 | 30 | 781.5 | 2.3 |
| | SB-10 | 32 | 782.1 | 21 | 793.4 | 11.3 |
| | SB-11 | 24 | 789.5 | 20 | 792 | 2.5 |
| | SB-12 | 13 | 785.0 | 5 | 793.4 | 8.4 |

Extensive dewatering will likely be required for Open Cut and Auger Bore installation along all of the Chapin Street alignment and portions of the First Street alignment. If microtunneling methods are utilized, then limited dewatering may be required to reduce uplift pressure at shafts. Dewatering is generally divided into two categories, deep (base of excavation deeper than about 15 to 18 ft) and shallow (base of excavation shallower than about 15 to 18 ft).

Deep dewatering wells are generally seated 10 to 20 ft below the base of the excavation, although they may be seated shallower if there are confining layers present. Deep wells are typically spaced at 50 to 70 ft intervals close to the pipe alignment, and water is pumped to the surface from each well point to draw down the water level along the pipe alignment. Installation of deep dewatering wells is accomplished with equipment similar to residential well drilling equipment. Overhead obstructions, such as power lines, may cause conflicts with the installation equipment. Providing power to the pumps is typically provided by the pipe installation contractor.

Shallow dewatering may be provided by either shallow well points or linear sock drain methods. These installations are typically faster and more economical than deep dewatering wells. Shallow dewatering is typical for Open Cut excavations less than about 15 to 18 ft deep. Dewatering groundwater in areas where approximately 20 ft or more of head is present above the base of the excavation may be difficult to achieve.

CLOSURE

In this report, descriptions of the preliminary geotechnical investigation and encountered conditions have been provided. The limitations of this study are described in the Appendix.

We appreciate this opportunity to provide engineering services and express our interest in providing continuing services as the project progresses. Please contact our office should you have any questions or require further assistance.

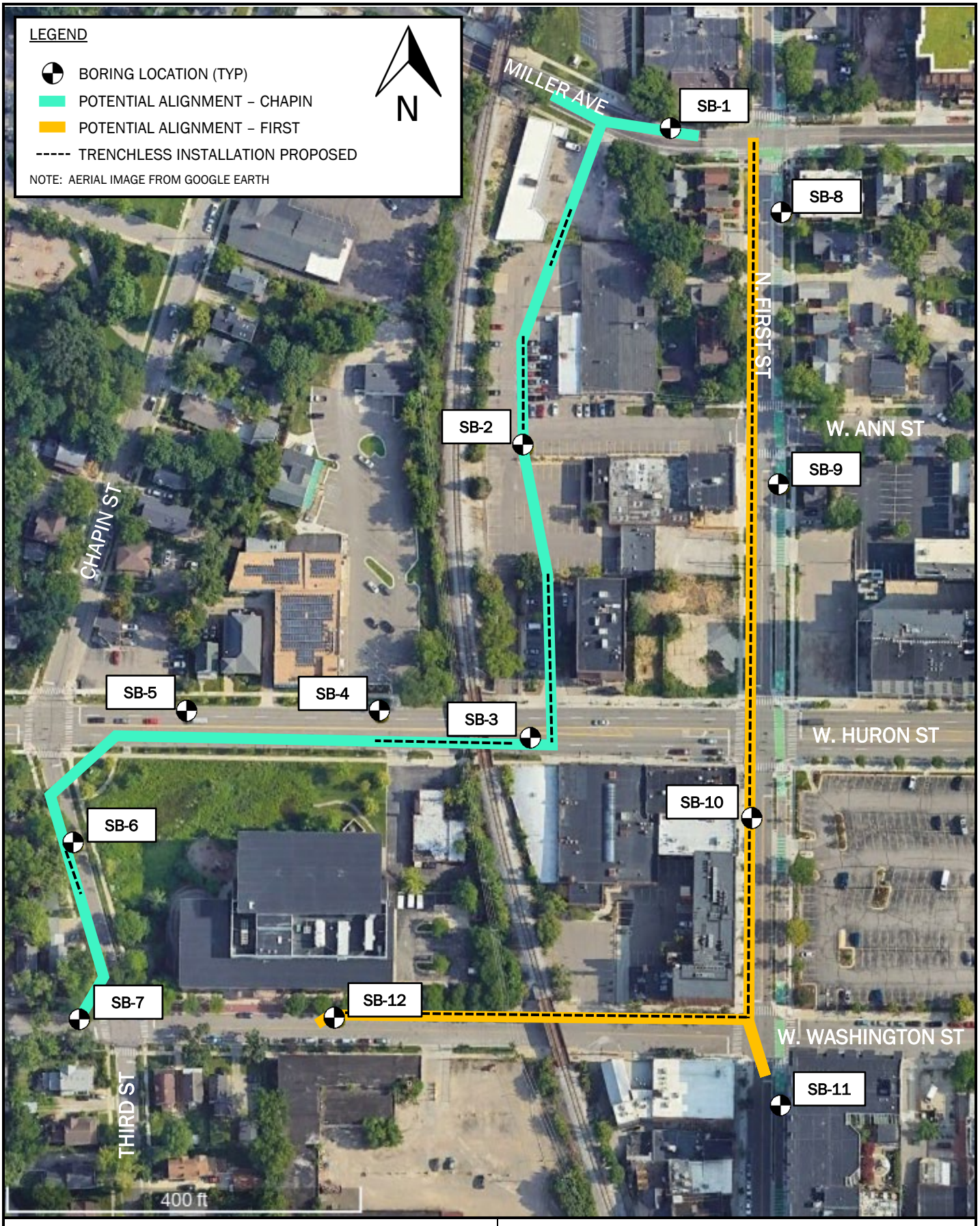
Sincerely,

**MATERIALS TESTING CONSULTANTS, INC.**

Isaac L. MacMillan, P.E.
Project Engineer

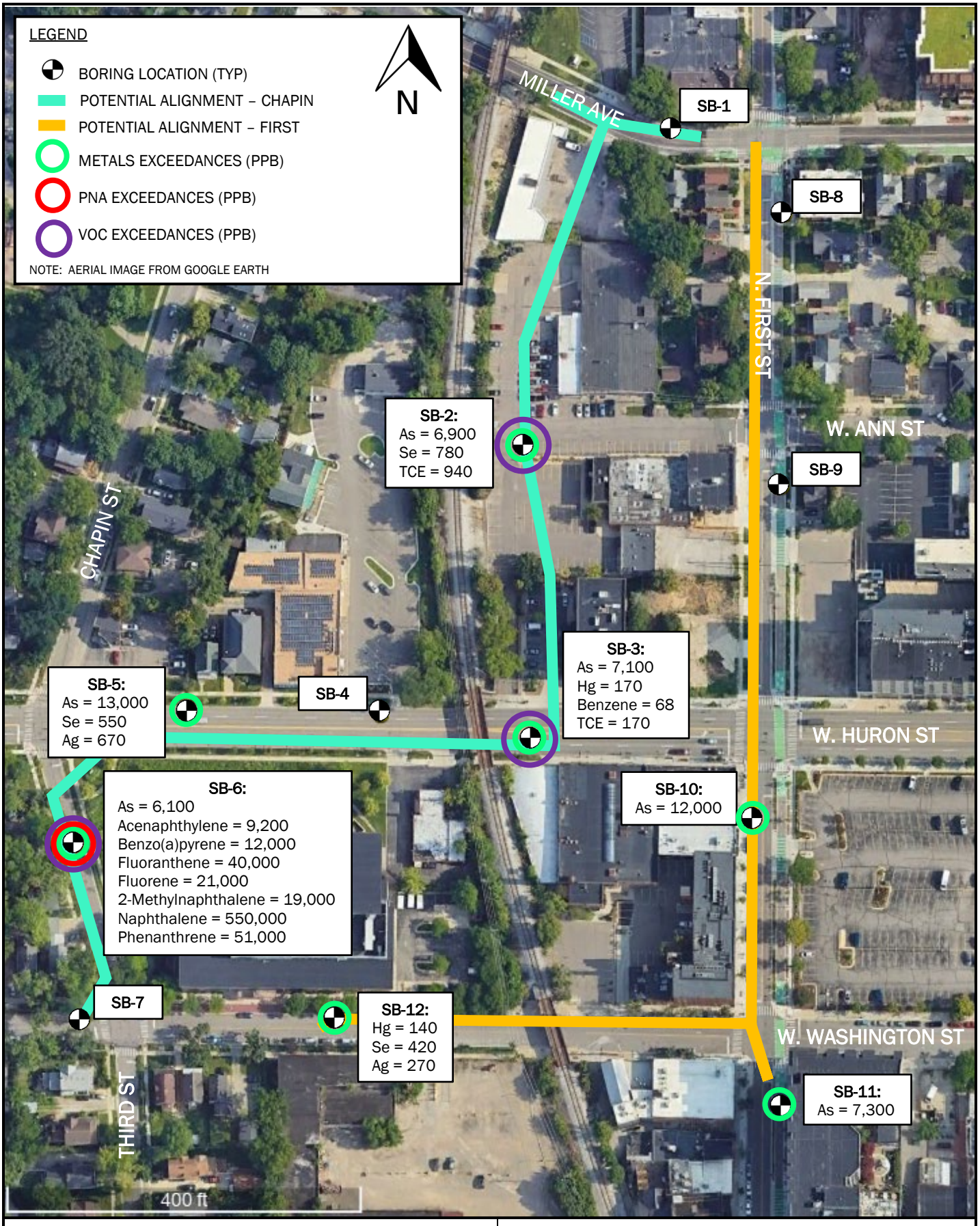
Robert J. Warren, P.E.
Senior Project Manager

Attachments: Figure No. 1 – Boring Location Plan
Figure No. 2 – Soil Exceedances
Figure No. 3 – Groundwater Exceedances
Figure No. 4 – Generalized Subsurface Profile: Chapin Street
Figure No. 5 – Generalized Subsurface Profile: First Street
Appendix
- Limitations
- Test Drilling and Sampling Procedures
- Boring Log Terminology and Classification Outline
- Boring Logs
- Summary of Laboratory Test Data
- Particle Size Distribution Reports
- Table 1 – Comparison of Soil Samples to EGLE Criteria
- Table 2 – Comparison of Groundwater Samples to EGLE Criteria
- Analytical Test Results



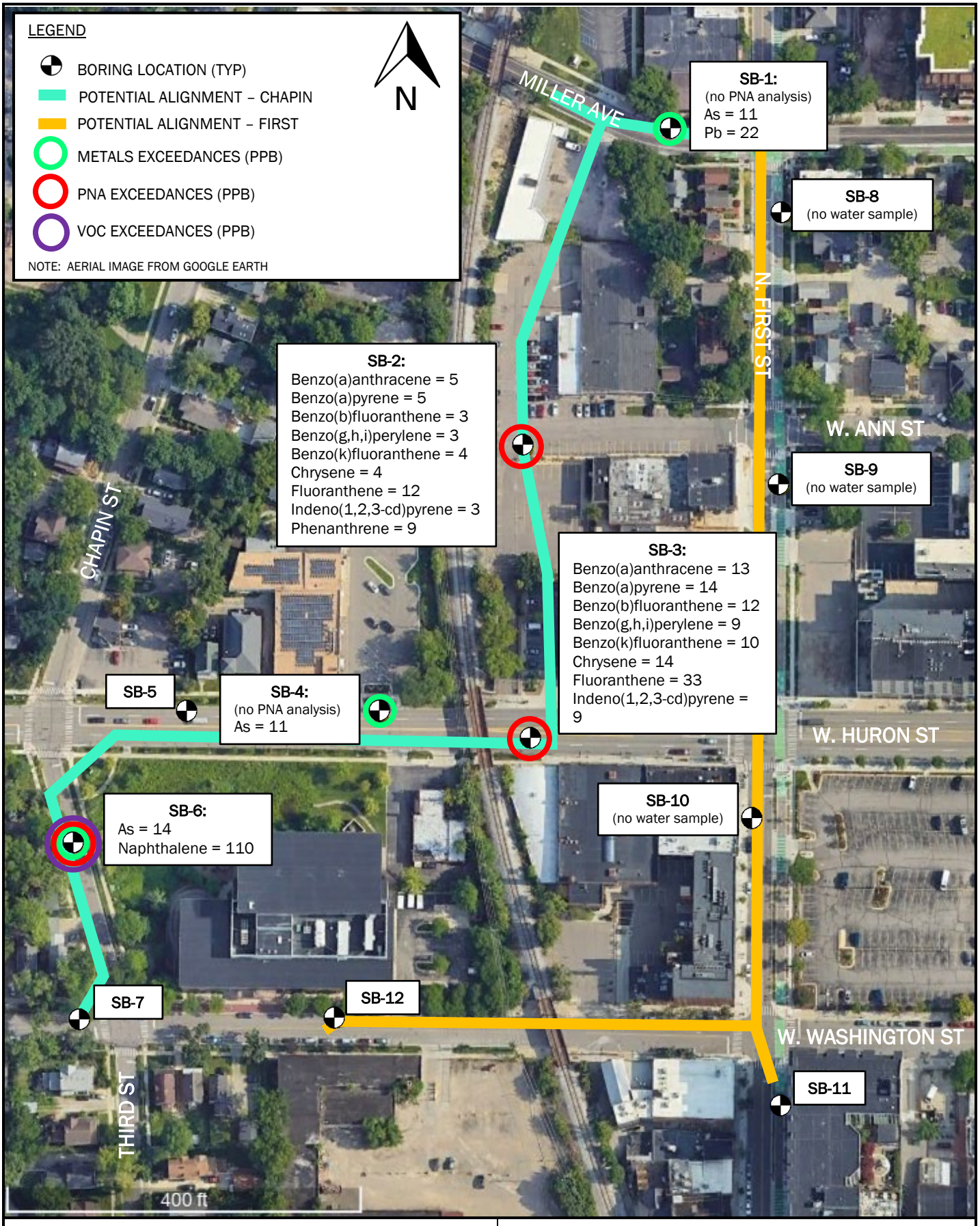

| | | |
|---|---|---|
| TITLE: BORING LOCATION PLAN | | PROJECT: MILLER-CHAPIN SANITARY RELIEF SEWER |
| SCALE: AS SHOWN | DATE: 4/5/2024 | PROJECT NO.: 241082 |
| FIG. NO.: 1 | DR. BY: IM | REV. BY: RW |

MTC MATERIALS TESTING CONSULTANTS

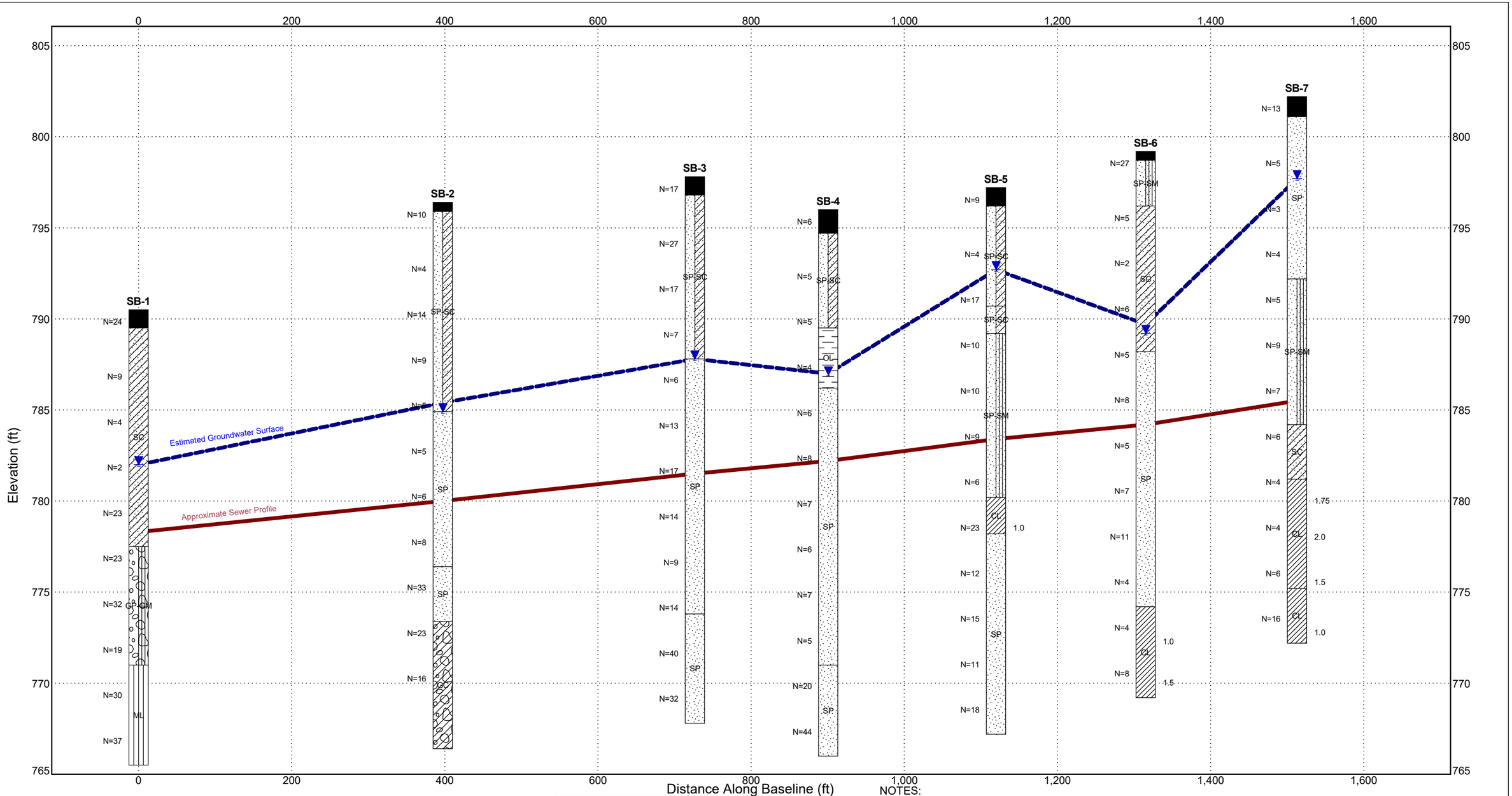



| | | |
|---|---|---|
| TITLE: SOIL EXCEEDANCES | | PROJECT: MILLER-CHAPIN SANITARY RELIEF SEWER |
| SCALE: AS SHOWN | DATE: 4/5/2024 | PROJECT NO.: 241082 |
| FIG. NO.: 2 | DR. BY: IM | REV. BY: MG |

MTC MATERIALS TESTING CONSULTANTS



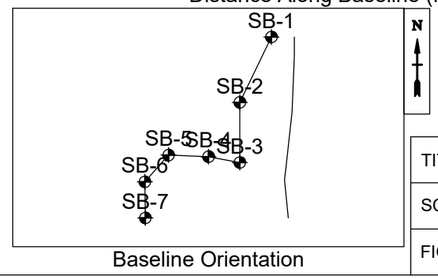

| | | | |
|---|---|---|---|
| TITLE: GROUNDWATER EXCEEDANCES | | | PROJECT: MILLER-CHAPIN SANITARY RELIEF SEWER |
| SCALE: AS SHOWN | DATE: 4/5/2024 | PROJECT NO.: 241082 | MTC MATERIALS TESTING CONSULTANTS |
| FIG. NO.: 3 | DR. BY: IM | REV. BY: RW | |




Asphalt
USCS Silt
USCS Clayey Gravel
USCS Low Plasticity Clay
Encountered Groundwater Surface

USCS Clayey Sand
USCS Poorly-graded Sand with Clay
USCS Low Plasticity Organic silt or clay

USCS Poorly-graded Gravel with Silt
USCS Poorly-graded Sand
USCS Poorly-graded Sand with Silt

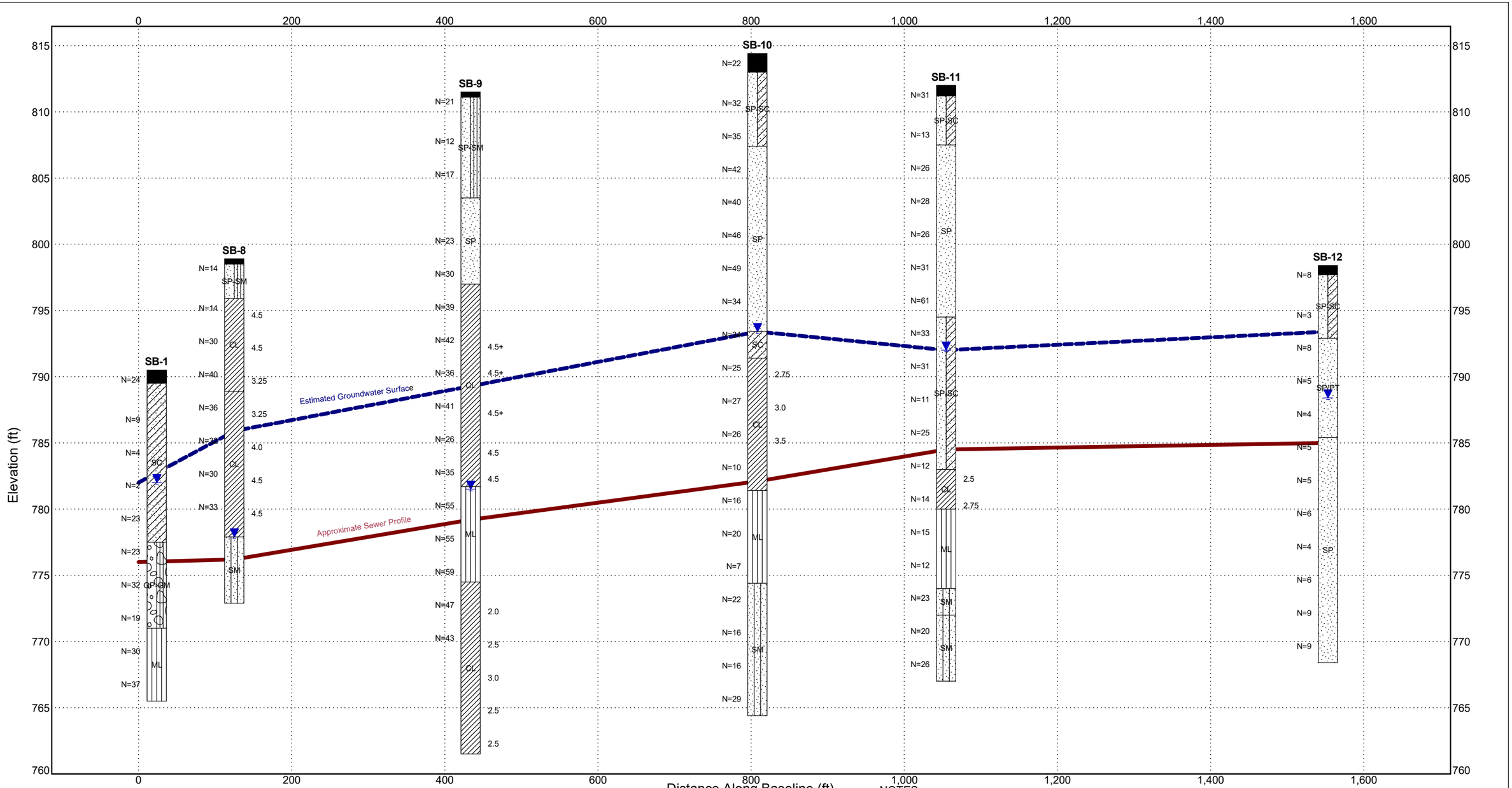



Baseline Orientation

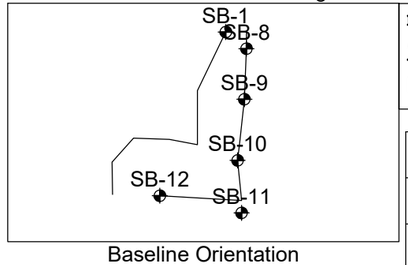
NOTES:

1. SUBSURFACE CONDITONS ARE GENERALIZED. REFER TO BORING LOGS FOR SPECIFIC DESCRIPTIONS.
2. CONDITIONS BETWEEN BORINGS AND GROUNDWATER ELEVATIONS BETWEEN BORINGS MAY VARY.

| | | | |
|---|---|---|---|
| TITLE: GENERALIZED SUBSURFACE PROFILE - CHAPIN ST. | | | PROJECT: ANN ARBOR MILLER CHAPIN RELIEF SEWER |
| SCALE: NTS | DATE:4/5/2024 | PROJECT NO.: 241082 | **Materials Testing Consultants, INC** |
| FIG. NO.: 4 | DR. BY: RW | REV. BY: IM | |




Asphalt
USCS Silt
USCS Low Plasticity Clay
Encountered Groundwater Surface
USCS Clayey Sand
USCS Poorly-graded Sand with Clay
USCS Silty Sand
USCS Poorly-graded Gravel with Silt
USCS Poorly-graded Sand
USCS Poorly-graded Sand with Silt




Baseline Orientation

NOTES:
1. SUBSURFACE CONDITONS ARE GENERALIZED. REFER TO BORING LOGS FOR SPECIFIC DESCRIPTIONS.
2. CONDITIONS BETWEEN BORINGS AND GROUNDWATER ELEVATIONS BETWEEN BORINGS MAY VARY.

| | | | |
|---|---|---|---|
| TITLE: GENERALIZED SUBSURFACE PROFILE - FIRST ST. | | | PROJECT: ANN ARBOR MILLER CHAPIN RELIEF SEWER |
| SCALE: NTS | DATE: 4/9/2024 | PROJECT NO.: 241082 | **Materials Testing Consultants, INC** |
| FIG. NO.: 5 | DR. BY: RW | REV. BY: IM | |

*APPENDIX*

- Limitations
- Test Drilling and Sampling Procedures
- Boring Log Terminology and Classification Outline
- Boring Logs
- Summary of Laboratory Test Data
- Particle Size Distribution Reports
- Table 1 – Comparison of Soil Samples to EGLE Criteria
- Table 2 – Comparison of Groundwater Samples to EGLE Criteria
- Analytical Test Results

# LIMITATIONS

## Soil Variations

The recommendations in this report are based upon the data obtained from the soil borings. This report does not reflect variations which may occur between these borings, and which would not become evident until construction. If variations then become evident, it would be necessary for a re-evaluation of recommendations of this report, after performing on-site observations.

## Warranties

We have prepared this report in accordance with generally accepted soil and foundation engineering practices. We make no other warranties, either expressed or implied, as to the professional advice provided under the terms of our agreement and included in this report. This report is prepared exclusively for our client and may not be relied upon by other parties without written consent from our office.

## Boring Logs

In the process of obtaining and testing samples and preparing this report, we follow reasonable and accepted practice in the field of soil engineering. Field logs maintained during drilling describe field occurrences, sampling locations, and other information. The samples obtained in the field are subjected to additional testing in the laboratory and differences may exist between the field logs and the final logs. The engineer reviews the field logs and laboratory test data, and then prepares the final boring logs. Our recommendations are based on the contents of the final logs.

## Review of Design Plans and Specifications

In the event that any changes in the design of the building or the location, however slight, are planned, our recommendations shall not be considered valid unless modified or approved in writing by our office. We recommend that we be provided the opportunity to review the final design and specifications in order to determine whether changes in the original concept may have affected the validity of our recommendations, and whether our recommendations have, in fact, been implemented in the design and specifications.

# TEST DRILLING AND SAMPLING PROCEDURES

Test Drilling Methods:

- [X] Hollow stem auger, ASTM D6151
- [ ] Mud rotary, ASTM D5783
- [ ] Casing advancer, ASTM D5872
- [ ] Rock coring, ASTM D2113
- [ ] Core/Hand Auger

*Note: Cone penetration test data can be used to interpret subsurface stratigraphy and can provide data on engineering properties of soils. The ASTM procedure does not include a procedure for determining soil classification from CPT testing. Soil classifications shown on CPT logs are based on published procedures and are not based on physical ASTM soil classification tests.*

Sampling Methods:

- [X] SPT, ASTM D1586, Auto hammer (140 lb., 30" drop, 2" OD split spoon sampler)
- [ ] Thin-walled tube sampler (Shelby), ASTM D1587
- [X] Grab Samples

*Note: The number of hammer blows required to drive the SPT sampler 12 inches, after seating 6 inches, is termed the soil N-value and provides an indication of the soil's relative density and strength parameters at the sample location. SPT blow counts in 6 inch increments are recorded on the boring logs.*

Drill Rig:

- [X] CME 55 (ATV)
- [ ] Acker Renegade (ATV)
- [X] CME 45 Truck
- [ ] Geoprobe 7822 (ATV)
- [ ] Geoprobe Rotary Sonic

Boreholes Backfilled With:

- [X] Excavated soil
- [X] Cement bentonite grout
- [ ] Piezometer or Monitoring Well (see notes on logs)
- [X] Concrete or asphalt patch where appropriate

Sample Handling and Disposition:

- [X] Samples labeled, placed in jars, returned to MTC Laboratory
- [X] Discard after 60 days

# BORING LOG TERMINOLOGY AND ASTM D 2488 CLASSIFICATION OUTLINE

**TERMS DESCRIBING CONSISTENCY OR CONDITION**

**COARSE-GRAINED** SOILS (major portions retained on No. 200 sieve): includes (1) clean gravel and sands and (2) silty or clayey gravels and sands. Condition is rated according to relative density as determined by laboratory tests or standard penetration resistance tests.

| Descriptive Terms | Relative Density | SPT Blow Count |
|---|---|---|
| Very loose | 0 to 15 % | < 5 |
| Loose | 15 to 35 % | 5 to 10 |
| Medium dense | 35 to 65 % | 10 to 30 |
| Dense | 65 to 85 % | 30 to 50 |
| Very dense | 85 to 100 % | > 50 |

Per ASTM D2487, the following conditions must be met based on laboratory testing to justify the label 'well graded' in a soil description.

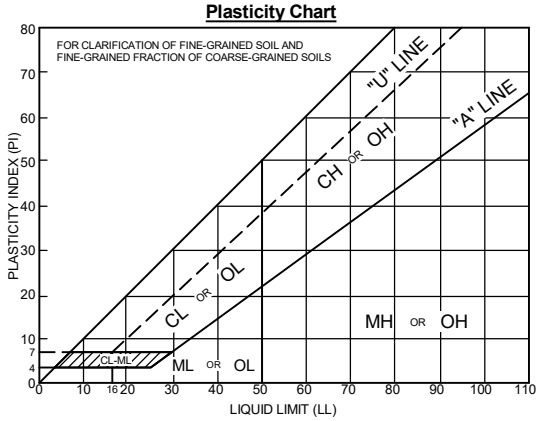
Gravel: $C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

Sand: $C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

**FINE-GRAINED** SOILS (major portions passing on No. 200 sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings, SPT blow count, or unconfined compression tests.

| Descriptive Terms | Unconfined Compressive Strength TSF | SPT Blow Count |
|---|---|---|
| Very soft | < 0.25 | < 2 |
| Soft | 0.25 to 0.5 | 2 to 4 |
| Medium stiff | 0.5 to 1.0 | 4 to 8 |
| Stiff | 1.0 to 2.0 | 8 to 15 |
| Very stiff | 2.0 to 4.0 | 15 to 30 |
| Hard | > 4.0 | > 30 |

**Plasticity Chart**




| MAJOR DIVISIONS | | | | | TYPICAL NAMES |
|---|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE | CLEAN GRAVELS WITH LESS THAN 15% FINES | GW | | WELL-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | | GP | | POORLY-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | GRAVELS WITH 15% OR MORE FINES | GM | | SILTY GRAVELS WITH OR WITHOUT SAND |
| | | | GC | | CLAYEY GRAVELS WITH OR WITHOUT SAND |
| | SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LESS THAN 15% FINES | SW | | WELL-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP | | POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP-SM | | POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL |
| | | SANDS WITH 15% OR MORE FINES | SM | | SILTY SANDS WITH OR WITHOUT GRAVEL |
| | | | SC | | CLAYEY SANDS WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | | INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CL | | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OL | | ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | | INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CH | | INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OH | | ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| HIGHLY ORGANIC SOILS | | | PT/OL | | PEAT AND OTHER HIGHLY ORGANIC SOILS |

## GENERAL NOTES

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

2. "Grades with" or "Grades without" may be used to describe soil when characteristics vary within a stratum.

3. Preserved soil samples will be discarded after 60 days unless alternate arrangements have been made.

## GROUNDWATER OBSERVATIONS:

During - indicates water level encountered during the boring
End- indicates water level immediately after drilling
Date and Depth - Measurements at indicated date

SAMPLE TYPES AND NUMBERING

| | |
|---|---|
| S | SPT, split barrel sample, ASTM D1586 |
| U | Shelby tube sample, ASTM D1587 |
| R | Rock core run |
| *S | Other than 2" split barrel sample |
| L | SPT with liner, ASTM D1586 |
| A | Auger cuttings |
| G | Geoprobe liner |

MINOR COMPONENT QUANTIFYING TERMS

| | |
|---|---|
| Less than 5% | TRACE |
| 5 to 10% | FEW |
| 15 to 25% | LITTLE |
| 30 to 40% | SOME |
| 50 to 100% | MOSTLY |

GRAIN SIZE

| | |
|---|---|
| BOULDER | >12" |
| COBBLE | 12" to 3" |
| COARSE GRAVEL | 3" to 0.75" |
| FINE GRAVEL | 0.75" to No. 4 |
| COARSE SAND | No. 4 to No. 10 |
| MEDIUM SAND | No. 10 to No.40 |
| FINE SAND | No. 40 to No. 200 |

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-1
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=286096.8 E=13289879.1 (MI South ift)
Elevation: 790.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 15.0 ft.

Date Begin: 03/11/2024 Date End: 03/11/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 8.5 |
| Sampler | SPT | 2" | End | 11.5 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 789.5 | 1 | | | | | 6" HMA, 6" Gravel Base | | | | Fill: 0' to 13.0' |
| 788.5 | 2 | S-1 | 1.0 | 14-12-12 N=24 | | 1.0 Brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist, Fill | | | | S-1 to S-3: Poor recovery; possible coarse gravel / COBBLE |
| 787.5 | 3 | | | | | | | | | |
| 786.5 | 4 | | | | | | | | | Environmental composite soil sample from 0.5' to 10' |
| 785.5 | 5 | S-2 | 0.0 | 5-5-4 N=9 | | | | | | |
| 784.5 | 6 | | | | | | | | | |
| 783.5 | 7 | S-3 | 1.0 | 1-2-2 N=4 | SC | | | | | |
| 782.5 | 8 | | | | | | | | | |
| 781.5 | 9 | | | | | | | | | |
| 780.5 | 10 | S-4 | 1.3 | 1-1-1 N=2 | | Grades wet at 8.5' | | | | |
| 779.5 | 11 | | | | | | | | | |
| 778.5 | 12 | S-5 | 1.5 | 5-6-17 N=23 | | | | | | |
| 777.5 | 13 | | | | | 13.0 | | | | Driller noted difficult drilling from 12' to 19' |
| 776.5 | 14 | | | | | Brown poorly graded GRAVEL with silt and sand; mostly coarse to fine gravel, little coarse to fine sand, few silty fines, wet | | | | |
| 775.5 | 15 | S-6 | 1.3 | 5-17-6 N=23 | | | | | | Environmental water sample at 15' |
| 774.5 | 16 | | | | | | | | | |
| 773.5 | 17 | S-7 | 1.4 | 12-14-18 N=32 | GP-GM | | | | | |
| 772.5 | 18 | | | | | | | | | |
| 771.5 | 19 | | | | | | | | | |
| 770.5 | 20 | S-8 | 1.5 | 4-10-9 N=19 | | 19.5 | | | | |
| 769.5 | 21 | | | | | Gray SILT; mostly silty fines, trace fine sand, moist | | | | |
| 768.5 | 22 | S-9 | 1.5 | 9-13-17 N=30 | ML | | | | | |
| 767.5 | 23 | | | | | Grades with trace coarse to fine gravel and few coarse to fine sand | | | | |
| 766.5 | 24 | | | | | | | | | |
| 765.5 | 25 | S-10 | 1.5 | 9-17-20 N=37 | | 25.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-2
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285739.2 E=13289706.2 (MI South ift)
Elevation: 796.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 12.0 ft.

Date Begin: 03/14/2024 Date End: 03/14/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 11.5 |
| Sampler | SPT | 2" | End | 11.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 795.4 | 1 | | | | | 2" HMA, 4" Gravel Base 0.5 | | | | Fill: 0' to 11.5' |
| 794.4 | 2 | S-1 | 1.5 | 8-5-5 N=10 | SP-SC | Dark brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, trace coarse to fine gravel, Fill with glass, brick, and woody debris | | | | Environmental composite soil sample from 0.5' to 30' |
| 793.4 | 3 | | | | | | | | | |
| 792.4 | 4 | | | | | | | | | S-2, S-3, S-5, S-10, S-11: Poor recovery; possible coarse gravel / COBBLE |
| 791.4 | 5 | S-2 | 0.4 | 4-2-2 N=4 | | | | | | |
| 790.4 | 6 | | | | | | | | | |
| 789.4 | 7 | S-3 | 1.2 | 8-8-6 N=14 | | | | | | |
| 788.4 | 8 | | | | | | | | | |
| 787.4 | 9 | | | | | | | | | |
| 786.4 | 10 | S-4 | 1.5 | 6-6-3 N=9 | | | | | | |
| 785.4 | 11 | | | | | 11.5 | | | | |
| 784.4 | 12 | S-5 | 1.2 | 2-2-3 N=5 | SP | Light brown poorly graded SAND; mostly coarse to fine sand, trace clayey fines, wet | | | | |
| 783.4 | 13 | | | | | | | | | |
| 782.4 | 14 | | | | | | | | | Environmental water sample at 15' |
| 781.4 | 15 | S-6 | 1.5 | 2-2-3 N=5 | | | | | | |
| 780.4 | 16 | | | | | | | | | |
| 779.4 | 17 | S-7 | 1.5 | 4-3-3 N=6 | | | | | | Charged augers with water at 16.0' |
| 778.4 | 18 | | | | | | | | | *End water level may be influenced by charging augers |
| 777.4 | 19 | | | | | | | | | |
| 776.4 | 20 | S-8 | 1.5 | 4-4-4 N=8 | | 20.0 | | | | |
| 775.4 | 21 | | | | | | | | | |
| 774.4 | 22 | S-9 | 1.4 | 10-15-18 N=33 | SP | Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace clayey fines, wet | | | | Driller noted difficult drilling from 21' to 26' |
| 773.4 | 23 | | | | | 23.0 | | | | |
| 772.4 | 24 | | | | | | | | | |
| 771.4 | 25 | S-10 | 0.1 | 8-9-14 N=23 | | Gray clayey GRAVEL; mostly coarse to fine gravel, some clayey fines, wet with occasional clay seams | | | | |
| 770.4 | 26 | | | | | | | | | |
| 769.4 | 27 | S-11 | 0.5 | 14-7-9 N=16 | GC | | | | | |
| 768.4 | 28 | | | | | | | | | |
| 767.4 | 29 | | | | | | | | | |
| 766.4 | 30 | S-12 | 0.2 | 10-50/5" | | 30.0 | | | | S-12: Sampler refusal; possible coarse gravel / COBBLE |
| | | | | | | End of Boring | | | | |

PID = Photoionization Detector.
Detection <50 ppm except where noted.

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-3
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285410.0 E=13289706.1 (MI South ift)
Elevation: 797.8 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with grout, patched pavement with cold patch.

Date Begin: 03/18/2024 Date End: 03/19/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 10.0 |
| Sampler | SPT | 2" | End | 10.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 796.8 | 1 | | | | | 6" HMA, 6" Gravel Base | | | | Fill: 0' to 10.0' |
| 795.8 | 2 | S-1 | 0.7 | 4-6-11 N=17 | | 1.0 | | | | S-1 to S-4, S-7 to S-10, S-12: Poor recovery; possible coarse gravel / COBBLE |
| 794.8 | 3 | | | | | Brown poorly graded SAND with clay and gravel; mostly coarse to fine sand, little coarse to fine gravel, few clayey fines, moist, Fill | | | | |
| 793.8 | 4 | | | | | | | | | |
| 792.8 | 5 | S-2 | 0.6 | 5-10-17 N=27 | | | | | 50 | |
| 791.8 | 6 | | | | SP-SC | | | | | |
| 790.8 | 7 | S-3 | 1.2 | 8-11-6 N=17 | | | | | 193 | Environmental soil grab sample at 6' |
| 789.8 | 8 | | | | | | | | | |
| 788.8 | 9 | | | | | | | | | |
| 787.8 | 10 | S-4 | 0.7 | 3-3-4 N=7 | | 10.0 | | | 71 | |
| 786.8 | 11 | | | | | Brown poorly graded SAND with gravel; mostly coarse to fine sand, some coarse to fine gravel, trace clayey fines, wet | | | | |
| 785.8 | 12 | S-5 | 1.4 | 3-2-4 N=6 | | | | | | Environmental water sample at 15' |
| 784.8 | 13 | | | | | | | | | |
| 783.8 | 14 | | | | | | | | | |
| 782.8 | 15 | S-6 | 1.4 | 4-6-7 N=13 | | | | 12.1 | | S-6: LBW = 4.1% |
| 781.8 | 16 | | | | | | | | | |
| 780.8 | 17 | S-7 | 0.7 | 9-8-9 N=17 | SP | | | | | Charged augers with water at 16.0' *End water level may be influenced by charging augers |
| 779.8 | 18 | | | | | | | | | |
| 778.8 | 19 | | | | | | | | | |
| 777.8 | 20 | S-8 | 1.1 | 8-7-7 N=14 | | | | | | |
| 776.8 | 21 | | | | | | | | | |
| 775.8 | 22 | S-9 | 0.8 | 4-4-5 N=9 | | | | | | |
| 774.8 | 23 | | | | | | | | | |
| 773.8 | 24 | | | | | 24.0 | | | | |
| 772.8 | 25 | S-10 | 1.0 | 5-5-9 N=14 | | Gray gravelly SAND; mostly coarse to fine sand, some coarse to fine gravel, wet | | | | |
| 771.8 | 26 | | | | | | | | | |
| 770.8 | 27 | S-11 | 1.3 | 31-22-18 N=40 | SP | | | | | |
| 769.8 | 28 | | | | | | | | | |
| 768.8 | 29 | | | | | | | | | |
| 767.8 | 30 | S-12 | 1.2 | 10-18-14 N=32 | | 30.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-4
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285441.9 E=13289534.8 (MI South ift)
Elevation: 796.0 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 9.0 ft.

Date Begin: 03/15/2024 Date End: 03/15/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 9.8 |
| Sampler | SPT | 2" | End | 9.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 795.0 | 1 | | | | | 9" HMA, 4" Gravel Base (1.3) | | | | Fill: 0' to 9.8' |
| 794.0 | 2 | S-1 | 1.3 | 3-3-3 N=6 | | | | | | |
| 793.0 | 3 | | | | SP-SC | Dark brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, trace coarse to fine gravel, moist, Fill with brick pieces (6.5) | | | | Environmental composite soil sample from 1' to 30' |
| 792.0 | 4 | | | | | | | | | |
| 791.0 | 5 | S-2 | 1.5 | 3-3-2 N=5 | | | | | | |
| 790.0 | 6 | | | | | | | | | |
| 789.0 | 7 | S-3 | 1.5 | 4-3-2 N=5 | OL | Black organic clayey SAND; mostly fine sand, some clayey fines, moist, Fill with brick fragments and woody debris (9.8) | | | | |
| 788.0 | 8 | | | | | | | | | |
| 787.0 | 9 | | | | | | | | | |
| 786.0 | 10 | S-4 | 1.4 | 3-2-2 N=4 | | | | | | |
| 785.0 | 11 | | | | | | | | | |
| 784.0 | 12 | S-5 | 1.5 | 3-3-3 N=6 | | Brown to gray poorly graded SAND; mostly coarse to fine sand, trace fine gravel, trace silty fines, wet | | | | Environmental water sample at 11' |
| 783.0 | 13 | | | | | | | | | |
| 782.0 | 14 | | | | | | | | | |
| 781.0 | 15 | S-6 | 1.5 | 3-4-4 N=8 | | | | | | Charged augers with water at 16.0' |
| 780.0 | 16 | | | | | | | | | |
| 779.0 | 17 | S-7 | 1.3 | 4-4-3 N=7 | | | | | | *End water level may be influenced by charging augers |
| 778.0 | 18 | | | | SP | | | | | |
| 777.0 | 19 | | | | | | | | | |
| 776.0 | 20 | S-8 | 0.7 | 2-2-4 N=6 | | | | | | S-8, S-12: Poor recovery; possible coarse gravel / COBBLE |
| 775.0 | 21 | | | | | | | | | |
| 774.0 | 22 | S-9 | 1.5 | 4-3-4 N=7 | | | | | | |
| 773.0 | 23 | | | | | | | | | |
| 772.0 | 24 | | | | | | | | | |
| 771.0 | 25 | S-10 | 1.5 | 3-2-3 N=5 | | (25.0) | | | | |
| 770.0 | 26 | | | | | | | | | |
| 769.0 | 27 | S-11 | 1.4 | 4-9-11 N=20 | | Gray poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, wet | | | | |
| 768.0 | 28 | | | | SP | | | | | |
| 767.0 | 29 | | | | | | | | | |
| 766.0 | 30 | S-12 | 1.1 | 5-13-31 N=44 | | (30.0) | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-5
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285450.4 E=13289315.9 (MI South ift)
Elevation: 797.2 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 10.5 ft.

Date Begin: 03/21/2024 Date End: 03/21/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 4.5 |
| Sampler | SPT | 2" | End | 5.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 796.2 | 1 | | | | | 4" HMA, 8" Concrete 1.0 | | | | Fill: 0' to 8.0' |
| 795.2 | 2 | S-1 | 1.2 | 7-5-4 N=9 | | Gray to brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, trace fine gravel, Fill with brick fragments | | | | S-1, S-2: Poor recovery; possible coarse gravel / COBBLE |
| 794.2 | 3 | | | | | | | | | |
| 793.2 | 4 | | | | SP-SC | | | | | Environmental composite soil sample from 1' to 30' |
| 792.2 | 5 | S-2 | 1.2 | 3-2-2 N=4 | | Grades wet at 4.5' | | | | |
| 791.2 | 6 | | | | | 6.5 | | | | |
| 790.2 | 7 | S-3 | 1.3 | 4-8-9 N=17 | SP-SC | Dark gray poorly graded SAND with clay and gravel; mostly coarse to fine sand, little coarse to fine gravel, few clayey fines, wet, Fill 8.0 | | | | |
| 789.2 | 8 | | | | | | | | | |
| 788.2 | 9 | | | | | Gray poorly graded SAND with silt; mostly coarse to fine sand, few silty fines, wet | | | | Environmental water sample at 10' |
| 787.2 | 10 | S-4 | 1.4 | 4-5-5 N=10 | | | | | | |
| 786.2 | 11 | | | | | | | | | |
| 785.2 | 12 | S-5 | 1.5 | 4-5-5 N=10 | SP-SM | | | | | |
| 784.2 | 13 | | | | | | | | | |
| 783.2 | 14 | | | | | | | | | |
| 782.2 | 15 | S-6 | 1.5 | 4-5-4 N=9 | | | | | | |
| 781.2 | 16 | | | | | | | | | Charged augers with water at 15.0' |
| 780.2 | 17 | S-7 | 1.5 | 2-3-3 N=6 | | 17.0 | | | | *End water level may be influenced by charging augers |
| 779.2 | 18 | | | | CL | Gray lean CLAY; mostly clayey fines, moist | | | | |
| 778.2 | 19 | | | | | 19.0 | 1.0 | | | |
| 777.2 | 20 | S-8 | 1.5 | 4-11-12 N=23 | | Gray poorly graded SAND; mostly coarse to fine sand, trace silty fines, wet | | | | |
| 776.2 | 21 | | | | | | | | | |
| 775.2 | 22 | S-9 | 1.5 | 5-6-6 N=12 | | Grades with few fine gravel at 22' | | | | |
| 774.2 | 23 | | | | | | | | | |
| 773.2 | 24 | | | | | | | | | |
| 772.2 | 25 | S-10 | 1.5 | 6-6-9 N=15 | SP | | | | | |
| 771.2 | 26 | | | | | | | | | |
| 770.2 | 27 | S-11 | 1.5 | 4-4-7 N=11 | | | | | | |
| 769.2 | 28 | | | | | | | | | |
| 768.2 | 29 | | | | | | | | | |
| 767.2 | 30 | S-12 | 1.5 | 5-8-10 N=18 | | 30.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-6
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285304.2 E=13289186.1 (MI South ift)
Elevation: 799.2 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 15.0 ft.

Date Begin: 03/12/2024 Date End: 03/12/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 10.0 |
| Sampler | SPT | 2" | End | 9.5* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 798.2 | 1 | | | | | 6" HMA 0.5 | | | | Fill: 0' to 11.0' |
| 797.2 | 2 | S-1 | 1.4 | 6-12-15 N=27 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, moist, 3.0 | | | 148 | Driller noted difficult drilling at 2' |
| 796.2 | 3 | | | | | Fill | | | | |
| 795.2 | 4 | | | | | | | | | |
| 794.2 | 5 | S-2 | 0.7 | 5-2-3 N=5 | | Brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, moist, Fill with organic fines and woody debris | | | 286 | Environmental composite soil sample from 0.5' to 5' |
| 793.2 | 6 | | | | | | | | | |
| 792.2 | 7 | S-3 | 1.3 | 3-1-1 N=2 | SC | | | | 150 | S-2, S-4: Poor recovery; possible coarse gravel / COBBLE |
| 791.2 | 8 | | | | | | | | | |
| 790.2 | 9 | | | | | | | | | |
| 789.2 | 10 | S-4 | 1.2 | 1-3-3 N=6 | | | | | 55 | |
| 788.2 | 11 | | | | | Grades wet at 10' 11.0 | | | | |
| 787.2 | 12 | S-5 | 1.3 | 3-2-3 N=5 | | Gray poorly graded SAND; mostly coarse to fine sand, trace silty fines, wet | | | | |
| 786.2 | 13 | | | | | | | | | |
| 785.2 | 14 | | | | | | | | | |
| 784.2 | 15 | S-6 | 1.4 | 3-2-6 N=8 | | | | | | Environmental water sample at 15' |
| 783.2 | 16 | | | | | | | | | |
| 782.2 | 17 | S-7 | 1.5 | 5-3-2 N=5 | | | | | | Charged augers with water at 16.0' |
| 781.2 | 18 | | | | SP | | | | | *End water level may be influenced by charging augers |
| 780.2 | 19 | | | | | | | | | |
| 779.2 | 20 | S-8 | 1.5 | 2-3-4 N=7 | | Grades with occasional clay lenses from 19' | | | | |
| 778.2 | 21 | | | | | | | | | |
| 777.2 | 22 | S-9 | 1.5 | 4-5-6 N=11 | | | | | | |
| 776.2 | 23 | | | | | | | | | |
| 775.2 | 24 | | | | | | | | | |
| 774.2 | 25 | S-10 | 1.5 | 2-2-2 N=4 | | Grades with frequent clay lenses 25.0 | | | | |
| 773.2 | 26 | | | | | | | | | |
| 772.2 | 27 | S-11 | 1.5 | 2-2-2 N=4 | CL | Gray lean CLAY; mostly clayey fines, few coarse to fine sand, moist | 1.0 | | | |
| 771.2 | 28 | | | | | | | | | |
| 770.2 | 29 | | | | | | | | | |
| 769.2 | 30 | S-12 | 1.5 | 3-3-5 N=8 | | 30.0 | 1.5 | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-7
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285106.6 E=13289188.9 (MI South ift)
Elevation: 802.2 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 7.5 ft.

Date Begin: 03/19/2024 Date End: 03/19/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 4.5 |
| Sampler | SPT | 2" | End | 6.5* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 801.2 | 1 | | | | | 10" HMA, 3" Gravel Base 1.1 | | | | Fill: 0' to 10.0' |
| 800.2 | 2 | S-1 | 1.2 | 8-7-6 N=13 | | Brown poorly graded SAND; mostly medium to fine sand, trace silty fines, moist, Fill | | | | S-1, S-2, S-5: Poor recovery; possible coarse gravel / COBBLE |
| 799.2 | 3 | | | | | | | | | |
| 798.2 | 4 | | | | | | | | | Environmental composite soil sample from 1.1' to 30' |
| 797.2 | 5 | S-2 | 1.1 | 4-3-2 N=5 | | Grades wet at 4.5' | | | | |
| 796.2 | 6 | | | | SP | | | | | |
| 795.2 | 7 | S-3 | 1.5 | 3-1-2 N=3 | | Grades with few coarse to fine gravel | | | | |
| 794.2 | 8 | | | | | | | | | |
| 793.2 | 9 | | | | | | | | | Environmental water sample at 10' |
| 792.2 | 10 | S-4 | 1.4 | 2-2-2 N=4 | | 10.0 | | | | |
| 791.2 | 11 | | | | | Brown poorly graded SAND with silt; mostly fine sand, trace fine gravel, few silty fines, wet | | | | Charged augers with water at 11.0' |
| 790.2 | 12 | S-5 | 1.1 | 4-3-2 N=5 | | | | | | *End water level may be influenced by charging augers |
| 789.2 | 13 | | | | | | | | | |
| 788.2 | 14 | | | | | | | | | |
| 787.2 | 15 | S-6 | 1.5 | 4-4-5 N=9 | SP-SM | | | 24.3 | | S-6: LBW = 6.9% |
| 786.2 | 16 | | | | | | | | | |
| 785.2 | 17 | S-7 | 1.5 | 4-4-3 N=7 | | | | | | |
| 784.2 | 18 | | | | | 18.0 | | | | |
| 783.2 | 19 | | | | | Gray clayey SAND; mostly coarse to fine sand, little clayey fines, wet | | | | |
| 782.2 | 20 | S-8 | 1.4 | 4-4-2 N=6 | SC | | | | | |
| 781.2 | 21 | | | | | 21.0 | | | | |
| 780.2 | 22 | | | | | Gray lean CLAY; mostly clayey fines, trace coarse to fine sand, moist | 1.75 | | | |
| 779.2 | 23 | S-9 | 1.4 | 2-2-2 N=4 | | | | | | |
| 778.2 | 24 | | | | | | 2.0 | | | |
| 777.2 | 25 | S-10 | 1.5 | 2-2-2 N=4 | CL | | | | | |
| 776.2 | 26 | | | | | | | | | |
| 775.2 | 27 | | | | | | 1.5 | | | |
| 774.2 | 28 | S-11 | 1.5 | 3-3-3 N=6 | | 27.0 | | | | |
| 773.2 | 29 | | | | | Gray lean CLAY with sand; mostly clayey fines, few coarse to fine sand, moist | | | | |
| 772.2 | 30 | S-12 | 1.5 | 6-7-9 N=16 | CL | | 1.0 | | | |
| | | | | | | 30.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-8
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285995.5 E=13290005.0 (MI South ift)
Elevation: 798.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 15.0 ft.

Date Begin: 03/03/2024 Date End: 03/03/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21.0 |
| Sampler | SPT | 2" | End | 13.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 26.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 797.9 | 1 | | | | | 5" HMA (0.4) | | | | Fill: 0' to 3.0' |
| 796.9 | 2 | S-1 | 0.8 | 7-7-7 N=14 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, moist, (3.0) | | | | S-1: Poor recovery; possible coarse gravel / COBBLE |
| 795.9 | 3 | | | | | Fill | | | | |
| 794.9 | 4 | | | | | | | | | |
| 793.9 | 5 | S-2 | 1.4 | 12-5-9 N=14 | | Brown lean CLAY; mostly clayey fines, trace coarse to fine sand, trace fine gravel, moist | 4.5 | | | Driller noted difficult drilling at 4' |
| 792.9 | 6 | | | | | | | | | |
| 791.9 | 7 | S-3 | 1.5 | 7-9-21 N=30 | CL | | 4.5 | | | Environmental composite soil sample from 0.5' to 30' |
| 790.9 | 8 | | | | | | | | | |
| 789.9 | 9 | | | | | | | | | |
| 788.9 | 10 | S-4 | 1.5 | 13-17-23 N=40 | | (10.0) | 3.25 | | | |
| 787.9 | 11 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | No environmental water sample due to limited groundwater quantity |
| 786.9 | 12 | S-5 | 1.5 | 9-16-20 N=36 | | | 3.25 | | | |
| 785.9 | 13 | | | | | | | | | |
| 784.9 | 14 | | | | | | | | | |
| 783.9 | 15 | S-6 | 1.5 | 9-13-19 N=32 | | | 4.0 | | | |
| 782.9 | 16 | | | | CL | | | | | |
| 781.9 | 17 | S-7 | 1.5 | 7-12-18 N=30 | | | 4.5 | | | |
| 780.9 | 18 | | | | | Grades with trace coarse to fine sand | | | | |
| 779.9 | 19 | | | | | | | | | |
| 778.9 | 20 | S-8 | 1.5 | 9-13-20 N=33 | | Grades with wet sand seams | 4.5 | | | |
| 777.9 | 21 | | | | | (21.0) | | | | Driller noted difficult drilling at 20' |
| 776.9 | 22 | S-9 | 0.9 | 18-50/5" | | Gray silty SAND; mostly coarse to fine sand, some silty fines, trace coarse to fine gravel, wet | | | | S-9, S-10: Sampler refusal; possible coarse gravel / COBBLE |
| 775.9 | 23 | | | | | | | | | |
| 774.9 | 24 | | | | SM | | | | | |
| 773.9 | 25 | S-10 | 0.9 | 19-50/5" | | | | | | |
| 772.9 | 26 | | | | | (26.0) | | | | |
| | | | | | | End of Boring | | | | Auger refusal at 26.0' due to possible coarse gravel / BOULDER |

PID = Photoionization Detector.
Detection <50 ppm except where noted.

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-9
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285687.1 E=13289991.9 (MI South ift)
Elevation: 811.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 33.0 ft.

Date Begin: 03/07/2024 Date End: 03/07/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 30.0 |
| Sampler | SPT | 2" | End | 37.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 810.5 | 1 | | | | | 5" HMA (0.4) | | | | Fill: 0' to 8.0' |
| 809.5 | 2 | S-1 | 1.3 | 6-9-12 N=21 | | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little fine gravel, few silty fines, moist, Fill | | | | |
| 808.5 | 3 | | | | | | | | | |
| 807.5 | 4 | | | | | | | | | |
| 806.5 | 5 | S-2 | 1.5 | 9-6-6 N=12 | SP-SM | | | | | Debris at 4' |
| 805.5 | 6 | | | | | | | | | |
| 804.5 | 7 | S-3 | 1.5 | 13-11-6 N=17 | | Grades with trace recycled asphalt at 6' | | | | Driller noted difficult drilling at 6' |
| 803.5 | 8 | | | | | (8.0) | | | | |
| 802.5 | 9 | | | | | Gray gravelley SAND; mostly coarse to fine sand, some coarse to fine gravel, trace silty fines, moist | | | | |
| 801.5 | 10 | S-4 | 0.5 | 50/8" | | | | | | S-4 to S-7: Poor recovery; possible coarse gravel / COBBLE |
| 800.5 | 11 | | | | | | | | | |
| 799.5 | 12 | S-5 | 0.7 | 36-12-11 N=23 | SP | | | | | Environmental composite soil sample from 0.5' to 30' |
| 798.5 | 13 | | | | | | | | | |
| 797.5 | 14 | | | | | | | | | |
| 796.5 | 15 | S-6 | 1.0 | 16-15-15 N=30 | | (14.5) | | | | |
| 795.5 | 16 | | | | | Gray lean CLAY; mostly clayey fines, few coarse to fine sand, few coarse to fine gravel, moist | | | | No environmental water sample due to limited groundwater quantity |
| 794.5 | 17 | S-7 | 0.0 | 7-17-22 N=39 | | | | | | |
| 793.5 | 18 | | | | | | | | | |
| 792.5 | 19 | | | | | | | | | |
| 791.5 | 20 | S-8 | 1.5 | 13-25-17 N=42 | | | 4.5+ | | | |
| 790.5 | 21 | | | | | | | | | |
| 789.5 | 22 | S-9 | 1.5 | 7-14-22 N=36 | CL | | 4.5+ | | | |
| 788.5 | 23 | | | | | | | | | |
| 787.5 | 24 | | | | | | | | | |
| 786.5 | 25 | S-10 | 1.5 | 8-19-22 N=41 | | | 4.5+ | | | |
| 785.5 | 26 | | | | | | | | | Driller noted difficult drilling at 25' |
| 784.5 | 27 | S-11 | 1.5 | 8-12-14 N=26 | | | 4.5 | | | |
| 783.5 | 28 | | | | | | | | | |
| 782.5 | 29 | | | | | | | | | |
| 781.5 | 30 | S-12 | 1.5 | 14-17-18 N=35 | | (29.8) | 4.5 | | | |
| 780.5 | 31 | | | | | Gray SILT with sand; mostly silty fines, few fine sand, wet with occasional clay lenses | | | | |
| 779.5 | 32 | S-13 | 1.5 | 22-27-28 N=55 | | | | 15.5 | | S-13: LBW = 86.6% |
| 778.5 | 33 | | | | | | | | | |
| 777.5 | 34 | | | | ML | | | | | |
| 776.5 | 35 | S-14 | 1.3 | 12-28-27 N=55 | | | | | | |
| 775.5 | 36 | | | | | | | | | |
| 774.5 | 37 | S-15 | 1.5 | 21-31-28 N=59 | | (37.0) | | | | |
| 773.5 | 38 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | |
| 772.5 | 39 | | | | CL | | | | | |
| 771.5 | 40 | S-16 | 1.5 | 4-14-33 N=47 | | | 2.0 | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-9
**Sheet:** 2 of 2

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 770.5 | 41 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | S-18, S-19, S-20: Sampler refusal; possible coarse gravel / COBBLE |
| 769.5 | 42 | S-17 | 1.5 | 7-18-25 N=43 | | | 2.5 | | | |
| 768.5 | 43 | | | | | Grades with occasional sand lenses from 38' to 42' | | | | |
| 767.5 | 44 | | | | | | | | | |
| 766.5 | 45 | S-18 | 0.9 | 20-50/5" | CL | | 3.0 | | | |
| 765.5 | 46 | | | | | | | | | |
| 764.5 | 47 | S-19 | 0.7 | 21-50/3" | | | 2.5 | | | |
| 763.5 | 48 | | | | | | | | | |
| 762.5 | 49 | | | | | Grades with trace fine sand at 48' | | | | |
| 761.5 | 50 | S-20 | 0.5 | 50/8" | | 50.0 | 2.5 | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-10
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285314.8 E=13289950.9 (MI South ift)
Elevation: 814.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with grout, patched pavement with cold patch.

Date Begin: 03/13/2024 Date End: 03/13/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21.0 |
| Sampler | SPT | 2" | End | 23.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 813.4 | 1 | | | | | 8" HMA, 6" Gravel Base | | | | Fill: 0' to 21.0' |
| 812.4 | 2 | S-1 | 1.3 | 8-11-11 N=22 | | 1.4 | | | | |
| 811.4 | 3 | | | | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few coarse to fine gravel, few clayey fines, moist, Fill | | | | Driller noted difficult drilling from 2' to 5' |
| 810.4 | 4 | | | | | | | | | S-2, S-4, S-7, S-8: Poor recovery; possible coarse gravel / COBBLE |
| 809.4 | 5 | S-2 | 0.5 | 6-19-13 N=32 | | | | | 240 | |
| 808.4 | 6 | | | | | | | | | |
| 807.4 | 7 | S-3 | 1.4 | 15-12-23 N=35 | | 7.0 | | | 238 | Environmental composite soil sample from 1.5' to 7.5' |
| 806.4 | 8 | | | | | | | | | |
| 805.4 | 9 | | | | | Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist, Fill | | | | |
| 804.4 | 10 | S-4 | 1.2 | 9-19-23 N=42 | | | | | | No environmental water sample due to limited groundwater quantity |
| 803.4 | 11 | | | | | | | | | |
| 802.4 | 12 | S-5 | 1.3 | 5-17-23 N=40 | | | | | | Driller noted difficult drilling from 10' to 20' |
| 801.4 | 13 | | | | | | | | | |
| 800.4 | 14 | | | | | | | | | |
| 799.4 | 15 | S-6 | 1.4 | 21-23-23 N=46 | SP | | | | | |
| 798.4 | 16 | | | | | | | | | |
| 797.4 | 17 | S-7 | 1.0 | 9-16-33 N=49 | | | | | | |
| 796.4 | 18 | | | | | | | | | |
| 795.4 | 19 | | | | | | | | | |
| 794.4 | 20 | S-8 | 0.6 | 9-15-19 N=34 | | | | | | |
| 793.4 | 21 | | | | | 21.0 | | | | |
| 792.4 | 22 | S-9 | 1.3 | 9-15-19 N=34 | SC | Gray clayey SAND; mostly fine sand, some clayey fines, wet | | | | |
| 791.4 | 23 | | | | | 23.0 | | | | |
| 790.4 | 24 | | | | | Gray sandy lean CLAY; mostly clayey fines, little fine sand, moist | 2.75 | | | |
| 789.4 | 25 | S-10 | 1.5 | 9-13-12 N=25 | | | | | | |
| 788.4 | 26 | | | | | | | | | |
| 787.4 | 27 | S-11 | 1.5 | 9-12-15 N=27 | | | 3.0 | | | |
| 786.4 | 28 | | | | CL | | | | | |
| 785.4 | 29 | | | | | | | | | |
| 784.4 | 30 | S-12 | 1.5 | 9-11-15 N=26 | | Grades with trace fine sand | 3.5 | | | |
| 783.4 | 31 | | | | | | | | | |
| 782.4 | 32 | S-13 | 1.5 | 5-4-6 N=10 | | | | 24.7 | | S-13: LBW = 98.2% |
| 781.4 | 33 | | | | | 33.0 | | | | |
| 780.4 | 34 | | | | | Gray SILT with sand; mostly silty fines, little fine sand, wet with occasional clay seams | | | | |
| 779.4 | 35 | S-14 | 1.5 | 4-7-9 N=16 | | | | | | |
| 778.4 | 36 | | | | | | | | | |
| 777.4 | 37 | S-15 | 1.5 | 4-7-13 N=20 | ML | | | | | |
| 776.4 | 38 | | | | | | | | | |
| 775.4 | 39 | | | | | | | | | |
| 774.4 | 40 | S-16 | 1.5 | 2-3-4 N=7 | | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| | LOG OF BORING | Project No.: 241082<br>Boring No.: SB-10<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 773.4 | 41 | | | | | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 772.4 | 42 | S-17 | 1.5 | 6-9-13 N=22 | | | | | | |
| 771.4 | 43 | | | | | | | | | |
| 770.4 | 44 | | | | | | | | | |
| 769.4 | 45 | S-18 | 1.5 | 4-7-9 N=16 | SM | | | | | |
| 768.4 | 46 | | | | | | | | | |
| 767.4 | 47 | S-19 | 1.5 | 5-9-7 N=16 | | Grades with trace coarse to fine gravel | | | | |
| 766.4 | 48 | | | | | | | | | |
| 765.4 | 49 | | | | | | | | | |
| 764.4 | 50 | S-20 | 1.5 | 8-12-17 N=29 | | 50.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-11
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=284994.6 E=13289974.9 (MI South ift)
Elevation: 812 ft Datum: NAVD 88 (GPS Observation)
Notes: Elevation estimated from Washtenaw County GIS contours

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 11.4 ft.

Date Begin: 03/20/2024 Date End: 03/20/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 20.0 |
| Sampler | SPT | 2" | End | 20.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 45.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 811.0 | 1 | | | | | 4 1/2" HMA, 5 1/2" Gravel Base 0.8 | | | | Fill: 0' to 17.5' |
| 810.0 | 2 | S-1 | 1.3 | 12-18-13 N=31 | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, few coarse to fine gravel, moist, Fill | | | | Environmental composite soil sample from 0.5' to 30' |
| 809.0 | 3 | | | | | 4.5 | | | | |
| 808.0 | 4 | S-2 | 1.4 | 4-7-6 N=13 | | Gray to brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist, Fill | | | | |
| 807.0 | 5 | | | | | | | | | |
| 806.0 | 6 | | | | | | | | | |
| 805.0 | 7 | S-3 | 1.3 | 8-11-15 N=26 | | | | | | Driller noted difficult drilling at 7' |
| 804.0 | 8 | | | | | | | | | |
| 803.0 | 9 | S-4 | 1.3 | 6-13-15 N=28 | | | | | | |
| 802.0 | 10 | | | | | | | | | |
| 801.0 | 11 | | | | SP | | | | | |
| 800.0 | 12 | S-5 | 1.4 | 5-7-19 N=26 | | | | | | |
| 799.0 | 13 | | | | | | | | | |
| 798.0 | 14 | S-6 | 1.5 | 5-12-19 N=31 | | | | | | |
| 797.0 | 15 | | | | | | | | | |
| 796.0 | 16 | | | | | | | | | |
| 795.0 | 17 | S-7 | 1.1 | 32-28-33 N=61 | | | | | | |
| 794.0 | 18 | | | | | 17.5 | | | | Driller noted difficult drilling from 17' to 22' |
| 793.0 | 19 | | | | | Brown poorly graded SAND with clay and gravel; mostly coarse to fine sand, little clayey fines with occasional clay seams, little coarse to fine gravel, moist | | | | |
| 792.0 | 20 | S-8 | 1.0 | 39-16-17 N=33 | | Grades wet at 20' | | | | S-8, S-9, S-10: Poor recovery; possible coarse gravel / COBBLE |
| 791.0 | 21 | | | | | | | | | |
| 790.0 | 22 | S-9 | 0.6 | 13-21-10 N=31 | | | | | | |
| 789.0 | 23 | | | | | | | | | |
| 788.0 | 24 | | | | SP-SC | | | | | |
| 787.0 | 25 | S-10 | 0.9 | 7-6-5 N=11 | | | | | | Environmental water sample at 25' |
| 786.0 | 26 | | | | | | | | | |
| 785.0 | 27 | S-11 | 1.5 | 14-12-13 N=25 | | | | | | Charged augers with water at 26.0' |
| 784.0 | 28 | | | | | | | | | |
| 783.0 | 29 | | | | | 29.0 | | | | *End water level may be influenced by charging augers |
| 782.0 | 30 | S-12 | 1.5 | 5-5-7 N=12 | | Gray lean CLAY; mostly clayey fines, trace fine sand, moist | 2.5 | | | |
| 781.0 | 31 | | | | CL | | | | | |
| 780.0 | 32 | S-13 | 1.5 | 4-6-8 N=14 | | 32.0 | 2.75 | | | |
| 779.0 | 33 | | | | | Gray SILT; mostly silty fines, trace fine sand, wet with occasional clay seams | | | | |
| 778.0 | 34 | | | | | | | | | |
| 777.0 | 35 | S-14 | 1.5 | 4-6-9 N=15 | ML | | | 23.6 | | S-14: LBW = 99.1% |
| 776.0 | 36 | | | | | | | | | |
| 775.0 | 37 | S-15 | 1.5 | 4-6-6 N=12 | | | | | | |
| 774.0 | 38 | | | | | Grades with occasional sand seams 38.0 | | | | |
| 773.0 | 39 | | | | | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 772.0 | 40 | S-16 | 1.5 | 4-8-15 N=23 | SM | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| | LOG OF BORING | Project No.: 241082<br>Boring No.: SB-11<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 771.0 | 41 | | | | | | | | | |
| 770.0 | 42 | S-17 | 1.5 | 5-2-18<br>N=20 | SM | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 769.0 | 43 | | | | | | | | | |
| 768.0 | 44 | | | | | | | | | |
| 767.0 | 45 | S-18 | 1.5 | 5-11-15<br>N=26 | | 45.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector.<br>Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-12
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285099.4 E=13289477.2 (MI South ift)
Elevation: 798.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 7.1 ft.

Date Begin: 03/12/2024 Date End: 03/12/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 10.0 |
| Sampler | SPT | 2" | End | 5.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 797.4 | 1 | | | | | 3" HMA, 5" Concrete 0.7 | | | | Fill: 0' to 5.5' |
| 796.4 | 2 | S-1 | 1.3 | 6-5-3 N=8 | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, moist, Fill | | | | S-2, S-3, S-4, S-8, S-9: Poor recovery; possible coarse gravel / COBBLE |
| 795.4 | 3 | | | | | | | | | |
| 794.4 | 4 | | | | | Grades with few coarse to fine gravel | | | | |
| 793.4 | 5 | S-2 | 0.1 | 3-2-1 N=3 | | 5.5 | | | | Environmental composite soil sample from 0.5' to 10' |
| 792.4 | 6 | | | | | | | | | |
| 791.4 | 7 | S-3 | 0.4 | 5-6-2 N=8 | | Brown poorly graded SAND; mostly coarse to fine sand, trace silty fines, moist with frequent lenses of fibrous peat | | | | Environmental water sample at 11' |
| 790.4 | 8 | | | | | | | | | |
| 789.4 | 9 | | | | | | | | | |
| 788.4 | 10 | S-4 | 0.3 | 3-2-3 N=5 | SP/PT | Grades with little gravel and occasional clay lenses | | | | |
| 787.4 | 11 | | | | | Grades wet at 10' | | | | |
| 786.4 | 12 | S-5 | 1.5 | 2-2-2 N=4 | | 13.0 | | 48.5 | | S-5: 7.7% Organics |
| 785.4 | 13 | | | | | | | | | |
| 784.4 | 14 | | | | | Light brown poorly graded SAND; mostly coarse to fine sand, trace silty fines, wet | | | | |
| 783.4 | 15 | S-6 | 1.5 | 3-2-3 N=5 | | | | | | |
| 782.4 | 16 | | | | | | | | | |
| 781.4 | 17 | S-7 | 1.5 | 6-2-3 N=5 | | | | | | Charged augers with water at 16.0' |
| 780.4 | 18 | | | | | | | | | *End water level may be influenced by charging augers |
| 779.4 | 19 | | | | | | | | | |
| 778.4 | 20 | S-8 | 0.8 | 3-3-3 N=6 | | | | | | |
| 777.4 | 21 | | | | | | | | | |
| 776.4 | 22 | S-9 | 1.2 | 3-2-2 N=4 | SP | | | | | |
| 775.4 | 23 | | | | | | | | | |
| 774.4 | 24 | | | | | | | | | |
| 773.4 | 25 | S-10 | 1.5 | 2-2-4 N=6 | | Grades without silty fines | | | | |
| 772.4 | 26 | | | | | | | | | |
| 771.4 | 27 | S-11 | 1.3 | 4-4-5 N=9 | | | | | | |
| 770.4 | 28 | | | | | | | | | |
| 769.4 | 29 | | | | | | | | | |
| 768.4 | 30 | S-12 | 1.5 | 3-4-5 N=9 | | 30.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

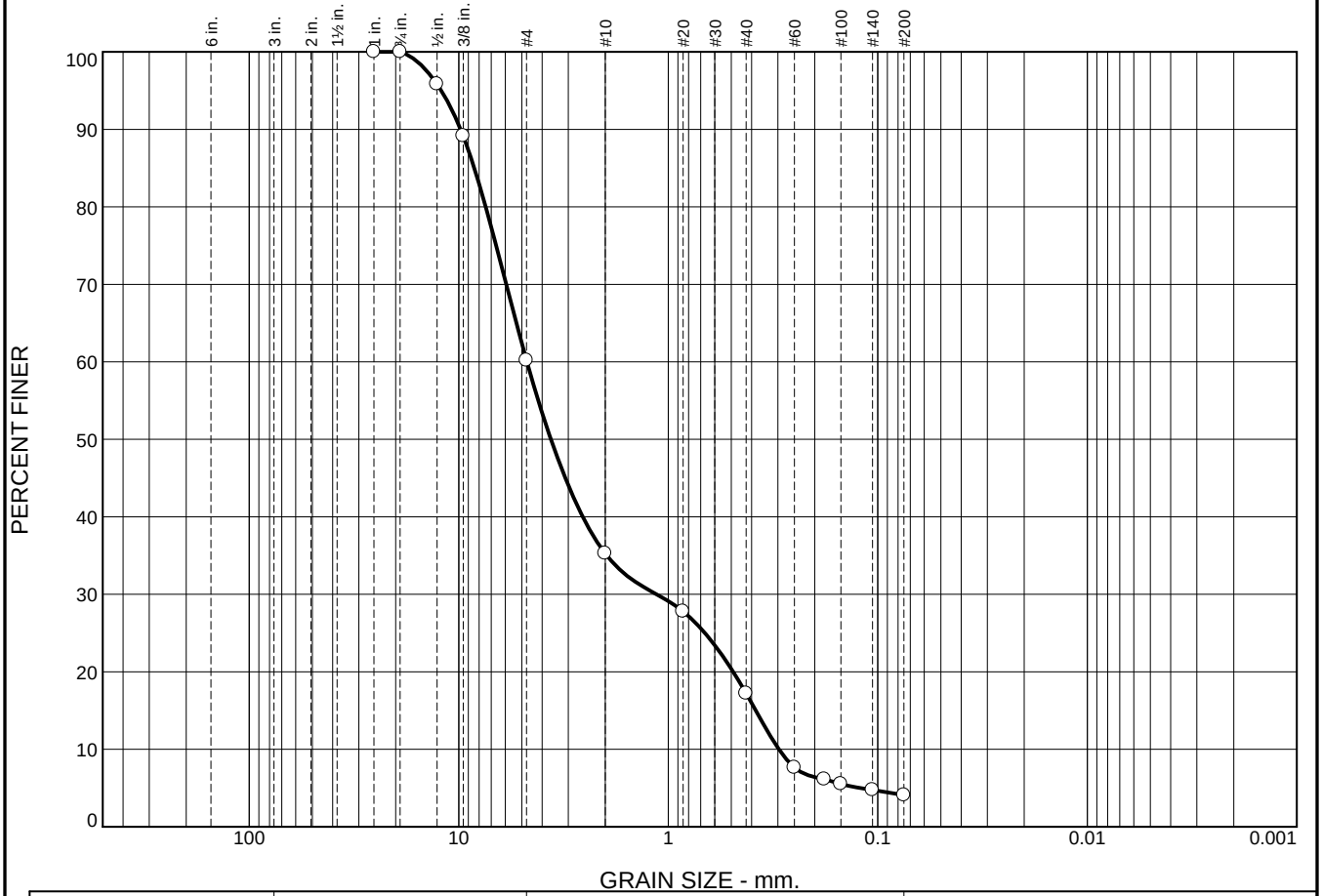
# SUMMARY OF LABORATORY TEST DATA

| Boring Number | Sample No.* | Sample Depth (ft) | Sample Description (USCS Symbol) | Natural Moisture Content (%) | Organic Content (%) | Loss By Wash (%) |
|---|---|---|---|---|---|---|
| SB-3 | S-6 | 13.5 – 15 | SP | 12.1 | | 4.1 |
| SB-7 | S-6 | 13.5 – 15 | SP-SM | 24.3 | | 6.9 |
| SB-9 | S-13 | 31 – 32.5 | ML | 15.5 | | 86.6 |
| SB-10 | S-13 | 31 – 32.5 | CL | 24.7 | | 98.2 |
| SB-11 | S-14 | 33.5 – 35 | ML | 23.6 | | 99.1 |
| SB-12 | S-5 | 11 – 12.5 | SP/PT | 48.5 | 7.7 | |

*S – Split Spoon Sample (ASTM D 1586)

PROJECT NO.: 241082

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 39.8 | 24.9 | 18.1 | 13.1 | 4.1 | |

| | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_C$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | 8.4322 | 4.7292 | 3.6326 | 1.1375 | 0.3821 | 0.2967 | 0.92 | 15.94 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly graded SAND with gravel | SP | |

**Project No.** 241082 **Client:** OHM Advisors

**Project:** Ann Arbor Miller Chapin Relief Sewer

○ **Depth:** 13.5-15 ft. **Sample Number:** SB-3 S-6

**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Ann Arbor, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 1.4 | 0.6 | 3.3 | 87.8 | 6.9 | |
| | | | | | | | | |
| | | | | | | | | |

| | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_C$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | 0.3008 | 0.2092 | 0.1887 | 0.1550 | 0.1163 | 0.0904 | 1.27 | 2.32 |
| | | | | | | | | | | |
| | | | | | | | | | | |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly graded SAND with silt | SP-SM | |

**Project No.** 241082 **Client:** OHM Advisors

**Project:** Ann Arbor Miller Chapin Relief Sewer

○ **Depth:** 13.5-15 ft. **Sample Number:** SB-7 S-6

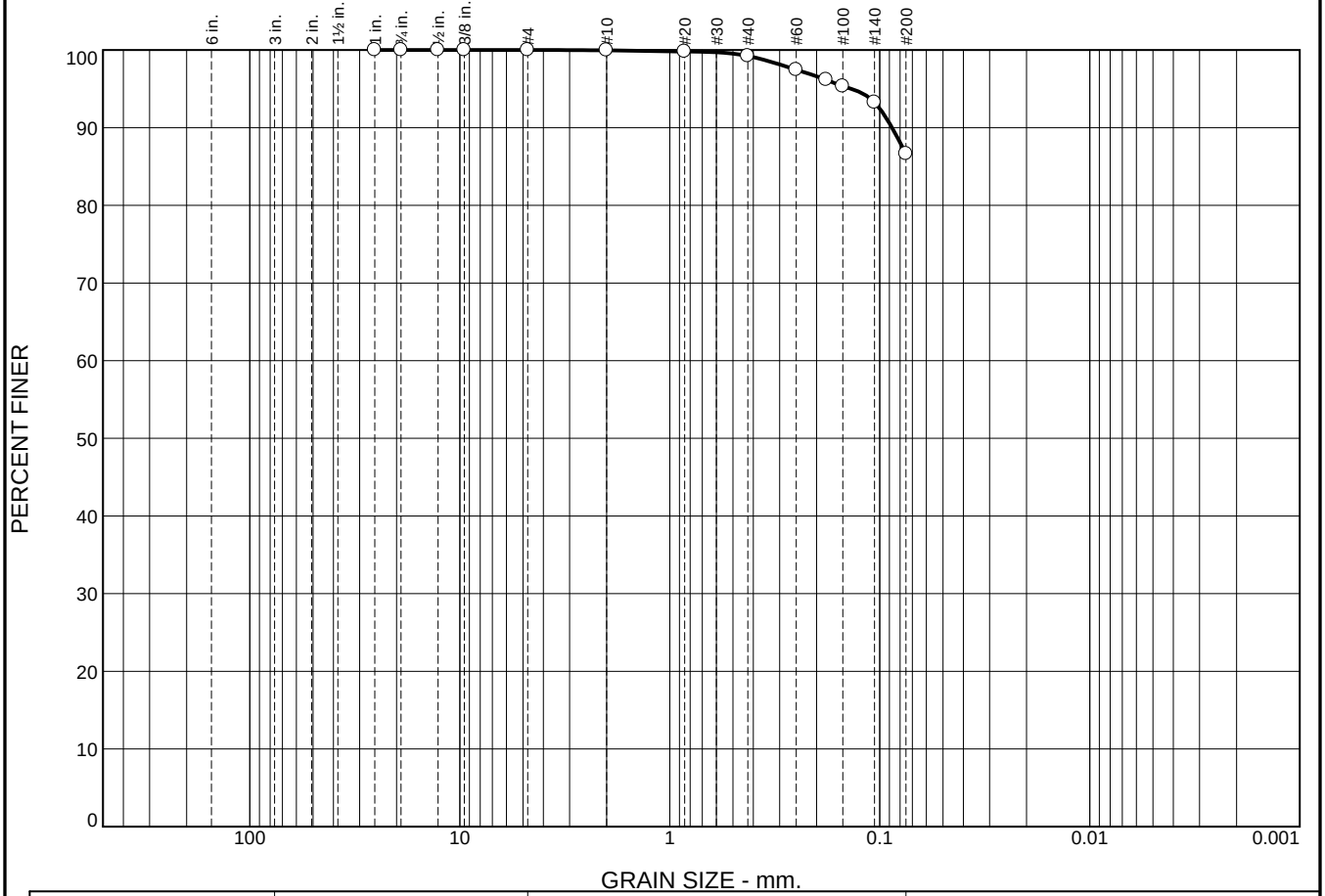
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Ann Arbor, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 12.6 | 86.6 | |

| | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_C$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | | | | | | | |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ SILT with sand | ML | |

**Project No.** 241082 **Client:** OHM Advisors

**Project:** Ann Arbor Miller Chapin Relief Sewer

○ **Depth:** 31-32.5 ft. **Sample Number:** SB-9 S-13

**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Ann Arbor, MI**

**Figure**

# TABLE 1

## 241082 - Miller Chapin Relief Sewer - Comparison of Soil Samples to EGLE Criteria

All criteria, unless otherwise noted, are expressed in units parts per billion (ppb). One ppb is equivalent to one micrograms per kilogram (µg/kg). Criteria with 6 or more digits are expressed in scientific notation. For example, 200,000 is presented as 2.0E+5. A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based value.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service (CAS) Number | Statewide Default Background Levels | Groundwater Protection | | | Contact | Soil Vapor | NOTES: | Sample Point (Depth) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Residential Drinking Water Protection Criteria (RDWP) | Nonresidential Drinking Water Protection Criteria (NRDWP) | Groundwater Surface Water Interface Protection Criteria (GSIP) | Nonresidential Direct Contact Criteria (NRDC) | Nonresidential Soil (VIAP) | | Sample Designation | SB-1 | SB-2 | SB-3 | SB-4 | SB-5 | SB-6 | SB-7 | SB-8 | SB-9 | SB-10 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | IA | IA | IA | IA | IA | IA | IA | IA | IA | IA | IA | IA |
| | | | | | | | | | | Date | 3/11/24 | 3/14/24 | 3/18/24 | 3/15/24 | 3/21/24 | 3/12/24 | 3/19/24 | 3/6/24 | 3/7/24 | 3/13/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 286096.8 | 285739.2 | 285410.0 | 285441.9 | 285450.4 | 285304.2 | 285106.6 | 285995.5 | 285687.1 | 285314.771 | 284994.6 | 285099.4 |
| | | | | | | | | | | Location E | 13289879.1 | 13289706.2 | 13289706.1 | 13289534.8 | 13289315.9 | 13289186.1 | 13289188.9 | 13290005.0 | 13289991.9 | 13289950.9 | 13289974.9 | 13289477.2 |
| | | | | | | | | | | Depth (ft) | 0.5 - 10 | 0.5 - 30 | 6 | 1 - 30 | 1 - 30 | 0.5 - 5 | 1.1 - 30 | 0.5 - 30 | 0.5 - 30 | 1.5 - 7.5 | 0.5 - 30 | 0.5 - 10 |
| Metals | Arsenic (B) | 7440382 | 5,800 | 4,600 | 4,600 | 4,600 | 37,000 | NA | | | **4,200** | 6,900 | 7,100 | **2,900** | 13,000 | 6,100 | **3,300** | **2,000** | **2,200** | 12,000 | 7,300 | **5,300** |
| | Barium (B) | 7440393 | 75,000 | 1.30E+06 | 1.30E+06 | (G) | 1.30E+08 | NA | | | **120,000** | **40,000** | **36,000** | **12,000** | **62,000** | **33,000** | **14,000** | **42,000** | **41,000** | **22,000** | **12,000** | **73,000** |
| | Cadmium (B) | 7440439 | 1,200 | 6,000 | 6,000 | (G,X) | 2.10E+06 | NA | | | **190** | **290** | **270** | **190** | **3,600** | **260** | **160** | **120** | **76** | **340** | **230** | **220** |
| | Chromium (Total) (B,H) | 7440473 | 18,000 (total) | | | | | | Data is for Total CR. Compare to Cr (VI) criteria | | **5,600** | **7,400** | **8,200** | **6,000** | **10,000** | **9,800** | **5,100** | **13,000** | **14,000** | **14,000** | **6,700** | **8,500** |
| | Chromium (VI) | 18540299 | NA | 30,000 | 30,000 | 3,300 | 9.20E+06 | NA | | | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | Copper (B) | 7440508 | 32,000 | 5.80E+06 | 5.80E+06 | (G) | 7.30E+07 | NA | | | **18,000** | **21,000** | **13,000** | **30,000** | **19,000** | **17,000** | **5,900** | **13,000** | **7,500** | **16,000** | **11,000** | **17,000** |
| | Lead (B) | 7439921 | 21,000 | 7.00E+05 | 7.00E+05 | (G,X) | 9.0E+5 (DD) | NA | | | **58,000** | **67,000** | **33,000** | **18,000** | **150,000** | **29,000** | **4,300** | **6,000** | **4,200** | **15,000** | **7,100** | **53,000** |
| | Mercury (Total) (B,Z) | Varies | 130 | 1,700 | 1,700 | 50 (M); 1.2 | 5.80E+05 | 390 nc | | | **78** | **69** | 170 | <50 | **120** | **89** | <50 | <50 | <50 | <50 | <50 | 140 |
| | Selenium (B) | 7782492 | 410 | 4,000 | 4,000 | 400 | 9.60E+06 | NA | | | <200 | 780 | <200 | <200 | 550 | <200 | <200 | **200** | **280** | <200 | **220** | 420 |
| | Silver (B) | 7440224 | 1,000 | 4,500 | 13,000 | 100 (M); 27 | 9.00E+06 | NA | | | <100 | **100** | **150** | <100 | 670 | <100 | <100 | <100 | <100 | <100 | <100 | 270 |
| | Zinc (B) | 7440666 | 47,000 | 2.40E+06 | 5.00E+06 | (G) | 6.30E+08 | NA | | | **41,000** | **7,000** | **36,000** | **22,000** | **65,000** | **41,000** | **18,000** | **29,000** | **19,000** | **35,000** | **30,000** | **54,000** |
| PNAs | Acenaphthene | 83329 | NA | 3.00E+05 | 8.80E+05 | 8,700 | 1.30E+08 | 3.60E+06 | | | <330 | <330 | <330 | <330 | <330 | **5,000** | <330 | <330 | <330 | <330 | <330 | <330 |
| | Acenaphthylene | 208968 | NA | 5,900 | 17,000 | ID | 5.20E+06 | DATA | | | <330 | <330 | <330 | <330 | <330 | 9,200 | <330 | <330 | <330 | <330 | <330 | <330 |
| | Anthracene | 120127 | NA | 41,000 | 41,000 | ID | 7.30E+08 | 2.2E+08 nc | | | <330 | <330 | **740** | <330 | <330 | **16,000** | <330 | <330 | <330 | <330 | <330 | <330 |
| | Benzo(a)anthracene (Q) | 56553 | NA | NLL | NLL | NLL | 80,000 | 1.1E+07 ca | | | <330 | **710** | **2,000** | <330 | <330 | **16,000** | <330 | <330 | <330 | <330 | <330 | <330 |
| | Benzo(a)pyrene (Q) | 50328 | NA | NLL | NLL | NLL | 8,000 | NA | | | <330 | **720** | **1,900** | <330 | <330 | 12,000 | <330 | <330 | <330 | <330 | <330 | <330 |
| | Benzo(b)fluoranthene (Q) | 205992 | NA | NLL | NLL | NLL | 80,000 | NA | | | <330 | **490** | **1,600** | <330 | <330 | **8,700** | <330 | <330 | <330 | <330 | <330 | <330 |
| | Benzo(g,h,i)perylene | 191242 | NA | NLL | NLL | NLL | 7.00E+06 | NA | | | <330 | **580** | **1,300** | <330 | <330 | **6,300** | <330 | <330 | <330 | <330 | <330 | <330 |
| | Benzo(k)fluoranthene (Q) | 207089 | NA | NLL | NLL | NLL | 8.00E+05 | NA | | | <330 | **510** | **1,500** | <330 | <330 | **9,500** | <330 | <330 | <330 | <330 | <330 | <330 |
| | Chrysene (Q) | 218019 | NA | NLL | NLL | NLL | 8.00E+06 | NA | | | <330 | **510** | **2,000** | <330 | <330 | **14,000** | <330 | <330 | <330 | <330 | <330 | <330 |
| | Dibenzo(a,h)anthracene (Q) | 53703 | NA | NLL | NLL | NLL | 8,000 | NA | | | <330 | <330 | **400** | <330 | <330 | **1,300** | <330 | <330 | <330 | <330 | <330 | <330 |
| | Fluoranthene | 206440 | NA | 7.30E+05 | 7.30E+05 | 5,500 | 1.30E+08 | NA | | | <330 | **2,000** | **5,100** | <330 | <330 | 40,000 | <330 | <330 | <330 | **950** | <330 | **340** |
| | Fluorene | 86737 | NA | 3.90E+05 | 8.90E+05 | 5,300 | 8.70E+07 | 8.3E+06 nc | | | <330 | <330 | **470** | <330 | <330 | 21,000 | <330 | <330 | <330 | <330 | <330 | <330 |
| | Indeno(1,2,3-cd)pyrene (Q) | 193395 | NA | NLL | NLL | NLL | 80,000 | NA | | | <330 | **640** | **1,300** | <330 | <330 | **6,600** | <330 | <330 | <330 | <330 | <330 | <330 |
| | 2-Methylnaphthalene | 91576 | NA | 57,000 | 1.70E+05 | 4,200 | 2.60E+07 | 30,000 nc | | | <330 | <330 | <330 | <330 | <330 | 19,000 | <330 | <330 | <330 | <330 | <330 | <330 |
| | Naphthalene | 91203 | NA | 35,000 | 1.00E+05 | 730 | 5.20E+07 | 1,900 ca | | | <330 | <330 | <330 | <330 | <330 | 34,000 | <330 | <330 | <330 | <330 | <330 | <330 |
| | Phenanthrene | 85018 | NA | 56,000 | 1.60E+05 | 2,100 | 5.20E+06 | 29,000 nc | | | <330 | **960** | **330** | <330 | <330 | 51,000 | <330 | <330 | <330 | <330 | <330 | <330 |
| | Pyrene | 129000 | NA | 4.80E+05 | 4.80E+05 | ID | 8.40E+07 | 4.4E+08 nc | | | <330 | **1,100** | **3,200** | <330 | <330 | **22,000** | <330 | <330 | <330 | **410** | <330 | <330 |
| | 1,1,1,2-Tetrachloroethane | 630206 | NA | 1,500 | 6,400 | ID | 2.2E+6 (C) | 91 (M) ca | | | | ND | ND | | | ND | | | | | | | |
| | 1,1,1-Trichloroethane | 71556 | NA | 4,000 | 4,000 | 1,800 | 1.0E+9 (C,D) | 7,500 (EE) st | | | | ND | ND | | | ND | | | | | | | |
| | 1,1,2,2-Tetrachloroethane | 79345 | NA | 170 | 700 | 1,600 (X) | 2.40E+05 | 77 ca | | | | ND | ND | | | ND | | | | | | | |
| | 1,1,2-Trichloroethane | 79005 | NA | 100 | 100 | 6,600 (X) | 8.40E+05 | 6.6 (M) nc | | | | ND | ND | | | ND | | | | | | | |
| | 1,1-Dichloroethane | 75343 | NA | 18,000 | 50,000 | 15,000 | 8.7E+7 (C) | 74 ca | | | | ND | ND | | | ND | | | | | | | |
| | 1,1-Dichloroethene (I) | 75354 | NA | 140 | 140 | 2,600 | 6.6E+5 (C) | 220 nc | | | | ND | ND | | | ND | | | | | | | |
| | 1,2,3-Trichlorobenzene | 87616 | NA | NA | NA | NA | NA | 15,000 nc | Only in EGLE Vapor Criteria | | | ND | ND | | | ND | | | | | | | |
| | 1,2,3-Trichloropropane | 96184 | NA | 840 | 2,400 | NA | 4.2E+6 (C) | 46 (M) nc | | | | ND | ND | | | ND | | | | | | | |
| | 1,2,3-Trimethylbenzene | 526738 | NA | NA | NA | NA | NA | 4,800 (JT) nc | Only in EGLE Vapor Criteria | | | ND | ND | | | ND | | | | | | | |
| | 1,2,4-Trichlorobenzene | 120821 | NA | 4,200 | 4,200 | 5,900 (X) | 5.8E+6 (C,DD) | 930 nc | | | | ND | ND | | | ND | | | | | | | |
| | 1,2,4-Trimethylbenzene (I) | 95636 | NA | 2,100 | 2,100 | 570 | 1.0E+8 (C) | 2,600 (JT) nc | | | | ND | ND | | | ND | | | | | | | |
| | 1,2-Dichlorobenzene | 95501 | NA | 14,000 | 14,000 | 280 | 6.3E+7 (C) | 26,000 nc | | | | ND | ND | | | ND | | | | | | | |
| | 1,2-Dichloroethane (I) | 107062 | NA | 100 | 100 | 7,200 (X) | 4.20E+05 | 23 (M) ca | | | | ND | ND | | | ND | | | | | | | |
| | 1,2-Dichloropropane (I) | 78875 | NA | 100 | 100 | 4,600 (X) | 6.6E+5 (C) | 37 (M) nc | | | | ND | ND | | | ND | | | | | | | |
| | 1,3,5-Trimethylbenzene (I) | 108678 | NA | 1,800 | 1,800 | 1,100 | 1.0E+8 (C) | 1,800 (JT) nc | | | | ND | ND | | | ND | | | | | | | |
| | 1,3-Dichlorobenzene | 541731 | NA | 170 | 480 | 680 | 6.6E+5 (C) | 180 nc | | | | ND | ND | | | ND | | | | | | | |
| | 1,3-Dichloropropene, cis- | 10061015 | NA | NA | NA | NA | NA | NA | Isomers not in EGLE Criteria | | | ND | ND | | | ND | | | | | | | |
| | 1,4-Dichlorobenzene | 106467 | NA | 1,700 | 1,700 | 360 | 1.90E+06 | 660 nc | | | | ND | ND | | | ND | | | | | | | |
| | 2-Butanone (MEK) (I) | 78933 | NA | 2.60E+05 | 7.60E+05 | 44,000 | 7.0E+8 (C,DD) | 3.7E+05 (DD) dev | | | | ND | ND | | | ND | | | | | | | |
| | 2-Hexanone | 591786 | NA | 20,000 | 58,000 | ID | 1.0E+8 (C) | 3,800 nc | | | | ND | ND | | | ND | | | | | | | |
| | 4-Isopropyltoluene | 99876 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | | | ND | ND | | | ND | | | | | | | |
| | 4-Methyl-2-pentanone (MIBK) (I) | 108101 | NA | 36,000 | 1.00E+05 | ID | 1.8E+8 (C) | 40,000 st | | | | ND | ND | | | ND | | | | | | | |
| | Acetone (I) | 67641 | NA | 15,000 | 42,000 | 34,000 | 7.30E+07 | 3.1E+06 (EE) st | | | | ND | ND | | | ND | | | | | | | |
| | Acrylonitrile (I) | 107131 | NA | 100 (M); 52 | 220 | 100 (M); 40 | 74,000 | 34 (M) ca | | | | ND | ND | | | ND | | | | | | | |
| | Benzene (I) | 71432 | NA | 100 | 100 | 4,000 (X) | 8.4E+5 (C) | 47 (M) ca | | | | ND | 68 | | | ND | | | | | | | |
| | Bromobenzene (I) | 108861 | NA | 550 | 1,500 | NA | 1.7E+6 (C) | 2,800 nc | | | | ND | ND | | | ND | | | | | | | |
| | Bromochloromethane | 74975 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | | | ND | ND | | | ND | | | | | | | |
| | Bromodichloromethane | 75274 | NA | 1,600 (W) | 1,600 (W) | ID | 4.90E+05 | 16 (M) nc | | | | ND | ND | | | ND | | | | | | | |

# TABLE 1

## 241082 - Miller Chapin Relief Sewer - Comparison of Soil Samples to Applicable Criteria

All criteria, unless otherwise noted, are expressed in units parts per billion (ppb). One ppb is equivalent to one micrograms per kilogram (µg/kg). Criteria with 6 or more digits are expressed in scientific notation. For example, 200,000 is presented as 2.0E+5. A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based value.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service (CAS) Number | Statewide Default Background Levels | Groundwater Protection | | | Contact | Soil Vapor | NOTES: | Sample Point (Depth) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Residential Drinking Water Protection Criteria (RDWP) | Nonresidential Drinking Water Protection Criteria (NRDWP) | Groundwater Surface Water Interface Protection Criteria (GSIP) | Nonresidential Direct Contact Criteria (NRDC) | Nonresidential Soil (VIAP) | | Sample Designation | SB-1 | SB-2 | SB-3 | SB-4 | SB-5 | SB-6 | SB-7 | SB-8 | SB-9 | SB-10 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | IA | IA | IA | IA | IA | IA | IA | IA | IA | IA | IA | IA |
| | | | | | | | | | | Date | 3/11/24 | 3/14/24 | 3/18/24 | 3/15/24 | 3/21/24 | 3/12/24 | 3/19/24 | 3/6/24 | 3/7/24 | 3/13/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 286096.8 | 285739.2 | 285410.0 | 285441.9 | 285450.4 | 285304.2 | 285106.6 | 285995.5 | 285687.1 | 285314.771 | 284994.6 | 285099.4 |
| | | | | | | | | | | Location E | 13289879.1 | 13289706.2 | 13289706.1 | 13289534.8 | 13289315.9 | 13289186.1 | 13289188.9 | 13290005.0 | 13289991.9 | 13289950.9 | 13289974.9 | 13289477.2 |
| | | | | | | | | | | Depth (ft) | 0.5 - 10 | 0.5 - 30 | 6 | 1 - 30 | 1 - 30 | 0.5 - 5 | 1.1 - 30 | 0.5 - 30 | 0.5 - 30 | 1.5 - 7.5 | 0.5 - 30 | 0.5 - 10 |
| VOCs | Bromoform | 75252 | NA | 1,600 (W) | 1,600 (W) | ID | 3.8E+6 (C) | 1,300 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromomethane | 74839 | NA | 200 | 580 | 100 | 1.00E+06 | 16 (M) nc | | | ND | ND | ND | | | ND | | | | | | |
| | Carbon disulfide | 75150 | NA | 16,000 | 46,000 | ID | 4.3E+7 (C,DD) | 920 nc | | | ND | ND | ND | | | ND | | | | | | |
| | Carbon tetrachloride | 56235 | NA | 100 | 100 | 760 (X) | 4.4E+5 (C) | 8.7 (M) ca | | | ND | ND | ND | | | ND | | | | | | |
| | Chlorobenzene | 108907 | NA | 2,000 | 2,000 | 500 | 1.4E+7 (C) | 1,400 nc | | | ND | ND | ND | | | ND | | | | | | |
| | Chloroethane | 75003 | NA | 8,600 | 34,000 | 22,000 (X) | 1.2E+7 (C) | 5,800 nc | | | ND | ND | ND | | | ND | | | | | | |
| | Chloroform | 67663 | NA | 1,600 (W) | 1,600 (W) | 7,000 | 5.5E+6 (C) | 7.4 (M) ca | | | ND | ND | ND | | | ND | | | | | | |
| | Chloromethane | 74873 | NA | 5,200 | 22,000 | ID | 7.4E+6 (C) | 120 (M) nc | | | ND | ND | ND | | | ND | | | | | | |
| | cis-1,2-Dichloroethene | 156592 | NA | 1,400 | 1,400 | 12,000 | 8.0E+6 (C) | 37 (M) nc | | | ND | ND | ND | | | ND | | | | | | |
| | Cyclohexane | 110827 | NA | NA | NA | NA | NA | 5,600 nc | Only in EGLE Vapor Criteria | | ND | ND | ND | | | ND | | | | | | |
| | Dibromochloromethane | 124481 | NA | 1,600 (W) | 1,600 (W) | ID | 5.00E+05 | 27 (M) ca | | | ND | ND | ND | | | ND | | | | | | |
| | Dibromochloropropane | 96128 | NA | 10 (M); 4.0 | 10 (M); 4.0 | ID | 20,000 (C) | DATA | | | ND | ND | ND | | | ND | | | | | | |
| | Dibromomethane | 74953 | NA | 1,600 | 4,600 | NA | 8.0E+6 (C) | 62 (M) nc | | | ND | ND | ND | | | ND | | | | | | |
| | Dichlorodifluoromethane | 75718 | NA | 95,000 | 2.70E+05 | ID | 1.7E+8 (C) | 220 (M) nc | | | ND | ND | ND | | | ND | | | | | | |
| | Diethyl ether | 60297 | NA | 200 | 200 | ID | 3.6E+8 (C) | 6,200 nc | | | ND | ND | ND | | | ND | | | | | | |
| | Diisopropyl ether | 108203 | NA | 600 | 1,700 (C) | ID | 3.0E+6 (C) | 2,300 (DD) dev | | | ND | ND | ND | | | ND | | | | | | |
| | Ethylbenzene (I) | 100414 | NA | 1,500 | 1,500 | 360 | 7.1E+7 (C) | 340 ca | | | ND | ND | ND | | | ND | | | | | | |
| | Ethylene dibromide (EDB) | 106934 | NA | 20 (M); 1.0 | 20 (M); 1.0 | 110 (X) | 430 | 2.1 (M) ca | | | ND | ND | ND | | | ND | | | | | | |
| | Ethyl-tert-butyl ether (ETBE) | 637923 | NA | 980 | 980 | ID | ID | DATA | | | ND | ND | ND | | | ND | | | | | | |
| | Iodomethane | 74884 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | | ND | ND | ND | | | ND | | | | | | |
| | Isopropyl benzene | 98828 | NA | 91,000 | 2.60E+05 | 3,200 | 8.0E+7 (C) | 110 (M) ca | | | ND | ND | ND | | | ND | | | | | | |
| | Methylene chloride | 75092 | NA | 100 | 100 | 30,000 (X) | 5.8E+6 (C) | 2,300 nc | | | ND | ND | ND | | | ND | | | | | | |
| | Methyl-tert-butyl ether (MTBE) | 1634044 | NA | 800 | 800 | 1.4E+5 (X) | 7.1E+6 (C) | 2,100 ca | | | ND | ND | ND | | | ND | | | | | | |
| | Naphthalene | 91203 | NA | 35,000 | 1.00E+05 | 730 | 5.20E+07 | 1,900 ca | | | ND | ND | ND | | | 550,000 | | | | | | |
| | n-Butylbenzene | 104518 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 9,800 nc | | | ND | ND | ND | | | ND | | | | | | |
| | n-Propylbenzene (I) | 103651 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 21,000 (DD) dev | | | ND | ND | ND | | | ND | | | | | | |
| | sec-Butylbenzene | 135988 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 66,000 (C) nc (49,000) | | | ND | ND | ND | | | ND | | | | | | |
| | Styrene | 100425 | NA | 2,700 | 2,700 | 2,100 (X) | 1.9E+6 (C) | 4,300 ca | | | ND | ND | ND | | | ND | | | | | | |
| | t-Amyl methyl ether (TAME) | 994058 | NA | 3,900 | 3,900 | NA | 9.5E+7 (C) | 600 nc | | | ND | ND | ND | | | ND | | | | | | |
| | t-Butyl alcohol | 75650 | NA | 78,000 | 2.20E+05 | NA | 3.9E+8 (C) | 57,000 nc | | | ND | ND | ND | | | ND | | | | | | |
| | t-Butylbenzene (I) | 98066 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 11 (M) nc | | | ND | ND | ND | | | ND | | | | | | |
| | Tetrachloroethylene | 127184 | NA | 100 | 100 | 1,200 (X) | 9.3E+5 (C) | 74 (EE) st | | | ND | ND | ND | | | ND | | | | | | |
| | Tetrahydrofuran | 109999 | NA | 1,900 | 5,400 | 2.2E+5 (X) | 9.50E+06 | 2.2E+05 nc | | | ND | ND | ND | | | ND | | | | | | |
| | Toluene (I) | 108883 | NA | 16,000 | 16,000 | 5,400 | 1.6E+8 (C) | 64,000 (EE) st | | | ND | ND | ND | | | ND | | | | | | |
| | trans-1,2-Dichloroethene | 156605 | NA | 2,000 | 2,000 | 30,000 (X) | 1.2E+7 (C) | 210 nc | | | ND | ND | ND | | | ND | | | | | | |
| | trans-1,4-Dichloro-2-butene | 110576 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | | ND | ND | ND | | | ND | | | | | | |
| | Trichloroethylene (TCE) | 79016 | NA | 100 | 100 | 4,000 (X) | 6.6E+5 (C,DD) | 4.0 (M) (DD) dev | | | 940 | 170 | ND | | | ND | | | | | | |
| | Trichlorofluoromethane | 75694 | NA | 52,000 | 1.50E+05 | NA | 2.6E+8 (C) | 340 nc | | | ND | ND | ND | | | ND | | | | | | |
| | Vinyl chloride | 75014 | NA | 40 | 40 | 260 (X) | 34,000 | 8.2 (M) ca | | | ND | ND | ND | | | ND | | | | | | |
| | Xylenes (I) | 1330207 | NA | 5,600 | 5,600 | 980 | 1.0E+9 (C,D) | 5,000 (J) nc | | | ND | ND | ND | | | ND | | | | | | |

# TABLE 2

## 241082 - Miller Chapin Relief Sewer - Comparison of Groundwater Samples to EGLE Criteria

All criteria, unless otherwise noted, are expressed in units of parts per billion (ppb). One ppb is equivalent to 1 microgram per liter (ug/L). A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based or solubility value, whichever is lower.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service Number | Groundwater Protection | | | Indoor Air | Water Solubility | Soil Vapor | NOTES: | Sample Point (Depth) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Residential Drinking Water Criteria (RDW) | Nonresidential Drinking Water Criteria (NRDW) | Groundwater Surface Water Interface Criteria (GSI) | Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria (GVIIC) | | Nonresidential Groundwater Not in Contact (VIAP) | | Sample Designation | SB-1 | SB-2 | SB-3 | SB-4 | SB-5 | SB-6 | SB-7 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | IA | IA | IA | IA | IA | IA | IA | IA | IA |
| | | | | | | | | | | Date | 3/11/24 | 3/14/24 | 3/18/24 | 3/15/24 | 3/21/24 | 3/12/24 | 3/19/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 286096.8 | 285739.2 | 285410.0 | 285441.9 | 285450.4 | 285304.2 | 285106.6 | 284,995 | 285,099 |
| | | | | | | | | | | Location E | 13289879.1 | 13289706.2 | 13289706.1 | 13289534.8 | 13289315.9 | 13289186.1 | 13289188.9 | 13,289,975 | 13,289,477 |
| | | | | | | | | | | Depth (ft) | 15 | 15 | 15 | 11 | 10 | 15 | 10 | 25 | 11 |
| Metals | Arsenic | 7440382 | 10 (A) | 10 (A) | 10 | NLV | NA | NA | | | 11 | 7 | 3 | 11 | 7 | 14 | 4 | 2 | 8 |
| | Barium (B) | 7440393 | 2,000 (A) | 2,000 (A) | (G) | NLV | NA | NA | | | 200 | 100 | <100 | 100 | <100 | 100 | <100 | <100 | <100 |
| | Cadmium (B) | 7440439 | 5.0 (A) | 5.0 (A) | (G,X) | NLV | NA | NA | | | <0.2 | <0.2 | <0.2 | 0.3 | <0.2 | <0.2 | 0.3 | <0.2 | <0.2 |
| | Chromium (III) (B,H) | 16065831 | 100 (A) | 100 (A) | (G,X) | NLV | NA | NA | Data is for Total CR. Compare to Cr (VI) criteria | | 8 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| | Chromium (VI) | 18540299 | 100 (A) | 100 (A) | 11 | NLV | NA | NA | | | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | Copper (B) | 7440508 | 1,000 (E) | 1,000 (E) | (G) | NLV | NA | NA | | | 13 | 7 | <4 | <4 | 7 | <4 | 15 | 58 | <4 |
| | Lead (B) | 7439921 | 4.0 (L) | 4.0 (L) | (G,X) | NLV | NA | NA | | | 22 | <3 | <3 | <3 | 3.0 | <3 | <3 | <3 | <3 |
| | Mercury (Total) (B,Z) | Varies | 2.0 (A) | 2.0 (A) | 0.0013 | 56 (S) | 56 | 3.7 nc | | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| | Selenium (B) | 7782492 | 50 (A) | 50 (A) | 5 | NLV | NA | NA | | | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| | Silver (B) | 7440224 | 34 | 98 | 0.2 (M); 0.06 | NLV | NA | NA | | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| | Zinc (B) | 7440666 | 2,400 | 5,000 (E) | (G) | NLV | NA | NA | | | 70 | <10 | <10 | <10 | <10 | <10 | <10 | 20 | <10 |
| PNAs | Acenaphthene | 83329 | 1,300 | 3,800 | 38 | 4,200 (S) | 4,240 | 3,900 (S) sol | | | NA | <5 | <5 | NA | <5 | <5 | <5 | <5 | <5 |
| | Acenaphthylene | 208968 | 52 | 150 | ID | 3,900 (S) | 3,930 | 710 (CC) nc | | | NA | <5 | 5 | NA | <5 | 18 | <5 | <5 | <5 |
| | Anthracene | 120127 | 43 (S) | 43 (S) | ID | 43 (S) | 43.4 | 43 (S) sol | | | NA | <5 | 5 | NA | <5 | <5 | <5 | <5 | <5 |
| | Benzo(a)anthracene (Q) | 56553 | 2.1 | 8.5 | ID | NLV | 9.4 | 9.4 (S) (MM) sol | | | NA | 5 | 13 | NA | <1 | <1 | <1 | <1 | <1 |
| | Benzo(a)pyrene (Q) | 50328 | 5.0 (A) | 5.0 (A) | ID | NLV | 1.62 | NA | | | NA | 5 | 14 | NA | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| | Benzo(b)fluoranthene (Q) | 205992 | 1.5 (S,AA) | 1.5 (S,AA) | ID | ID | 1.5 | NA | | | NA | 3 | 12 | NA | <1 | <1 | <1 | <1 | <1 |
| | Benzo(g,h,i)perylene | 191242 | 1.0 (M); 0.26 (S) | 1.0 (M); 0.26 (S) | ID | NLV | 0.26 | NA | | | NA | 3 | 9 | NA | <1 | <1 | <1 | <1 | <1 |
| | Benzo(k)fluoranthene (Q) | 207089 | 1.0 (M); 0.8 (S) | 1.0 (M); 0.8 (S) | NA | NLV | 0.8 | NA | | | NA | 4 | 10 | NA | <1 | <1 | <1 | <1 | <1 |
| | Chrysene (Q) | 218019 | 1.6 (S) | 1.6 (S) | ID | ID | 1.6 | NA | | | NA | 4 | 14 | NA | <1 | <1 | <1 | <1 | <1 |
| | Dibenz(a,h)anthracene (Q) | 53703 | 2.0 (M); 0.21 | 2.0 (M); 0.85 | ID | NLV | 2.49 | NA | | | NA | <2 | <2 | NA | <2 | <2 | <2 | <2 | <2 |
| | Fluoranthene | 206440 | 210 (S) | 210 (S) | 1.6 | 210 (S) | 206 | NA | | | NA | 12 | 33 | NA | <1 | <1 | <1 | <1 | <1 |
| | Fluorene | 86737 | 880 | 2,000 (S) | 12 | 2,000 (S) | 1,980 | 1,700 (S) sol | | | NA | <2 | <2 | NA | <5 | <5 | <5 | <5 | <5 |
| | Indeno(1,2,3-cd)pyrene (Q) | 193395 | 2.0 (M); 0.022 (S) | 2.0 (M); 0.022 (S) | ID | NLV | 0.022 | NA | | | NA | 3 | 9 | NA | <2 | <2 | <2 | <2 | <2 |
| | 2-Methylnaphthalene | 91576 | 260 | 750 | 19 | 25,000 (S) | 24,600 | 2,900 nc | | | NA | <5 | <5 | NA | <5 | <5 | <5 | <5 | <5 |
| | Naphthalene | 91203 | 520 | 1,500 | 11 | 31,000 (S) | 31,000 | 300 ca | | | NA | 9 | 5 | NA | <5 | 110 | <5 | <5 | <5 |
| | Phenanthrene | 85018 | 52 | 150 | 2.0 (M); 1.7 | 1,000 (S) | 1,000 | 420 nc | | | NA | 9 | 13 | NA | <2 | <2 | <2 | <2 | <2 |
| | Pyrene | 129000 | 140 (S) | 140 (S) | ID | 140 (S) | 135 | 140 (S) sol | | | NA | 7 | 12 | NA | <5 | <5 | <5 | <5 | <5 |
| | Acetone (I) | 67641 | 730 | 2,100 | 1,700 | 1.0E+9 (D,S) | 1.00E+09 | 4.0E+07 (FF) st | | | 86 | 69 | 53 | 50 | | 43 | ND | | 36 |
| | Acrylonitrile (I) | 107131 | 2.6 | 11 | 2.0 (M); 1.2 | 1.90E+05 | 7.50E+07 | 330 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Benzene (I) | 71432 | 5.0 (A) | 5.0 (A) | 200 (X) | 35,000 | 1.75E+06 | 66 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Bromobenzene (I) | 108861 | 18 | 50 | NA | 3.90E+05 | 4.13E+05 | 2,700 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Bromochloromethane | 74975 | | | | | | | Not in EGLE Criteria | | ND | ND | ND | ND | | ND | ND | | ND |
| | Bromodichloromethane | 75274 | 80 (A,W) | 80 (A,W) | ID | 37,000 | 6.74E+06 | 73 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Bromoform | 75252 | 80 (A,W) | 80 (A,W) | ID | 3.1E+6 (S) | 3.10E+06 | 6,200 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Bromomethane | 74839 | 10 | 29 | 5.0 (M); 4.2 | 9,000 | 1.45E+07 | 80 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 2-Butanone (MEK) (I) | 78933 | 13,000 | 38,000 | 2,200 | 2.4E+8 (S) | 2.40E+08 | 4.3E+06 (DD) dev | | | 24 | ND | 13 | ND | | ND | 9 | | ND |
| | Carbon disulfide (I,R) | 75150 | 800 | 2,300 | ID | 5.50E+05 | 1.19E+06 | 3,100 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Carbon tetrachloride | 56235 | 5.0 (A) | 5.0 (A) | 38 (X) | 2,400 | 7.93E+05 | 18 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Chlorobenzene (I) | 108907 | 100 (A) | 100 (A) | 25 | 4.7E+5 (S) | 4.72E+05 | 1,400 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Chloroethane | 75003 | 430 | 1,700 | 1,100 (X) | 5.7E+6 (S) | 5.74E+06 | 22,000 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Chloroform | 67663 | 80 (A,W) | 80 (A,W) | 350 | 1.80E+05 | 7.92E+06 | 32 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Chloromethane (I) | 74873 | 260 | 1,100 | ID | 45,000 | 6.34E+06 | 560 ca | | | 1 | ND | ND | ND | | ND | ND | | ND |
| | Cyclohexane | 110827 | | | | | | 8,100 (GW) nc | Only in EGLE Vapor Criteria | | ND | ND | ND | ND | | ND | ND | | ND |
| | Dibromochloromethane | 124481 | 80 (A,W) | 80 (A,W) | ID | 1.10E+05 | 2.60E+06 | 130 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Dibromochloropropane | 96128 | 0.2 (A) | 0.2 (A) | ID | 1,200 (S) | 1,230 | 2.1E-02 (M) (CC) | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,2-Dibromoethane Ethylene dibromide (EDB) | 106934 | 0.05 (A) | 0.05 (A) | 5.7 (X) | 15,000 | 4.20E+06 | 8.9 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Dibromomethane | 74953 | 80 | 230 | NA | ID | 1.10E+07 | 380 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,2-Dichlorobenzene | 95501 | 600 (A) | 600 (A) | 13 | 1.6E+5 (S) | 1.56E+05 | 16,000 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,3-Dichlorobenzene | 541731 | 6.6 | 19 | 28 | 41,000 | 1.11E+05 | 110 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,4-Dichlorobenzene | 106467 | 75 (A) | 75 (A) | 17 | 74,000 (S) | 73,800 | 400 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Dichlorodifluoromethane | 75718 | 1,700 | 4,800 | ID | 3.0E+5 (S) | 3.00E+05 | 410 (GW) nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,1-Dichloroethane | 75343 | 880 | 2,500 | 740 | 2.30E+06 | 5.06E+06 | 300 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,2-Dichloroethane (I) | 107062 | 5.0 (A) | 5.0 (A) | 360 (X) | 59,000 | 8.52E+06 | 97 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,1-Dichloroethylene (I) | 75354 | 7.0 (A) | 7.0 (A) | 130 | 1,300 | 2.25E+06 | 480 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | cis-1,2-Dichloroethylene | 156592 | 70 (A) | 70 (A) | 620 | 2.10E+05 | 3.50E+06 | 140 nc | | | ND | ND | ND | ND | | ND | ND | | ND |

# TABLE 2

## 241082 - Miller Chapin Relief Sewer - Comparison of Groundwater Samples to Applicable Criteria

All criteria, unless otherwise noted, are expressed in units of parts per billion (ppb). One ppb is equivalent to 1 microgram per liter (ug/L). A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based or solubility value, whichever is lower.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service Number | Groundwater Protection | | | Indoor Air | Water Solubility | Soil Vapor | NOTES: | Sample Point (Depth) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Residential Drinking Water Criteria (RDW) | Nonresidential Drinking Water Criteria (NRDW) | Groundwater Surface Water Interface Criteria (GSI) | Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria (GVIIC) | | Nonresidential Groundwater Not in Contact (VIAP) | | Sample Designation | SB-1 | SB-2 | SB-3 | SB-4 | SB-5 | SB-6 | SB-7 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | IA | IA | IA | IA | IA | IA | IA | IA | IA |
| | | | | | | | | | | Date | 3/11/24 | 3/14/24 | 3/18/24 | 3/15/24 | 3/21/24 | 3/12/24 | 3/19/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 286096.8 | 285739.2 | 285410.0 | 285441.9 | 285450.4 | 285304.2 | 285106.6 | 284,995 | 285,099 |
| | | | | | | | | | | Location E | 13289879.1 | 13289706.2 | 13289706.1 | 13289534.8 | 13289315.9 | 13289186.1 | 13289188.9 | 13,289,975 | 13,289,477 |
| | | | | | | | | | | Depth (ft) | 15 | 15 | 15 | 11 | 10 | 15 | 10 | 25 | 11 |
| VOCs | 1,2-Dichloropropane (I) | 78875 | 5.0 (A) | 5.0 (A) | 230 (X) | 36,000 | 2.80E+06 | 110 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Diethyl ether | 60297 | 10 (E) | 10 (E) | ID | 6.1E+7 (S) | 6.10E+07 | 53,000 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Diisopropyl ether DIPE | 108203 | 30 | 86 | ID | 8,000 (S) | 8,041 | 13,000 (DD) dev | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Ethylbenzene (I) | 100414 | 74 (E) | 74 (E) | 18 | 1.7E+5 (S) | 1.69E+05 | 170 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Ethyl-tert-butyl ether (ETBE) | 637923 | 49 (E) | 49 (E) | ID | 5.6E+6 (S) | 5.63E+06 | 580 (CC) nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 2-Hexanone | 591786 | 1,000 | 2,900 | ID | 8.70E+06 | 1.60E+07 | 29,000 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Isopropyl benzene | 98828 | 800 | 2,300 | 28 | 56,000 (S) | 56,000 | 36 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Iodomethane | 74884 | | | | | | | Not in EGLE Criteria | | ND | ND | ND | ND | | ND | ND | | ND |
| | Methylene chloride | 75092 | 5.0 (A) | 5.0 (A) | 1,500 (X) | 1.40E+06 | 1.70E+07 | 12,000 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 2-Methylnaphthalene | 91576 | 260 | 750 | 19 | 25,000 (S) | 2.46E+04 | 2,900 nc | | | NA | <5 | ND | NA | | <5 | ND | | <5 |
| | 4-Methyl-2-pentanone (MIBK) (I) | 108101 | 1,800 | 5,200 | ID | 2.0E+7 (S) | 2.00E+07 | 3.3E+05 st | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Methyl-tert-butyl ether (MTBE) | 1634044 | 40 (E) | 40 (E) | 7,100 (X) | 4.7E+7 (S) | 4.68E+07 | 17,000 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Naphthalene | 91203 | 520 | 1,500 | 11 | 31,000 (S) | 3.10E+04 | 300 ca | | | NA | **9** | ND | NA | | 110 | ND | | <5 |
| | n-Butylbenzene | 104518 | 80 | 230 | ID | ID | NA | 1,600 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | n-Propylbenzene (I) | 103651 | 80 | 230 | ID | ID | NA | 6,100 (DD) dev | | | ND | ND | ND | ND | | ND | ND | | ND |
| | p-Isopropyltoluene | 99876 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | | ND | ND | ND | ND | | ND | ND | | ND |
| | sec-Butylbenzene | 135988 | 80 | 230 | ID | ID | NA | 12,000 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Styrene | 100425 | 100 (A) | 100 (A) | 80 (X) | 3.1E+5 (S) | 3.10E+05 | 2,300 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | t-Butyl alcohol | 75650 | 3,900 | 11,000 | NA | 1.0E+9 (D,S) | 1.00E+09 | 7.5E+05 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | t-Amyl methyl ether (TAME) | 994058 | 190 (E) | 190 (E) | NA | 5.70E+05 | 2.64E+06 | 3,500 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | t-Butylbenzene (I) | 98066 | 80 | 230 | ID | ID | NA | 2.6 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,1,1,2-Tetrachloroethane | 630206 | 77 | 320 | ID | 96,000 | 1.10E+06 | 210 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,1,2,2-Tetrachloroethane | 79345 | 8.5 | 35 | 78 (X) | 77,000 | 2.97E+06 | 170 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Tetrachloroethylene | 127184 | 5.0 (A) | 5.0 (A) | 60 (X) | 1.70E+05 | 2.00E+05 | 130 (EE) st | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Tetrahydrofuran | 109999 | 95 | 270 | 11,000 (X) | 1.60E+07 | 1.00E+09 | 2.0E+06 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Toluene (I) | 108883 | 790 (E) | 790 (E) | 270 | 5.3E+5 (S) | 5.26E+05 | 59,00 (EE) st | | | ND | ND | ND | ND | | ND | ND | | ND |
| | trans-1,4-Dichloro-2-butene | 110576 | | | | | | | Not in EGLE Criteria | | ND | ND | ND | ND | | ND | ND | | ND |
| | trans-1,2-Dichloroethylene | 156605 | 100 (A) | 100 (A) | 1,500 (X) | 2.00E+05 | 6.30E+06 | 580 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,2,3-Trichlorobenzene | 87616 | NA | NA | NA | NA | NA | 2,600 nc | Rule 57 & EGLE Vapor Criteria | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,2,4-Trichlorobenzene | 120821 | 70 (A) | 70 (A) | 99 (X) | 3.0E+5 (S) | 3.00E+05 | 160 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,1,1-Trichloroethane | 71556 | 200 (A) | 200 (A) | 89 | 1.3E+6 (S) | 1.33E+06 | 19,000 (EE) st | | | ND | ND | **4** | ND | | ND | ND | | ND |
| | 1,1,2-Trichloroethane | 79005 | 5.0 (A) | 5.0 (A) | 330 (X) | 1.10E+05 | 4.42E+06 | 20 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Trichloroethylene (TCE) | 79016 | 5.0 (A) | 5.0 (A) | 200 (X) | 4,900 | 1.10E+06 | 10 (DD) dev | | | ND | ND | **3** | **4** | | ND | **1** | | ND |
| | Trichlorofluoromethane | 75694 | 2,600 | 7,300 | NA | 1.1E+6 (S) | 1.10E+06 | 560 (GW) nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,2,3-Trichloropropane | 96184 | 42 | 120 | NA | 18,000 | 1.90E+06 | 84 nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,2,3-Trimethylbenzene | 526738 | NA | NA | NA | NA | NA | 1,800 (JT) nc | Rule 57 & EGLE Vapor Criteria | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,2,4-Trimethylbenzene (I) | 95636 | 63 (E) | 63 (E) | 17 | 56,000 (S) | 55,890 | 990 (JT) nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | 1,3,5-Trimethylbenzene (I) | 108678 | 72 (E) | 72 (E) | 45 | 61,000 (S) | 61,150 | 690 (JT) nc | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Vinyl chloride | 75014 | 2.0 (A) | 2.0 (A) | 13 (X) | 13,000 | 2,760,000 | 18 ca | | | ND | ND | ND | ND | | ND | ND | | ND |
| | Xylenes (I) | 1330207 | 280 (E) | 280 (E) | 49 | 1.9E+5 (S) | 1.86E+05 | 3,000 (J) nc | | | ND | ND | ND | ND | | ND | ND | | ND |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/06/2024
Submit Date: 03/08/2024
Report Date: 03/18/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95691**
BA Sample ID: **CV02701**
Project Name: **AA Chapin**
Project Number: **241082**
Sample ID: **SB-8 (0-20')**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **2000** | ug/Kg | 100 | SW846 6020A | MH | 03/14/2024 |
| Total Barium | **42000** | ug/Kg | 1000 | SW846 6020A | MH | 03/14/2024 |
| Total Cadmium | **120** | ug/Kg | 50 | SW846 6020A | MH | 03/14/2024 |
| Total Chromium | **13000** | ug/Kg | 500 | SW846 6020A | MH | 03/14/2024 |
| Total Copper | **13000** | ug/Kg | 1000 | SW846 6020A | MH | 03/14/2024 |
| Total Lead | **6000** | ug/Kg | 1000 | SW846 6020A | MH | 03/14/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | AP | 03/12/2024 |
| Total Selenium | **200** | ug/Kg | 200 | SW846 6020A | MH | 03/14/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6020A | MH | 03/14/2024 |
| Total Zinc | **29000** | ug/Kg | 1000 | SW846 6020A | MH | 03/14/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | LT | 03/14/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/12/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/14/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 03/08/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/08/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |

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2105 Pless Drive
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Sample Date: 03/06/2024
Submit Date: 03/08/2024
Report Date: 03/18/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95691** Project Name: **AA Chapin**

BA Sample ID: **CV02701** Project Number: **241082**

Sample ID: **SB-8 (0-20')**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/08/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 03/08/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 03/08/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/08/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/08/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/08/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |

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BA Sample ID: **CV02701** Project Number: **241082**

Sample ID: **SB-8 (0-20')**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 03/08/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 03/08/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 03/08/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/06/2024 |
| %Solid | **90** | % | | ASTM D2216 | AP | 03/12/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/06/2024
Submit Date: 03/08/2024
Report Date: 03/18/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95691**
BA Sample ID: **CV02701**
Project Name: **AA Chapin**
Project Number: **241082**
Sample ID: **SB-8 (0-20')**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/18/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/07/2024
Submit Date: 03/08/2024
Report Date: 03/18/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95691**
Project Name: **AA Chapin**
BA Sample ID: **CV02702**
Project Number: **241082**
Sample ID: **SB-9 (0-30')**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **2200** | ug/Kg | 100 | SW846 6020A | MH | 03/14/2024 |
| Total Barium | **41000** | ug/Kg | 1000 | SW846 6020A | MH | 03/14/2024 |
| Total Cadmium | **76** | ug/Kg | 50 | SW846 6020A | MH | 03/14/2024 |
| Total Chromium | **14000** | ug/Kg | 500 | SW846 6020A | MH | 03/14/2024 |
| Total Copper | **7500** | ug/Kg | 1000 | SW846 6020A | MH | 03/14/2024 |
| Total Lead | **4200** | ug/Kg | 1000 | SW846 6020A | MH | 03/14/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | LT | 03/12/2024 |
| Total Selenium | **280** | ug/Kg | 200 | SW846 6020A | MH | 03/14/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6020A | MH | 03/14/2024 |
| Total Zinc | **19000** | ug/Kg | 1000 | SW846 6020A | MH | 03/14/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | LT | 03/14/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/12/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/15/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/14/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 03/08/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/08/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
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NELAC Accredited #176507

Sample Date: 03/07/2024
Submit Date: 03/08/2024
Report Date: 03/18/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95691** Project Name: **AA Chapin**

BA Sample ID: **CV02702** Project Number: **241082**

Sample ID: **SB-9 (0-30')**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/08/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 03/08/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 03/08/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/08/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/08/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/08/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/07/2024
Submit Date: 03/08/2024
Report Date: 03/18/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95691** Project Name: **AA Chapin**

BA Sample ID: **CV02702** Project Number: **241082**

Sample ID: **SB-9 (0-30')**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 03/08/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/08/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/08/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 03/08/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 03/08/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/06/2024 |
| %Solid | **95** | % | | ASTM D2216 | AP | 03/12/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/07/2024
Submit Date: 03/08/2024
Report Date: 03/18/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95691**
Project Name: **AA Chapin**
BA Sample ID: **CV02702**
Project Number: **241082**
Sample ID: **SB-9 (0-30')**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/18/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/11/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03138**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-1 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **4200** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Barium | **120000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Cadmium | **190** | ug/Kg | 50 | SW846 6020A | LT | 03/18/2024 |
| Total Chromium | **5600** | ug/Kg | 500 | SW846 6020A | LT | 03/18/2024 |
| Total Copper | **18000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Lead | **58000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Mercury | **78** | ug/Kg | 50 | SW846 7471A | LT | 03/20/2024 |
| Total Selenium | **Not detected** | ug/Kg | 200 | SW846 6020A | LT | 03/18/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Zinc | **41000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/18/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 03/19/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |

**Brighton Analytical LLC**
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Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/11/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03138**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-1 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/19/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 03/19/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 03/19/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/19/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/11/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839** Project Name: **Ann Arbor Chapin**

BA Sample ID: **CV03138** Project Number: **24108.2**

Sample ID: **SB-1 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 03/19/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 03/19/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 03/19/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/11/2024 |
| %Solid | **86** | % | | ASTM D2216 | AP | 03/18/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/11/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03138**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-1 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/20/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/11/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03139**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-1 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **11** | ug/L | 1 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Barium | **200** | ug/L | 100 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Chromium | **8** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Copper | **13** | ug/L | 4 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Lead | **22** | ug/L | 3 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | LT | 03/20/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Zinc | **70** | ug/L | 10 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 03/18/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **86** | ug/L | 20 | SW846 8260C | BY | 03/18/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 2-Butanone (MEK) | **24** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloromethane(Methyl Chloride) | **1** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 03/18/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/11/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03139**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-1 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 03/18/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |

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2105 Pless Drive
Brighton, Michigan 48114
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Sample Date: 03/11/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03139**
Project Number: **24108.2**
Sample ID: **SB-1 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 03/18/2024 |

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 3/20/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
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NELAC Accredited #176507

Sample Date: 03/14/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03140**
Project Number: **24108.2**
Sample ID: **SB-2 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **6900** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Barium | **40000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Cadmium | **290** | ug/Kg | 50 | SW846 6020A | LT | 03/18/2024 |
| Total Chromium | **7400** | ug/Kg | 500 | SW846 6020A | LT | 03/18/2024 |
| Total Copper | **21000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Lead | **67000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Mercury | **69** | ug/Kg | 50 | SW846 7471A | LT | 03/20/2024 |
| Total Selenium | **780** | ug/Kg | 200 | SW846 6020A | LT | 03/18/2024 |
| Total Silver | **100** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Zinc | **70000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)anthracene | **710** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)pyrene | **720** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(b)fluoranthene | **490** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(g,h,i)perylene | **580** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(k)fluoranthene | **510** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Chrysene | **510** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluoranthene | **2000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Indeno(1,2,3-cd)pyrene | **640** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Phenanthrene | **960** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Pyrene | **1100** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/18/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 03/19/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/14/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03140**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-2 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/19/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 03/19/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 03/19/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/19/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |

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Brighton, Michigan 48114
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Sample Date: 03/14/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03140**
Project Number: **24108.2**
Sample ID: **SB-2 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 03/19/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Trichloroethene | **940** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 03/19/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 03/19/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/14/2024 |
| %Solid | **84** | % | | ASTM D2216 | AP | 03/18/2024 |

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Sample Date: 03/14/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03140**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-2 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/20/2024

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Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03141**
Project Number: **24108.2**
Sample ID: **SB-2 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **7** | ug/L | 1 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Barium | **100** | ug/L | 100 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Chromium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Copper | **7** | ug/L | 4 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Lead | **Not detected** | ug/L | 3 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | LT | 03/20/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Zinc | **Not detected** | ug/L | 10 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 03/18/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(a)anthracene | **5** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(a)pyrene | **5** | ug/L | 0.2 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(b)fluoranthene | **3** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(g,h,i)perylene | **3** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(k)fluoranthene | **4** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Chrysene | **4** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/18/2024 |
| Fluoranthene | **12** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Indeno(1,2,3-cd)pyrene | **3** | ug/L | 2 | EPA 625/625.1 | RG | 03/18/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Naphthalene | **9** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Phenanthrene | **9** | ug/L | 2 | EPA 625/625.1 | RG | 03/18/2024 |
| Pyrene | **7** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/18/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **69** | ug/L | 20 | SW846 8260C | BY | 03/18/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |

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BA Report Number: **95839**
BA Sample ID: **CV03141**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-2 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 03/18/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |

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BA Report Number: **95839**
BA Sample ID: **CV03141**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-2 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 03/18/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 03/18/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/14/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03141**
Project Number: **24108.2**
Sample ID: **SB-2 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 3/20/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
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Sample Date: 03/15/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03142**
Project Number: **24108.2**
Sample ID: **SB-4 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **2900** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Barium | **12000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Cadmium | **190** | ug/Kg | 50 | SW846 6020A | LT | 03/18/2024 |
| Total Chromium | **6000** | ug/Kg | 500 | SW846 6020A | LT | 03/18/2024 |
| Total Copper | **30000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Lead | **18000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | LT | 03/20/2024 |
| Total Selenium | **Not detected** | ug/Kg | 200 | SW846 6020A | LT | 03/18/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Zinc | **22000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/18/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 03/19/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |

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Sample Date: 03/15/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839** Project Name: **Ann Arbor Chapin**

BA Sample ID: **CV03142** Project Number: **24108.2**

Sample ID: **SB-4 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/19/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 03/19/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 03/19/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/19/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |

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Sample Date: 03/15/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03142**
Project Number: **24108.2**
Sample ID: **SB-4 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 03/19/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 03/19/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 03/19/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/15/2024 |
| %Solid | **83** | % | | ASTM D2216 | AP | 03/18/2024 |

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Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03142**
Project Number: **24108.2**
Sample ID: **SB-4 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/20/2024

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Sample Date: 03/15/2024
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BA Report Number: **95839**
BA Sample ID: **CV03143**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-4 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **11** | ug/L | 1 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Barium | **100** | ug/L | 100 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Cadmium | **0.3** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Chromium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Copper | **Not detected** | ug/L | 4 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Lead | **Not detected** | ug/L | 3 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | LT | 03/20/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Zinc | **Not detected** | ug/L | 10 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 03/18/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **50** | ug/L | 20 | SW846 8260C | BY | 03/18/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 03/18/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |

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Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03143**
Project Number: **24108.2**
Sample ID: **SB-4 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 03/18/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/15/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03143**
Project Number: **24108.2**
Sample ID: **SB-4 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Trichloroethene | **4** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 03/18/2024 |

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 3/20/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
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e-mail:bai-brighton@sbcglobal.net
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Sample Date: 03/12/2024
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Report Date: 03/20/2024

To:
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253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03144**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-6 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **6100** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Barium | **33000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Cadmium | **260** | ug/Kg | 50 | SW846 6020A | LT | 03/18/2024 |
| Total Chromium | **9800** | ug/Kg | 500 | SW846 6020A | LT | 03/18/2024 |
| Total Copper | **17000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Lead | **29000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Mercury | **89** | ug/Kg | 50 | SW846 7471A | LT | 03/20/2024 |
| Total Selenium | **Not detected** | ug/Kg | 200 | SW846 6020A | LT | 03/18/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Zinc | **41000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **5000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Acenaphthylene | **9200** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Anthracene | **16000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)anthracene | **16000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)pyrene | **12000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(b)fluoranthene | **8700** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(g,h,i)perylene | **6300** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(k)fluoranthene | **9500** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Chrysene | **14000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Dibenzo(a,h)anthracene | **1300** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluoranthene | **40000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluorene | **21000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Indeno(1,2,3-cd)pyrene | **6600** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| 2-Methylnaphthalene | **19000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Naphthalene | **34000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Phenanthrene | **51000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Pyrene | **22000** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/18/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 85000 | SW846 8260C | BY | 03/19/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 11000 | SW846 8260C | BY | 03/19/2024 |
| Benzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |

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Sample Date: 03/12/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03144**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-6 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Bromoform | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 23000 | SW846 8260C | BY | 03/19/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Chloroethane | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| Chloroform | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 57000 | SW846 8260C | BY | 03/19/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 2300 | SW846 8260C | BY | 03/19/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 11000 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 23000 | SW846 8260C | BY | 03/19/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 11000 | SW846 8260C | BY | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |

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Sample Date: 03/12/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839** Project Name: **Ann Arbor Chapin**

BA Sample ID: **CV03144** Project Number: **24108.2**

Sample ID: **SB-6 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Naphthalene | **550000** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Styrene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 280000 | SW846 8260C | BY | 03/19/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| Toluene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 28000 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 5700 | SW846 8260C | BY | 03/19/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 4500 | SW846 8260C | BY | 03/19/2024 |
| Xylenes | **Not detected** | ug/Kg | 17000 | SW846 8260C | BY | 03/19/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/12/2024 |
| %Solid | **92** | % | | ASTM D2216 | AP | 03/18/2024 |

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To:
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Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03144**
Project Number: **24108.2**
Sample ID: **SB-6 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Elevated volatile dl due to sample matrix.

Released by Cynthia L Williams

Date 3/20/2024

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BA Report Number: **95839**
BA Sample ID: **CV03145**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-6 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **14** | ug/L | 1 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Barium | **100** | ug/L | 100 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Chromium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Copper | **Not detected** | ug/L | 4 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Lead | **Not detected** | ug/L | 3 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | LT | 03/20/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Zinc | **Not detected** | ug/L | 10 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 03/18/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Acenaphthylene | **18** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/18/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/18/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Naphthalene | **110** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/18/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/18/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **43** | ug/L | 20 | SW846 8260C | BY | 03/18/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |

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BA Report Number: **95839**
BA Sample ID: **CV03145**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-6 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 03/18/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/12/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03145**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-6 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 03/18/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 03/18/2024 |

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Sample Date: 03/12/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03145**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-6 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 3/20/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
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Sample Date: 03/13/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
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253 Dino Drive
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Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03146**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-10 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **12000** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Barium | **22000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Cadmium | **340** | ug/Kg | 50 | SW846 6020A | LT | 03/18/2024 |
| Total Chromium | **14000** | ug/Kg | 500 | SW846 6020A | LT | 03/18/2024 |
| Total Copper | **16000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Lead | **15000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | LT | 03/20/2024 |
| Total Selenium | **Not detected** | ug/Kg | 200 | SW846 6020A | LT | 03/18/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Zinc | **35000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluoranthene | **950** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Pyrene | **410** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/18/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 03/19/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |

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Sample Date: 03/13/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03146**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-10 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/19/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 03/19/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 03/19/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/19/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |

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Sample Date: 03/13/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839** Project Name: **Ann Arbor Chapin**

BA Sample ID: **CV03146** Project Number: **24108.2**

Sample ID: **SB-10 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 03/19/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 03/19/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 03/19/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/13/2024 |
| %Solid | **91** | % | | ASTM D2216 | AP | 03/18/2024 |

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Sample Date: 03/13/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To: Materials Testing Consultants
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Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03146**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-10 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/20/2024

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Brighton, Michigan 48114
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Sample Date: 03/12/2024
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Report Date: 03/20/2024

To:
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Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03147**
Project Number: **24108.2**
Sample ID: **SB-12 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **5300** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Barium | **73000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Cadmium | **220** | ug/Kg | 50 | SW846 6020A | LT | 03/18/2024 |
| Total Chromium | **8500** | ug/Kg | 500 | SW846 6020A | LT | 03/18/2024 |
| Total Copper | **17000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Lead | **53000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Total Mercury | **140** | ug/Kg | 50 | SW846 7471A | LT | 03/20/2024 |
| Total Selenium | **420** | ug/Kg | 200 | SW846 6020A | LT | 03/18/2024 |
| Total Silver | **270** | ug/Kg | 100 | SW846 6020A | LT | 03/18/2024 |
| Total Zinc | **54000** | ug/Kg | 1000 | SW846 6020A | LT | 03/18/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluoranthene | **340** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/19/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/18/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 03/19/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/12/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839** Project Name: **Ann Arbor Chapin**

BA Sample ID: **CV03147** Project Number: **24108.2**

Sample ID: **SB-12 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/19/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 03/19/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 03/19/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 03/19/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 03/19/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
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e-mail:bai-brighton@sbcglobal.net
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Sample Date: 03/12/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
Project Name: **Ann Arbor Chapin**
BA Sample ID: **CV03147**
Project Number: **24108.2**
Sample ID: **SB-12 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 03/19/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 03/19/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 03/19/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 03/19/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 03/19/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/12/2024 |
| %Solid | **83** | % | | ASTM D2216 | AP | 03/18/2024 |

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Brighton, Michigan 48114
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Sample Date: 03/12/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03147**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-12 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/20/2024

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BA Report Number: **95839**
BA Sample ID: **CV03148**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-12 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **8** | ug/L | 1 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Barium | **Not detected** | ug/L | 100 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Chromium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Copper | **Not detected** | ug/L | 4 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Lead | **Not detected** | ug/L | 3 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | LT | 03/20/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Total Zinc | **Not detected** | ug/L | 10 | EPA 200.8 rev5.4 | LT | 03/18/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | LT | 03/20/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 03/18/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/18/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/18/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/18/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/18/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/18/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/18/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **36** | ug/L | 20 | SW846 8260C | BY | 03/18/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |

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BA Report Number: **95839**
BA Sample ID: **CV03148**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-12 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 03/18/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |

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BA Report Number: **95839**
BA Sample ID: **CV03148**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-12 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 03/18/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 03/18/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 03/18/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 03/18/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/12/2024
Submit Date: 03/15/2024
Report Date: 03/20/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95839**
BA Sample ID: **CV03148**
Project Name: **Ann Arbor Chapin**
Project Number: **24108.2**
Sample ID: **SB-12 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 3/20/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/21/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03475** Project Number: **AA Chapin**

Sample ID: **SB-5 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **7** | ug/L | 1 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Barium | **Not detected** | ug/L | 100 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Chromium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Copper | **7** | ug/L | 4 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Lead | **3** | ug/L | 3 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | MH | 03/25/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Zinc | **Not detected** | ug/L | 10 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 03/25/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 03/22/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/25/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | RG | 03/26/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/21/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**
BA Sample ID: **CV03475** Project Number: **AA Chapin**
Sample ID: **SB-5 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | RG | 03/26/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |

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2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/21/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947**
Project Name: **241082**
BA Sample ID: **CV03475**
Project Number: **AA Chapin**
Sample ID: **SB-5 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | RG | 03/26/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | RG | 03/26/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
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NELAC Accredited #176507

Sample Date: 03/21/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947**
Project Name: **241082**
BA Sample ID: **CV03475**
Project Number: **AA Chapin**
Sample ID: **SB-5 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 3/28/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
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NELAC Accredited #176507

Sample Date: 03/21/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947**
BA Sample ID: **CV03476**
Project Name: **241082**
Project Number: **AA Chapin**
Sample ID: **SB-5 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **13000** | ug/Kg | 100 | SW846 6020A | LT | 03/22/2024 |
| Total Barium | **62000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Cadmium | **360** | ug/Kg | 50 | SW846 6020A | LT | 03/22/2024 |
| Total Chromium | **10000** | ug/Kg | 500 | SW846 6020A | LT | 03/22/2024 |
| Total Copper | **19000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Lead | **150000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Mercury | **120** | ug/Kg | 50 | SW846 7471A | MH | 03/25/2024 |
| Total Selenium | **550** | ug/Kg | 200 | SW846 6020A | LT | 03/22/2024 |
| Total Silver | **670** | ug/Kg | 100 | SW846 6020A | LT | 03/22/2024 |
| Total Zinc | **65000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 03/22/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 03/25/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/22/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | RG | 03/26/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |

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NELAC Accredited #176507

Sample Date: 03/21/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**
BA Sample ID: **CV03476** Project Number: **AA Chapin**
Sample ID: **SB-5 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | RG | 03/26/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | RG | 03/26/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | RG | 03/26/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | RG | 03/26/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/21/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03476** Project Number: **AA Chapin**

Sample ID: **SB-5 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | RG | 03/26/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | RG | 03/26/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | RG | 03/26/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/21/2024 |
| %Solid | **82** | % | | ASTM D2216 | MH | 03/22/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
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Sample Date: 03/21/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03476** Project Number: **AA Chapin**

Sample ID: **SB-5 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/28/2024

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2105 Pless Drive
Brighton, Michigan 48114
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Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03477** Project Number: **AA Chapin**

Sample ID: **SB-3 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **3** | ug/L | 1 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Barium | **Not detected** | ug/L | 100 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Chromium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Copper | **Not detected** | ug/L | 4 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Lead | **Not detected** | ug/L | 3 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | MH | 03/25/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Zinc | **Not detected** | ug/L | 10 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 03/25/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 03/22/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Acenaphthylene | **5** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Anthracene | **5** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(a)anthracene | **13** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(a)pyrene | **14** | ug/L | 0.2 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(b)fluoranthene | **12** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(g,h,i)perylene | **9** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(k)fluoranthene | **10** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Chrysene | **14** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| Fluoranthene | **33** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Indeno(1,2,3-cd)pyrene | **9** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Naphthalene | **5** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Phenanthrene | **13** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| Pyrene | **12** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/25/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **53** | ug/L | 20 | SW846 8260C | RG | 03/26/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |

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Sample Date: 03/18/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**
BA Sample ID: **CV03477** Project Number: **AA Chapin**
Sample ID: **SB-3 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 2-Butanone (MEK) | **13** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | RG | 03/26/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
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Sample Date: 03/18/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947**
BA Sample ID: **CV03477**
Project Name: **241082**
Project Number: **AA Chapin**
Sample ID: **SB-3 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | RG | 03/26/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1-Trichloroethane | **4** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Trichloroethene | **3** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | RG | 03/26/2024 |

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BA Report Number: **95947**
Project Name: **241082**
BA Sample ID: **CV03477**
Project Number: **AA Chapin**
Sample ID: **SB-3 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 3/28/2024

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2105 Pless Drive
Brighton, Michigan 48114
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Sample Date: 03/18/2024
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Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03478** Project Number: **AA Chapin**

Sample ID: **SB-3 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **7100** | ug/Kg | 100 | SW846 6020A | LT | 03/22/2024 |
| Total Barium | **36000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Cadmium | **270** | ug/Kg | 50 | SW846 6020A | LT | 03/22/2024 |
| Total Chromium | **8200** | ug/Kg | 500 | SW846 6020A | LT | 03/22/2024 |
| Total Copper | **13000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Lead | **33000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Mercury | **170** | ug/Kg | 50 | SW846 7471A | MH | 03/25/2024 |
| Total Selenium | **Not detected** | ug/Kg | 200 | SW846 6020A | LT | 03/22/2024 |
| Total Silver | **150** | ug/Kg | 100 | SW846 6020A | LT | 03/22/2024 |
| Total Zinc | **36000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 03/22/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 03/25/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Anthracene | **740** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(a)anthracene | **2000** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(a)pyrene | **1900** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(b)fluoranthene | **1600** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(g,h,i)perylene | **1300** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(k)fluoranthene | **1500** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Chrysene | **2000** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Dibenzo(a,h)anthracene | **400** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Fluoranthene | **5100** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Fluorene | **470** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Indeno(1,2,3-cd)pyrene | **1300** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Phenanthrene | **330** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Pyrene | **3200** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/22/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | RG | 03/26/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| Benzene | **68** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/18/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**
BA Sample ID: **CV03478** Project Number: **AA Chapin**
Sample ID: **SB-3 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | RG | 03/26/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | RG | 03/26/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | RG | 03/26/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | RG | 03/26/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
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Sample Date: 03/18/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03478** Project Number: **AA Chapin**

Sample ID: **SB-3 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | RG | 03/26/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Trichloroethene | **170** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | RG | 03/26/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | RG | 03/26/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/21/2024 |
| %Solid | **90** | % | | ASTM D2216 | MH | 03/22/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
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Sample Date: 03/18/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03478** Project Number: **AA Chapin**

Sample ID: **SB-3 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/28/2024

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Brighton, Michigan 48114
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Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03479** Project Number: **AA Chapin**

Sample ID: **SB-7 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **4** | ug/L | 1 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Barium | **Not detected** | ug/L | 100 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Cadmium | **0.3** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Chromium | **29** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Copper | **15** | ug/L | 4 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Lead | **Not detected** | ug/L | 3 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | MH | 03/25/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Zinc | **Not detected** | ug/L | 10 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 03/25/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 03/22/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/25/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | RG | 03/26/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |

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Sample Date: 03/19/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
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253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03479** Project Number: **AA Chapin**

Sample ID: **SB-7 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 2-Butanone (MEK) | **9** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | RG | 03/26/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |

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To:
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Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03479** Project Number: **AA Chapin**

Sample ID: **SB-7 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | RG | 03/26/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Trichloroethene | **1** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | RG | 03/26/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/19/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947**
Project Name: **241082**
BA Sample ID: **CV03479**
Project Number: **AA Chapin**
Sample ID: **SB-7 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 3/28/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
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Sample Date: 03/19/2024
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To:
Materials Testing Consultants
253 Dino Drive
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Ann Arbor, MI 48335

BA Report Number: **95947**
BA Sample ID: **CV03480**
Project Name: **241082**
Project Number: **AA Chapin**
Sample ID: **SB-7 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **3300** | ug/Kg | 100 | SW846 6020A | LT | 03/22/2024 |
| Total Barium | **14000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Cadmium | **160** | ug/Kg | 50 | SW846 6020A | LT | 03/22/2024 |
| Total Chromium | **5100** | ug/Kg | 500 | SW846 6020A | LT | 03/22/2024 |
| Total Copper | **5900** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Lead | **4300** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | MH | 03/25/2024 |
| Total Selenium | **Not detected** | ug/Kg | 200 | SW846 6020A | LT | 03/22/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6020A | LT | 03/22/2024 |
| Total Zinc | **18000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 03/22/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 03/25/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/22/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | RG | 03/26/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |

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Brighton, Michigan 48114
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Sample Date: 03/19/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**
BA Sample ID: **CV03480** Project Number: **AA Chapin**
Sample ID: **SB-7 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | RG | 03/26/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | RG | 03/26/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | RG | 03/26/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | RG | 03/26/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |

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Phone: (810)229-7575 (810)229-8650
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NELAC Accredited #176507

Sample Date: 03/19/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03480** Project Number: **AA Chapin**

Sample ID: **SB-7 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | RG | 03/26/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | RG | 03/26/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | RG | 03/26/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/21/2024 |
| %Solid | **90** | % | | ASTM D2216 | MH | 03/22/2024 |

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Sample Date: 03/19/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947**
Project Name: **241082**
BA Sample ID: **CV03480**
Project Number: **AA Chapin**
Sample ID: **SB-7 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/28/2024

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Brighton, Michigan 48114
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Sample Date: 03/20/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
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BA Report Number: **95947**
BA Sample ID: **CV03481**
Project Name: **241082**
Project Number: **AA Chapin**
Sample ID: **SB-11 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **2** | ug/L | 1 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Barium | **Not detected** | ug/L | 100 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Chromium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Copper | **58** | ug/L | 4 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Lead | **Not detected** | ug/L | 3 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | MH | 03/25/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Total Zinc | **20** | ug/L | 10 | EPA 200.8 rev5.4 | LT | 03/22/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 03/25/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 03/22/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 03/22/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 03/22/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 03/22/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/25/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | RG | 03/26/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |

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Sample Date: 03/20/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947**
BA Sample ID: **CV03481**
Project Name: **241082**
Project Number: **AA Chapin**
Sample ID: **SB-11 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | RG | 03/26/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail:bai-brighton@sbcglobal.net
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 03/20/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947**
BA Sample ID: **CV03481**
Project Name: **241082**
Project Number: **AA Chapin**
Sample ID: **SB-11 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | RG | 03/26/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | RG | 03/26/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | RG | 03/26/2024 |

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Brighton, Michigan 48114
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NELAC Accredited #176507

Sample Date: 03/20/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947**
Project Name: **241082**
BA Sample ID: **CV03481**
Project Number: **AA Chapin**
Sample ID: **SB-11 (Water)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 3/28/2024

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2105 Pless Drive
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Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03482** Project Number: **AA Chapin**

Sample ID: **SB-11 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **7300** | ug/Kg | 100 | SW846 6020A | LT | 03/22/2024 |
| Total Barium | **12000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Cadmium | **230** | ug/Kg | 50 | SW846 6020A | LT | 03/22/2024 |
| Total Chromium | **6700** | ug/Kg | 500 | SW846 6020A | LT | 03/22/2024 |
| Total Copper | **11000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Lead | **7100** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | MH | 03/25/2024 |
| Total Selenium | **220** | ug/Kg | 200 | SW846 6020A | LT | 03/22/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6020A | LT | 03/22/2024 |
| Total Zinc | **30000** | ug/Kg | 1000 | SW846 6020A | LT | 03/22/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 03/22/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 03/25/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 03/25/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | JG | 03/22/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | RG | 03/26/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |

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Sample Date: 03/20/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To:
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Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**
BA Sample ID: **CV03482** Project Number: **AA Chapin**
Sample ID: **SB-11 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | RG | 03/26/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | RG | 03/26/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | RG | 03/26/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | RG | 03/26/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | RG | 03/26/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |

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Sample Date: 03/20/2024
Submit Date: 03/21/2024
Report Date: 03/28/2024

To: Materials Testing Consultants
253 Dino Drive
Suite B
Ann Arbor, MI 48335

BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03482** Project Number: **AA Chapin**

Sample ID: **SB-11 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | RG | 03/26/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | RG | 03/26/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | RG | 03/26/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | RG | 03/26/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | RG | 03/26/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 03/21/2024 |
| %Solid | **95** | % | | ASTM D2216 | MH | 03/22/2024 |

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BA Report Number: **95947** Project Name: **241082**

BA Sample ID: **CV03482** Project Number: **AA Chapin**

Sample ID: **SB-11 (Soil)**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 3/28/2024

Brighton Analytical L.L.C.

# METHODS REGULATED BY NELAC AND OR STATE OF MICHIGAN

EPA 120.1-1982
EPA 150.1-1982
EPA 160.2-1979
EPA 160.3-1979
EPA 1631E-2002
EPA 200.7-1994
EPA 200.8 REV 5.4-1994
EPA 245.1-1994
EPA 245.2-1974
EPA 300.0R2.1-1993
EPA 310.1-1978
EPA 335.1-1974
EPA 335.4-1993
EPA 350.1 REV.2-1993
EPA 351.2 REV.2-1993
EPA 365.2-1971
EPA 405.1-1974
EPA 410.4 REV.2-1993
EPA 415.1-1974
EPA 420.1-1978
EPA 524.4-2013
EPA 608.3-2016
EPA 615-1993
EPA 624-1984
EPA 624.1-2016
EPA 625-1984
EPA 625.1-2016
SM 2540C-1997
SM 2540D-1997
SM 4500 H+B-1996
SM 4500 PE-1997
SM 5210B-1997
SM 5310B-1996
SM 9223B-1997
SW846 6010B-1996
SW846 6020A-2007
SW846 7471-1994
SW846 8081B-2007
SW846 8082A-2000
SW846 8151A-1996
SW846 8260C-2006
SW846 8270D-2007
SW846 9040B-1994

Brighton Analytical L.L.C.

# BRIGHTON ANALYTICAL, LLC

# QUALITY ASSURANCE/QUALITY CONTROL

# GC/MS

# VOLATILE METHOD 8260

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: March 26, 2024 Spike Std. ID: 4607.2.3 Inst./Detec: HP7890/5973 Vol 5

Laboratory ID: CV03371 Matrix: water Analyst: RG

CV03464 CV03465

| | Matrix Spike - Precision | | | Matrix Spike - Accuracy | | | | Sample background | LCS | Method Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| d4-1,2-Dichloroethane | 49.7 | 49.6 | 0.2 | 50 | 99 | 99 | 70-130 | 100% | 104% | 102% |
| d8-Toluene | 48.3 | 47.9 | 0.8 | 50 | 97 | 96 | 70-130 | 98% | 94% | 98% |
| 4-Bromofluorobenzene | 40.7 | 41.3 | 1.5 | 50 | 81 | 83 | 70-130 | 88% | 82% | 90% |
| COMPOUNDS | | | | | | | | | | |
| 1,1- Dichloroethene | 51.7 | 53.5 | 3.4 | 50 | 103% | 107% | 70-130 | <1 | 111% | <1 |
| 1,1- Dichloroethane | 49.6 | 51.9 | 4.5 | 50 | 99% | 104% | 70-130 | <1 | 106% | <1 |
| Chloroform | 53.8 | 56.0 | 4.0 | 50 | 108% | 112% | 70-130 | <1 | 114% | <1 |
| 1.2- Dichlororethane | 48.8 | 49.1 | 0.6 | 50 | 98% | 98% | 70-130 | <1 | 105% | <1 |
| Carbon tetrachloride | 51.5 | 52.1 | 1.2 | 50 | 103% | 104% | 70-130 | <1 | 110% | <1 |
| 1,2- Dichloropropane | 45.3 | 45.5 | 0.4 | 50 | 91% | 91% | 70-130 | <1 | 94% | <1 |
| cis- 1,3 -dichloropropene | 38.7 | 37.9 | 2.1 | 50 | 77% | 76% | 70-130 | <1 | 97% | <1 |
| Trichloroethene | 51.1 | 50.4 | 1.4 | 50 | 102% | 101% | 70-130 | <1 | 105% | <1 |
| Dibromochloromethane | 46.3 | 45.8 | 1.1 | 50 | 93% | 92% | 70-130 | <1 | 102% | <1 |
| 1,1,2- Trichloroethane | 48.2 | 47.1 | 2.3 | 50 | 96% | 94% | 70-130 | <1 | 100% | <1 |
| Tetrachloroethane | 48.2 | 47.9 | 0.6 | 50 | 96% | 96% | 70-130 | <1 | 104% | <1 |
| 1,1,2,2 -Tetrachloroethane | 46.0 | 44.5 | 3.3 | 50 | 92% | 89% | 70-130 | <1 | 99% | <1 |
| Chlorobenzene | 43.4 | 44.9 | 3.4 | 50 | 87% | 90% | 70-130 | <1 | 93% | <1 |
| 1,3- Dichlorobenzene | 44.4 | 46.4 | 4.4 | 50 | 89% | 93% | 70-130 | <1 | 100% | <1 |
| 1,4- Dichlorobenzene | 45.7 | 47.9 | 4.7 | 50 | 91% | 96% | 70-130 | <1 | 97% | <1 |
| 1,2-Dichlorobenzene | 46.5 | 48.9 | 5.0 | 50 | 93% | 98% | 70-130 | <1 | 99% | <1 |

ug/L is equivalent to ppb

Comments: _____

# GC/MS

# VOLATILE METHOD 8260

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: March 26, 2024 Spike Std. ID: 4607.2.3 Inst./Detec: HP7890/5973 Vol 5

Laboratory ID: CV03476 Matrix: soil Analyst: RG

CV03464 CV03465

| | Matrix Spike - Precision | | | Matrix Spike - Accuracy | | | | Sample background | LCS | Method Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| d4-1,2-Dichloroethane | 48.9 | 49.2 | 0.6 | 50 | 98 | 98 | 70-130 | 98% | 104% | 102% |
| d8-Toluene | 46.9 | 46.1 | 1.7 | 50 | 94 | 92 | 70-130 | 94% | 94% | 98% |
| 4-Bromofluorobenzene | 39.6 | 39.9 | 0.8 | 50 | 79 | 80 | 70-130 | 85% | 82% | 90% |
| **COMPOUNDS** | | | | | | | | | | |
| 1,1- Dichloroethene | 51.2 | 50.4 | 1.6 | 50 | 102% | 101% | 70-130 | <1 | 111% | <1 |
| 1,1- Dichloroethane | 48.4 | 48.4 | 0.0 | 50 | 97% | 97% | 70-130 | <1 | 106% | <1 |
| Chloroform | 50.6 | 51.9 | 2.5 | 50 | 101% | 104% | 70-130 | <1 | 114% | <1 |
| 1.2- Dichlororethane | 45.5 | 47.9 | 5.1 | 50 | 91% | 96% | 70-130 | <1 | 105% | <1 |
| Carbon tetrachloride | 44.4 | 46.1 | 3.8 | 50 | 89% | 92% | 70-130 | <1 | 110% | <1 |
| 1,2- Dichloropropane | 40.3 | 43.4 | 7.4 | 50 | 81% | 87% | 70-130 | <1 | 94% | <1 |
| cis- 1,3 -dichloropropene | 39.3 | 41.7 | 5.9 | 50 | 79% | 83% | 70-130 | <1 | 97% | <1 |
| Trichloroethene | 45.0 | 47.9 | 6.2 | 50 | 90% | 96% | 70-130 | <1 | 105% | <1 |
| Dibromochloromethane | 40.1 | 42.1 | 4.9 | 50 | 80% | 84% | 70-130 | <1 | 102% | <1 |
| 1,1,2- Trichloroethane | 41.7 | 44.9 | 7.4 | 50 | 83% | 90% | 70-130 | <1 | 100% | <1 |
| Tetrachloroethane | 44.9 | 46.1 | 2.6 | 50 | 90% | 92% | 70-130 | <1 | 104% | <1 |
| 1,1,2,2 -Tetrachloroethane | 42.2 | 45.9 | 8.4 | 50 | 84% | 92% | 70-130 | <1 | 99% | <1 |
| Chlorobenzene | 39.0 | 41.2 | 5.6 | 50 | 78% | 82% | 70-130 | <1 | 93% | <1 |
| 1,3- Dichlorobenzene | 46.6 | 49.0 | 5.0 | 50 | 93% | 98% | 70-130 | <1 | 100% | <1 |
| 1,4- Dichlorobenzene | 48.2 | 50.2 | 4.1 | 50 | 96% | 100% | 70-130 | <1 | 97% | <1 |
| 1,2-Dichlorobenzene | 46.5 | 51.2 | 9.6 | 50 | 93% | 102% | 70-130 | <1 | 99% | <1 |

ug/L is equivalent to ppb

Comments: _____

# ICP-MS
# EPA METHOD 6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 03/22/2024 Standard ID: 011224 S Batch: 03/21/2024 S1

Matrix Spike Lab ID: CV03239 Matrix: Soil Analyst: LT

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/Kg) | Matrix Spike Dup (ug/Kg) | RPD (%) | Spk Conc (ug/Kg) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/Kg) | Method Blk (ug/Kg) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Sodium | 1020478 | 960571 | 6.0 | 1000000 | 96.2 | 90.3 | 58032 | <10000 | 99.9 | 98.1 |
| Magnesium | 2143835 | 2007752 | 6.6 | 1000000 | 97.5 | 83.9 | 1168917 | <1000 | 94.8 | 96.5 |
| Aluminium | 2375997 | 2211887 | 7.2 | 100000 | 95.1 | 0.0 | 2280897 | <500 | 92.9 | 93.2 |
| Potassium | 1119212 | 1067437 | 4.7 | 1000000 | 109.9 | 104.7 | 20512 | <1000 | 94.1 | 95.0 |
| Calcium | 16149995 | 14817242 | 8.6 | 1000000 | 192.5 | 59.2 | 14225203 | <1000 | 91.8 | 93.7 |
| Chromium | 88653 | 82558 | 7.1 | 100000 | 85.4 | 79.3 | 3211 | <100 | 89.3 | 94.7 |
| Manganese | 113877 | 105701 | 7.4 | 100000 | 84.6 | 76.5 | 29235 | <500 | 89.2 | 94.3 |
| Iron | 4684147 | 4387972 | 6.5 | 1000000 | 85.6 | 56.0 | 3828401 | <200 | 87.2 | 92.8 |
| Copper | 101120 | 93195 | 8.2 | 100000 | 89.0 | 81.1 | 12085 | <100 | 91.8 | 99.7 |
| Zinc | 99567 | 92256 | 7.6 | 100000 | 87.3 | 80.0 | 12274 | <100 | 91.6 | 94.3 |
| Arsenic | 93049 | 85419 | 8.6 | 100000 | 90.7 | 83.1 | 2354 | <100 | 92.2 | 96.1 |
| Selenium | 91561 | 84858 | 7.6 | 100000 | 90.0 | 83.3 | 1605 | <100 | 91.4 | 94.0 |
| Silver | 846.00 | 777.00 | 8.5 | 1000 | 75.0 | 68.1 | 96 | <100 | 90.2 | 104.7 |
| Cadmium | 91537 | 85215 | 7.2 | 100000 | 90.5 | 84.2 | 1031 | <50 | 87.8 | 104.9 |
| Barium | 125732 | 118908 | 5.6 | 100000 | 90.5 | 83.7 | 35250 | <100 | 89.3 | 96.2 |
| Lead | 100248 | 92051 | 8.5 | 100000 | 92.8 | 84.6 | 7481 | <100 | 90.3 | 102.5 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: _____

# GC/MS
# SEMI-VOLATILE METHOD (PNA) 8270

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 3/25/2024 Std ID: #4420/#4435 Inst./Detec: HP5973/GC-MS

Laboratory ID#: CV03482 Matrix: SOIL Ext. Date: 3/22/24 JC Analyst: RG

| SURROGATES | Matrix Spike-Precision* | | | Matrix Spike - Accuracy | | | | LCS-%recovery | |
|---|---|---|---|---|---|---|---|---|---|
| | Spike 1 | Spike 2 | RPD | Spk Conc ug/L | % Recovery | Range (%) | Sample surr.recov. | LCS-MStd | Method Blank |
| Nitrobenzene-d5 | 90 | 88 | 2.2 | 100 | 89 | 35-125 | 69 | 101 | 40 |
| 2-Fluorobiphenyl | 91 | 86 | 5.6 | 100 | 89 | 36-123 | 72 | 108 | 80 |
| Terphenyl-d14 | 110 | 106 | 3.7 | 100 | 108 | 22-138 | 82 | 134 | 114 |
| **COMPOUNDS** | | | | | | | Background | | |
| Naphthalene | 47.8 | 46.3 | 3.2 | 50 | 94 | 34-161 | ND | 100 | <330 |
| Acenaphthylene | 57.7 | 56.9 | 1.4 | 50 | 115 | 40-183 | ND | 124 | <330 |
| Acenaphthene | 56.9 | 56.2 | 1.2 | 50 | 113 | 43-169 | ND | 124 | <330 |
| Fluorene | 57.9 | 59.4 | 2.6 | 50 | 117 | 32-192 | ND | 127 | <330 |
| Phenanthrene | 55.8 | 55.5 | 0.5 | 50 | 111 | 33-186 | ND | 118 | <330 |
| Anthracene | 53.8 | 54.0 | 0.4 | 50 | 108 | 57-140 | ND | 115 | <330 |
| Fluoranthene | 62.6 | 62.2 | 0.6 | 50 | 125 | 51-198 | ND | 130 | <330 |
| Pyrene | 64.7 | 61.7 | 4.7 | 50 | 126 | 61-148 | ND | 144 | <330 |
| Benzo[a]anthracene | 63.7 | 61.4 | 3.7 | 50 | 125 | 40-180 | ND | 130 | <330 |
| Chrysene | 52.8 | 51.9 | 1.7 | 50 | 105 | 12-161 | ND | 111 | <330 |
| Benzo[b]fluoranthene | 55.8 | 55.5 | 0.5 | 50 | 111 | 34-160 | ND | 107 | <330 |
| Benzo[k]fluorathene | 55.6 | 57.6 | 3.5 | 50 | 113 | 43-159 | ND | 112 | <330 |
| Benzo[a]pyrene | 61.7 | 62.0 | 0.5 | 50 | 124 | 44-182 | ND | 124 | <330 |
| Indeno[1,2,3-cd]pyrene | 49.4 | 47.9 | 3.1 | 50 | 97 | 23-164 | ND | 106 | <330 |
| Dibenzo (a,h) anthracene | 48.7 | 47.8 | 1.9 | 50 | 97 | 8-169 | ND | 106 | <330 |
| Benzo[g,h,i]perylene | 49.4 | 47.6 | 3.7 | 50 | 97 | 35-165 | ND | 108 | <330 |

* Matrix Spike Precision +/-20 Relative Percent Difference.

Comments:

# REPRESENTATIVE BATCH QUALITY CONTROL

## Accuracy & Precision

**Analyst:** MH **Parameter:** Mercury

**Analysis Date:** 03/25/24 **Method Reference:** 245.1/7470/7471

**Matrix:** SOIL **Batch:** S1

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Spike Concentration (ug/Kg)** | **Background (ug/Kg)** | **Recoveries (%)** | **Acceptable Range (%)** | **Method Blank Concentration (ug/Kg)** |
| CV03482 | 100 | 17.2 | 92 / 88 | 70 - 130 | <50 |

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Observed A (ug/Kg)** | **Observed B (ug/Kg)** | **RPD (%)** | **Acceptable Range (%)** | |
| CV03482 | 109.7 | 105.3 | 4.1 | 0 - 20 | |

| MISCELLANEOUS | | | | |
|---|---|---|---|---|
| | **Standard ID #** | **Recovery (%)** | **Acceptable Range (%)** | |
| Independent Secondary Reference Material: | Spex 032524 | 100.2 | 90 - 110 | |
| Method Standard (Laboratory Control Spike): | Hg- 032524 | 108.0 | 85 - 115 | |

**COMMENTS:** _____

# REPRESENTATIVE BATCH QUALITY CONTROL

## Accuracy & Precision

**Analyst:** MH **Parameter:** Mercury

**Analysis Date:** 03/25/24 **Method Reference:** 245.1/7470/7471

**Matrix:** Total **Batch:** W1

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Spike Concentration (ug/L)** | **Background (ug/L)** | **Recoveries (%)** | **Acceptable Range (%)** | **Method Blank Concentration (ug/L)** |
| CV03382 | 2.00 | 0.071 | 104 / 103 | 70 - 130 | <0.2 |

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Observed A (ug/L)** | **Observed B (ug/L)** | **RPD (%)** | **Acceptable Range (%)** | |
| CV03382 | 2.16 | 2.13 | 0.41 | 0 - 20 | |

| Method Standard (Laboratory Control Spike): | | | | |
|---|---|---|---|---|
| | **Standard ID #** | **Recovery (%)** | **Acceptable Range (%)** | |
| Independent Secondary Reference Material: | Spex 032524 | 100.2 | 90 - 110 | |
| Method Standard (Laboratory Control Spike): | Hg- 032524 | 102.1 | 85 - 115 | |

**COMMENTS:** _____

# GC/MS
# SEMI-VOLATILE METHOD (PNA) 8270

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 3/22/2024 Std ID: #4420/#4435 Inst./Detec: HP5972/GC-MS

Laboratory ID#: CV03479 Matrix: WATER Analyst: RG Ext.date03/22/2023

| SURROGATES | Matrix Spike-Precision* | | | Matrix Spike - Accuracy | | | | LCS-%recovery | |
|---|---|---|---|---|---|---|---|---|---|
| | Spike 1 | Spike 2 | RPD | Spk Conc ug/L | % Recovery | Range (%) | Sample surr.recov. | LCS-MStd | Method Blank |
| Nitrobenzene-d5 | 87 | 89 | 2.3 | 100 | 88 | 32-140 | 74 | 87 | 76 |
| 2-Fluorobiphenyl | 81 | 81 | 0.0 | 100 | 81 | 27-147 | 45 | 85 | 43 |
| Terphenyl-d14 | 96 | 93 | 3.2 | 100 | 95 | 23-150 | 82 | 104 | 102 |
| **COMPOUNDS** | | | | | | | Background | | |
| Naphthalene | 48.7 | 48.1 | 1.2 | 50 | 97 | 40-137 | ND | 101 | <5 |
| Acenaphthylene | 56.0 | 53.6 | 4.4 | 50 | 110 | 49-167 | ND | 114 | <5 |
| Acenaphthene | 54.8 | 55.0 | 0.4 | 50 | 110 | 48-155 | ND | 113 | <5 |
| Fluorene | 64.3 | 60.2 | 6.6 | 50 | 125 | 45-169 | ND | 115 | <5 |
| Phenanthrene | 58.7 | 56.1 | 4.5 | 50 | 115 | 46-167 | ND | 117 | <2 |
| Anthracene | 58.2 | 56.4 | 3.1 | 50 | 115 | 28-156 | ND | 115 | <5 |
| Fluoranthene | 76.2 | 70.0 | 8.5 | 50 | 146 | 39-206 | ND | 129 | <1 |
| Pyrene | 54.3 | 51.8 | 4.7 | 50 | 106 | 41-159 | ND | 118 | <5 |
| Benzo[a]anthracene | 62.3 | 61.4 | 1.5 | 50 | 124 | 47-168 | ND | 125 | <1 |
| Chrysene | 54.3 | 52.8 | 2.8 | 50 | 107 | 22-160 | ND | 106 | <1 |
| Benzo[b]fluoranthene | 53.1 | 51.0 | 4.0 | 50 | 104 | 41-150 | ND | 108 | <1 |
| Benzo[k]fluorathene | 56.5 | 54.2 | 4.2 | 50 | 111 | 35-157 | ND | 110 | <1 |
| Benzo[a]pyrene | 63.6 | 61.8 | 2.9 | 50 | 125 | 47-175 | ND | 127 | <1 |
| Indeno[1,2,3-cd]pyrene | 58.9 | 57.3 | 2.8 | 50 | 116 | 35-163 | ND | 123 | <2 |
| Dibenzo (a,h) anthracene | 59.5 | 58.4 | 1.9 | 50 | 118 | 14-178 | ND | 125 | <2 |
| Benzo[g,h,I]perylene | 60.2 | 58.7 | 2.5 | 50 | 119 | 29-173 | ND | 128 | <1 |

* Matrix Spike Precision +/-20 Relative Percent Difference.

Comments:

# ICP-MS
# METHOD 200.8

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 03/22/2024 Standard ID: 030724 H2O Batch: 03/22/2024 W1

Matrix Spike Lab ID: CV03343 Matrix: Total Analyst: LT

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/L) | Matrix Spike Dup (ug/L) | RPD (%) | Spk Conc (ug/L) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/L) | Method Blk (ug/L) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Sodium | 118484 | 115186 | 2.8 | 10000 | 68.8 | 35.8 | 111608 | <1000 | 91.1 | 98.1 |
| Potassium | 16345 | 15618 | 4.5 | 10000 | 91.5 | 84.2 | 7200 | <100 | 91.0 | 95.0 |
| Calcium | 104845 | 100154 | 4.6 | 10000 | 34.5 | -12.4 | 101391 | <100 | 93.7 | 93.7 |
| Chromium | 880 | 837 | 5.0 | 1000 | 87.9 | 83.6 | 1 | <1 | 90.0 | 94.7 |
| Iron | 10098 | 9811 | 2.9 | 10000 | 86.3 | 83.4 | 1468 | <20 | 89.0 | 92.8 |
| Nickel | 929 | 850 | 8.9 | 1000 | 92.7 | 84.8 | 2 | <10 | 93.2 | 96.6 |
| Copper | 956 | 896 | 6.5 | 1000 | 90.9 | 84.9 | 47 | <1 | 91.8 | 99.7 |
| Zinc | 1020 | 954 | 6.7 | 1000 | 91.8 | 85.2 | 102 | <5 | 90.9 | 94.3 |
| Arsenic | 955 | 887 | 7.4 | 1000 | 95.3 | 88.5 | 2 | <1 | 93.1 | 98.1 |
| Selenium | 914 | 868 | 5.2 | 1000 | 91.4 | 86.8 | 0 | <5 | 91.4 | 94.0 |
| Silver | 9.19 | 8.57 | 7.0 | 10 | 91.9 | 85.7 | 0 | <0.2 | 91.5 | 104.7 |
| Cadmium | 921 | 840 | 9.2 | 1000 | 92.1 | 84.0 | 0 | <0.2 | 87.6 | 104.9 |
| Barium | 973 | 905 | 7.2 | 1000 | 89.7 | 82.9 | 76 | <100 | 90.4 | 96.2 |
| Lead | 915 | 860 | 6.2 | 1000 | 90.9 | 85.4 | 6 | <1 | 88.8 | 102.5 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 20% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: Na and Ca out of ange due to sample matrix

# **Appendix D** Supplemental Data Package Miller-Chapin Sanitary Relief Sewer

January 10, 2025
Project No. 241691

OHM Advisors
355 South Zeeb Road, Suite A
Ann Arbor, MI 48103

Attention: Chris Elenbaas, P.E.

Reference: Supplemental Data Package
Miller-Chapin Sanitary Relief Sewer
Ann Arbor, Michigan

Dear Mr. Elenbaas:

We have completed an additional geotechnical investigation and environmental testing services for the above-referenced project. This data package is a supplement to our preliminary geotechnical report no. 241082R dated April 9, 2024. This work has been performed as described in our proposal dated September 19, 2024. Presented herein are descriptions of our investigation methods, data and test results.

## INVESTIGATION METHODOLOGY

### Field Investigation

Subsurface conditions along the proposed 1st Street sewer alignment were investigated by 6 soil test borings in March 2024 and 3 additional soil borings in October and December 2024. Boring depths ranged from 25 ft to 50 ft below the existing ground surface. Boring locations are shown on the attached plan, Figure No. 1.

One of our engineers staked the approximate boring locations in the field. Boring elevations were approximated by GPS, except for Boring SB-11 which was estimated from the 2017 contour map available in the Washtenaw County GIS database. The elevations used in this report are given in feet and are based on NAVD88 datum with boring coordinates based on the Michigan State Plane South coordinate system. If more precise location and elevation data are desired, a registered professional land surveyor should be retained to locate the borings and determine their ground elevations.

The drilling was performed using conventional hollow-stem auger methods to advance the boreholes. The boreholes were backfilled to the original ground surface with compacted soil cuttings or sealed with cement-bentonite grout, where appropriate, and patched with asphalt cold patch after drilling completion. Temporary monitoring wells were installed in Borings SB-102 and SB-103 at the completion of drilling. Monitoring well installation records are attached.

Soil samples were recovered at regular intervals by means of the Standard Penetration Test (SPT), ASTM D1586. The SPT test involves the use of a 140-lb hammer with a 30-inch drop to drive a standard 2.0-inch O.D. split spoon sampler. The number of hammer blows required to drive the sampler 12 inches, after seating 6 inches, is termed the soil N-value and provides an indication of the soil's relative density and strength parameters at the sample location. SPT blow counts in 6-inch increments are recorded on the boring logs. The drill rig was equipped with an automatic hammer system which delivers a more consistent driving energy to the sampler compared to the rope and cathead system.

Recovered samples were sealed, labeled and transported to our laboratory. All soil samples will be discarded after sixty days unless a longer hold time is specifically requested.

The recovered soil samples were reviewed by an engineer and technically classified according to the methods of ASTM D2488 "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)". Estimates of the unconfined compressive strength of the cohesive samples were made using a calibrated penetrometer. A copy of the test boring logs along with a description of the terminology used on the logs and a chart of the ASTM D2488 group symbol names are provided in the Appendix.

Environmental Sampling and Testing

Each soil sample recovered from the test borings was screened with a Photoionization detector (PID) or flammable gas meter to evaluate the possible presence of Volatile Organic Compounds (VOCs). PID and gas meter results are noted on the attached boring logs.

Composite or grab soil samples were collected from each soil boring and analyzed for VOCs, Polynuclear Aromatic Hydrocarbons (PNAs), and Michigan 10 metals. We prepared Table 1 to compare analytical soil test results to generic Michigan Department of Environment Great Lakes and Energy (EGLE) criteria. The locations where soil samples exceeded EGLE criteria are shown on the attached plan, Figure No. 2.

Groundwater samples were collected from Borings SB-1, SB-11, SB-12 and SB-101 and from Monitoring wells MW-102 and MW-103. Groundwater samples were recovered using a peristaltic pump from the monitoring wells or from temporary screen points set within the boreholes. Groundwater samples were analyzed for VOCs, PNAs, and Michigan 10 metals.

We prepared Table 2 to compare analytical groundwater test results to generic EGLE criteria. The analytical test results and comparison table are provided in the Appendix. The locations where groundwater samples exceeded applicable EGLE criteria are shown on the attached plan, Figure No. 3.

Geotechnical Laboratory

Selected samples were subjected to various laboratory tests, including:

- ASTM D422 "Test Method for Particle-Size Analysis of Soils"
- ASTM D1140 "Test Methods for Determining the Amount of Material Finer than 75-μm (No. 200) Sieve in Soils by Washing"

The samples subjected to the grain-size testing were reclassified according to ASTM D2487 procedures "Standard Test Method for Classifications of Soils for Engineering Purposes". The ASTM D2487 and D2488 classifications are included on the boring logs.

Results of the laboratory tests have been summarized in a table and on the Particle Size Distribution Reports attached to this letter.

CLOSURE

We appreciate this opportunity to provide engineering services and express our interest in providing continuing services as the project progresses. Please contact our office should you have any questions or require further assistance.

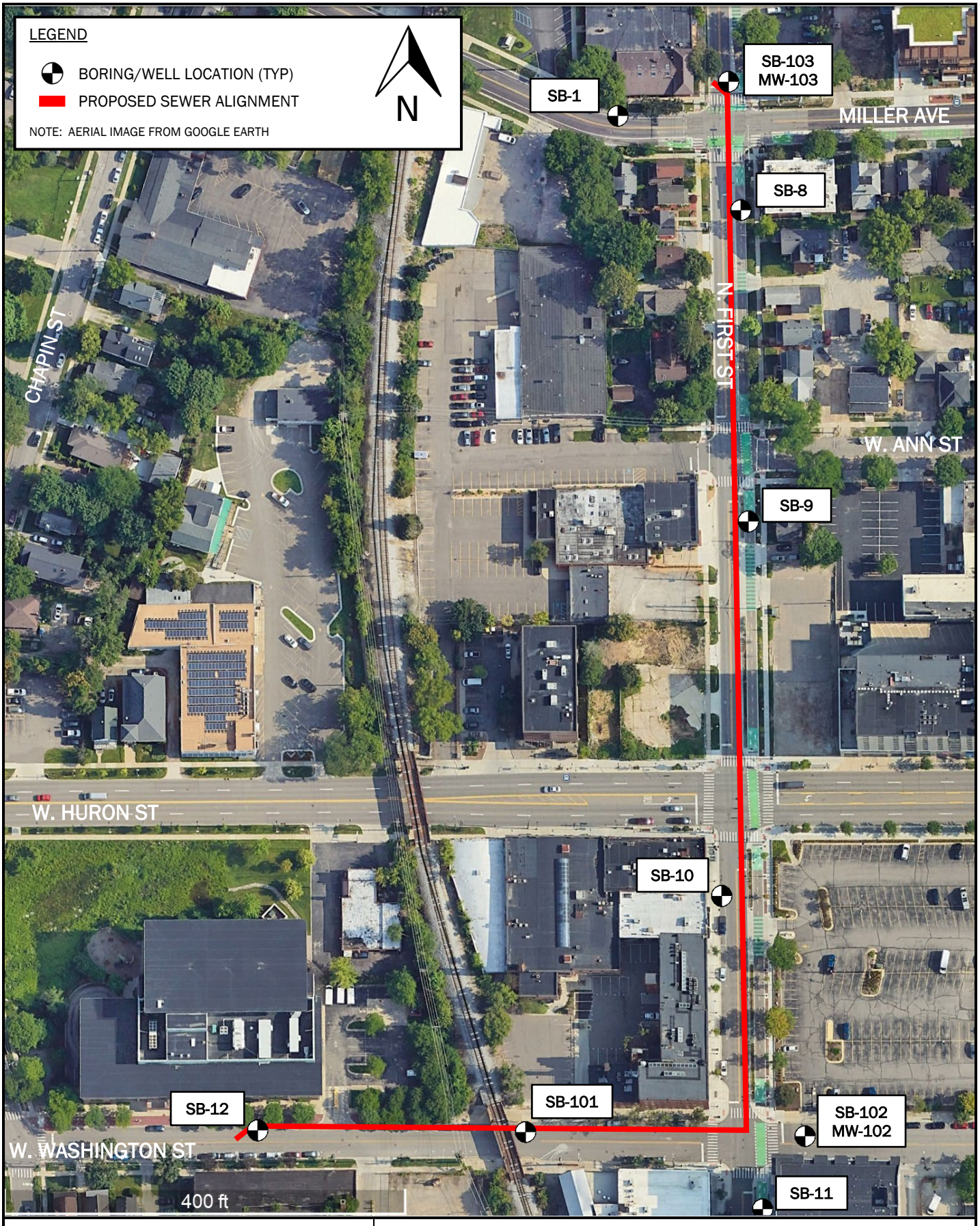
Sincerely,

MATERIALS TESTING CONSULTANTS, INC.

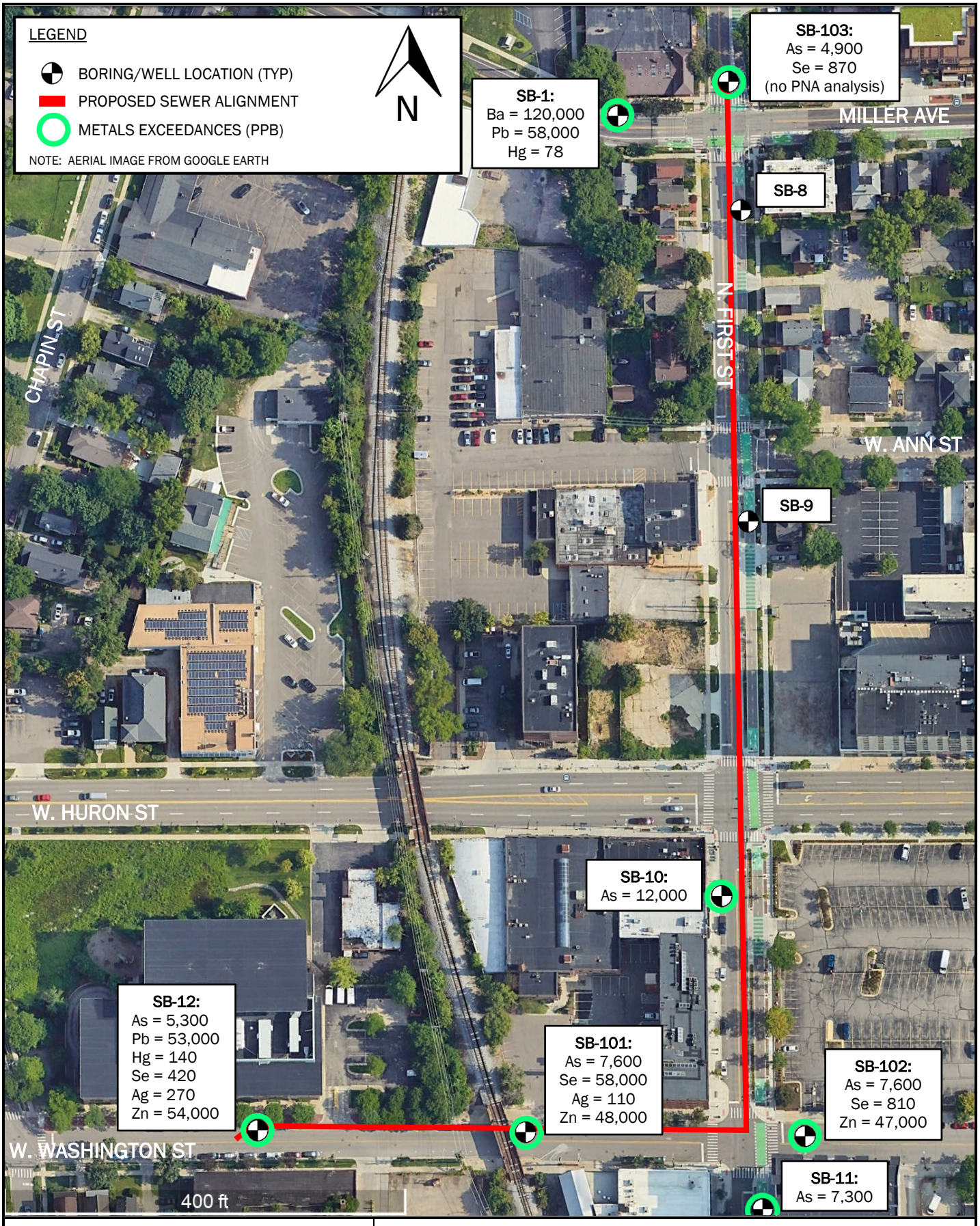
Isaac L. MacMillan, P.E.
Project Manager

Robert J. Warren, P.E.
Senior Project Manager

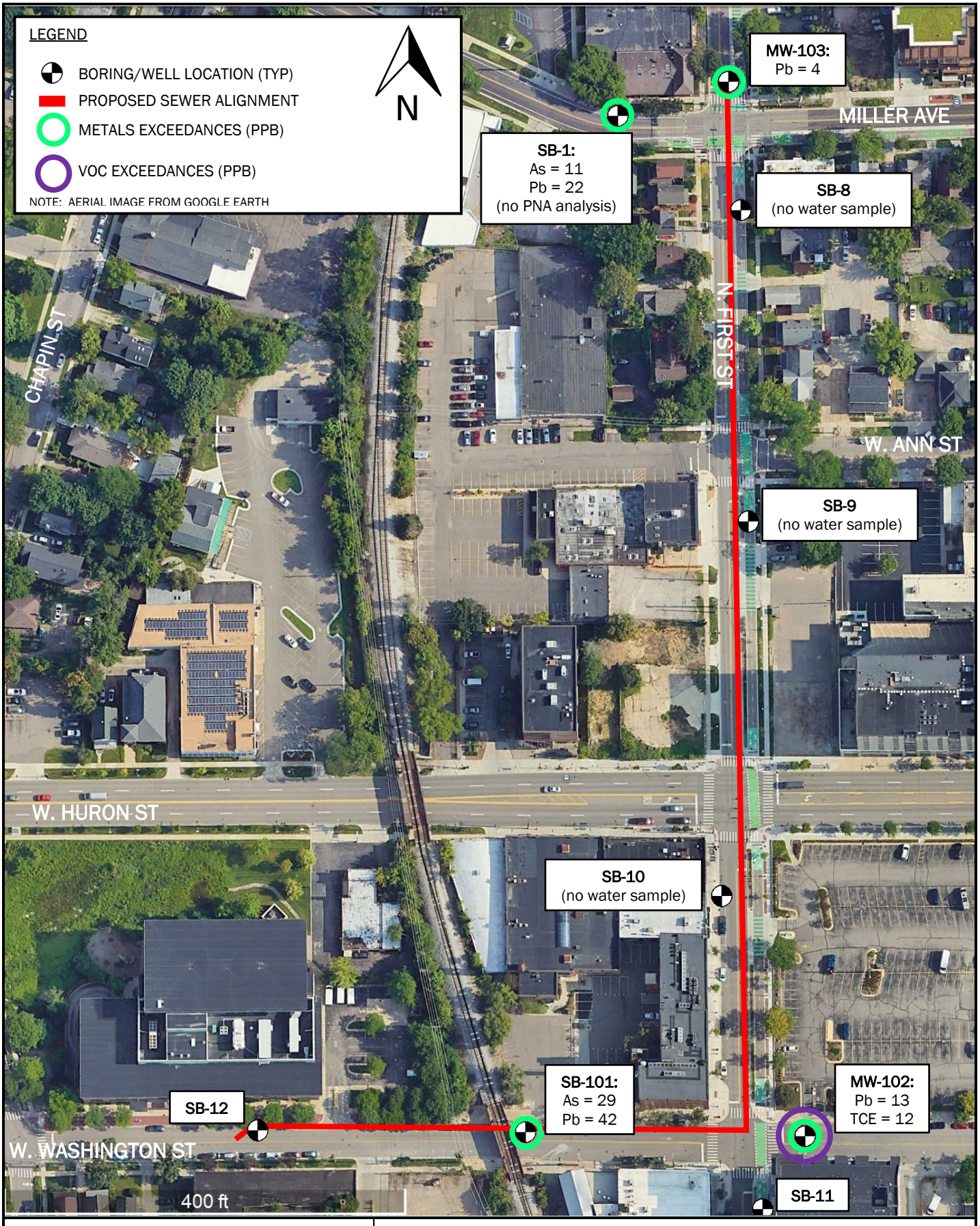
Attachments: Figure No. 1 – Boring Location Plan
Figure No. 2 – Soil Exceedances
Figure No. 3 – Groundwater Exceedances
Figure No. 4 – Generalized Subsurface Profile
Test Drilling and Sampling Procedures
Boring Log Terminology and Classification Outline
Boring Logs
Monitoring Well Installation Records
Particle Size Distribution Reports
Summary of Laboratory Test Data
Table 1 – Comparison of Soil Samples to EGLE Criteria
Table 2 – Comparison of Groundwater Samples to EGLE Criteria
Analytical Test Results



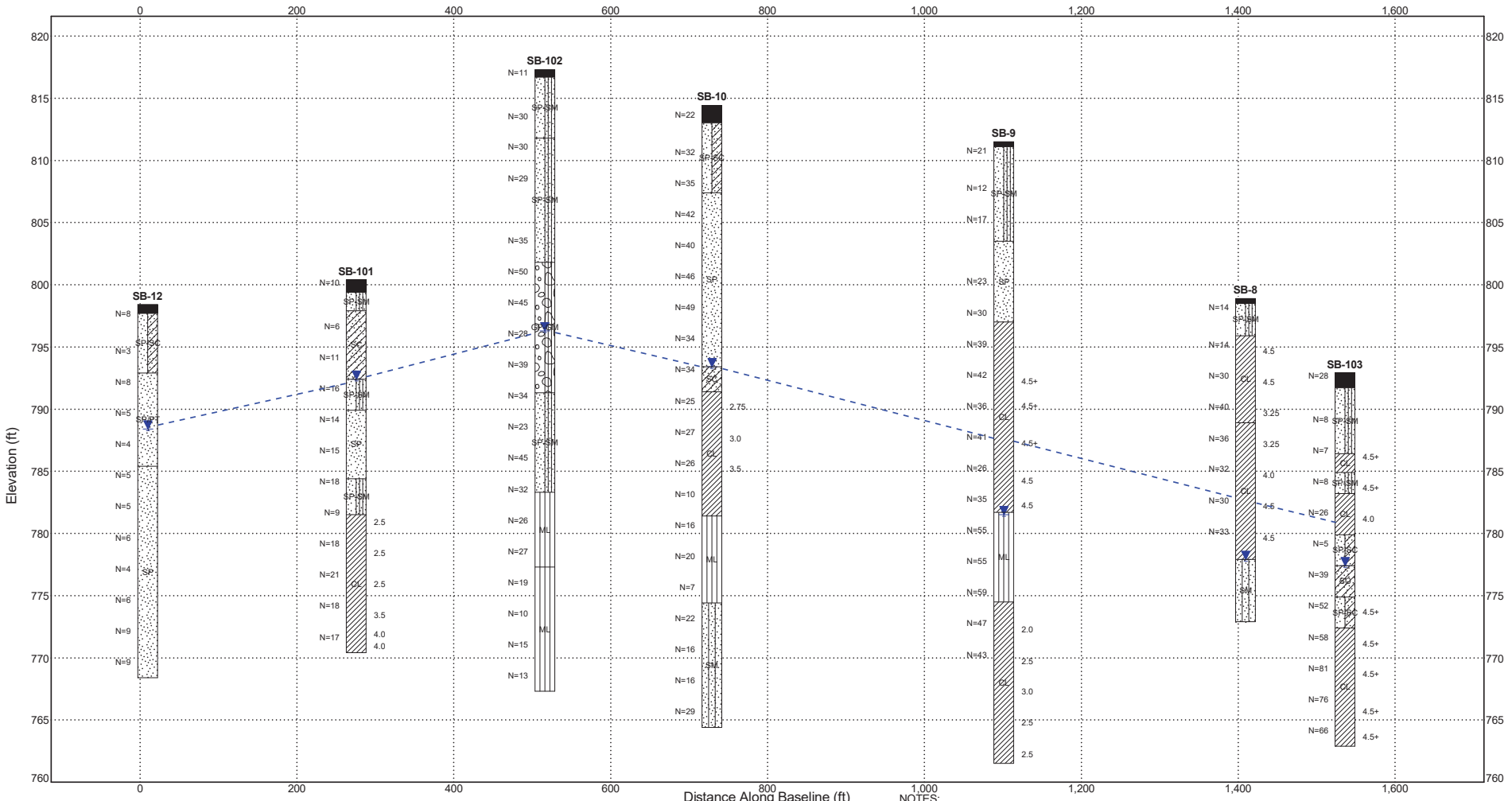

| | | | |
|---|---|---|---|
| TITLE: BORING LOCATION PLAN | | PROJECT: ANN ARBOR HIGH LEVEL TRUNKLINE SEWER IMPROVEMENTS | |
| SCALE: AS SHOWN | DATE: 1/10/2025 | PROJECT NO.: 241691 | MTC MATERIALS TESTING CONSULTANTS |
| FIG. NO.: 1 | DR. BY: IM | REV. BY: RW | |



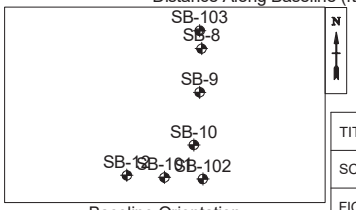

| | | | |
|---|---|---|---|
| TITLE: SOIL EXCEEDANCES | | PROJECT: ANN ARBOR HIGH LEVEL TRUNKLINE SEWER IMPROVEMENTS | |
| SCALE: AS SHOWN | DATE: 1/10/2025 | PROJECT NO.: 241691 | MTC MATERIALS TESTING CONSULTANTS |
| FIG. NO.: 2 | DR. BY: IM | REV. BY: RW | |




| | | | |
|---|---|---|---|
| TITLE: GROUNDWATER EXCEEDANCES | | PROJECT: ANN ARBOR HIGH LEVEL TRUNKLINE SEWER IMPROVEMENTS | |
| SCALE: AS SHOWN | DATE: 1/10/2025 | PROJECT NO.: 241691 | MTC MATERIALS TESTING CONSULTANTS |
| FIG. NO.: 3 | DR. BY: IM | REV. BY: RW | |




Asphalt
USCS Clayey Sand
USCS Silty Sand
Encountered Groundwater Level
Estimated Groundwater Surface
USCS Poorly-graded Sand with Clay
USCS Low Plasticity Clay
USCS Poorly-graded Sand with Silt
USCS Poorly-graded Sand
USCS Silt
USCS Poorly-graded Gravel with Silt




Baseline Orientation

NOTES:
1. SUBSURFACE CONDITONS ARE GENERALIZED. REFER TO BORING LOGS FOR SPECIFIC DESCRIPTIONS.
2. CONDITIONS BETWEEN BORINGS AND GROUNDWATER ELEVATIONS BETWEEN BORINGS MAY VARY.

| | | | |
|---|---|---|---|
| TITLE: GENERALIZED SUBSURFACE PROFILE | | | PROJECT: ANN ARBOR HIGH LEVEL TRUNKLINE SEWER IMPROVEMENTS |
| SCALE: NTS | DATE: 1/10/2025 | PROJECT NO.: 241691 | **Materials Testing Consultants, INC** |
| FIG. NO.: 4 | DR. BY: IM | REV. BY: RW | |

# TEST DRILLING AND SAMPLING PROCEDURES

Test Drilling Methods:

- [X] Hollow stem auger, ASTM D6151
- [ ] Mud rotary, ASTM D5783
- [ ] Casing advancer, ASTM D5872
- [ ] Rock coring, ASTM D2113
- [ ] Core/Hand Auger

*Note: Cone penetration test data can be used to interpret subsurface stratigraphy and can provide data on engineering properties of soils. The ASTM procedure does not include a procedure for determining soil classification from CPT testing. Soil classifications shown on CPT logs are based on published procedures and are not based on physical ASTM soil classification tests.*

Sampling Methods:

- [X] SPT, ASTM D1586, Auto hammer (140 lb., 30" drop, 2" OD split spoon sampler)
- [ ] Thin-walled tube sampler (Shelby), ASTM D1587
- [X] Grab Samples

*Note: The number of hammer blows required to drive the SPT sampler 12 inches, after seating 6 inches, is termed the soil N-value and provides an indication of the soil's relative density and strength parameters at the sample location. SPT blow counts in 6 inch increments are recorded on the boring logs.*

Drill Rig:

- [X] CME 55 (ATV)
- [ ] Acker Renegade (ATV)
- [X] CME 45 Truck
- [ ] Geoprobe 7822 (ATV)
- [ ] Geoprobe Rotary Sonic

Boreholes Backfilled With:

- [X] Excavated soil
- [X] Cement bentonite grout
- [X] Piezometer or Monitoring Well (see notes on logs)
- [X] Concrete or asphalt patch where appropriate

Sample Handling and Disposition:

- [X] Samples labeled, placed in jars, returned to MTC Laboratory
- [X] Discard after 60 days

# BORING LOG TERMINOLOGY AND ASTM D 2488 CLASSIFICATION OUTLINE

## TERMS DESCRIBING CONSISTENCY OR CONDITION

**COARSE-GRAINED** SOILS (major portions retained on No. 200 sieve): includes (1) clean gravel and sands and (2) silty or clayey gravels and sands. Condition is rated according to relative density as determined by laboratory tests or standard penetration resistance tests.

| Descriptive Terms | Relative Density | SPT Blow Count |
|---|---|---|
| Very loose | 0 to 15 % | < 5 |
| Loose | 15 to 35 % | 5 to 10 |
| Medium dense | 35 to 65 % | 10 to 30 |
| Dense | 65 to 85 % | 30 to 50 |
| Very dense | 85 to 100 % | > 50 |

Per ASTM D2487, the following conditions must be met based on laboratory testing to justify the label 'well graded' in a soil description.

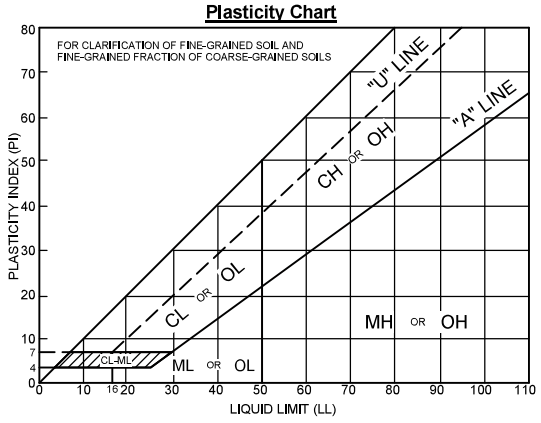
Gravel: $C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

Sand: $C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

**FINE-GRAINED** SOILS (major portions passing on No. 200 sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings, SPT blow count, or unconfined compression tests.

| Descriptive Terms | Unconfined Compressive Strength TSF | SPT Blow Count |
|---|---|---|
| Very soft | < 0.25 | < 2 |
| Soft | 0.25 to 0.5 | 2 to 4 |
| Medium stiff | 0.5 to 1.0 | 4 to 8 |
| Stiff | 1.0 to 2.0 | 8 to 15 |
| Very stiff | 2.0 to 4.0 | 15 to 30 |
| Hard | > 4.0 | > 30 |

### Plasticity Chart




| MAJOR DIVISIONS | | | | | TYPICAL NAMES |
|---|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE | CLEAN GRAVELS WITH LESS THAN 15% FINES | GW | | WELL-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | | GP | | POORLY-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | GRAVELS WITH 15% OR MORE FINES | GM | | SILTY GRAVELS WITH OR WITHOUT SAND |
| | | | GC | | CLAYEY GRAVELS WITH OR WITHOUT SAND |
| | SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LESS THAN 15% FINES | SW | | WELL-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP | | POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP-SM | | POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL |
| | | SANDS WITH 15% OR MORE FINES | SM | | SILTY SANDS WITH OR WITHOUT GRAVEL |
| | | | SC | | CLAYEY SANDS WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | | INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CL | | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OL | | ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | | INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CH | | INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OH | | ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| HIGHLY ORGANIC SOILS | | | PT/OL | | PEAT AND OTHER HIGHLY ORGANIC SOILS |

## GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. "Grades with" or "Grades without" may be used to describe soil when characteristics vary within a stratum.
3. Preserved soil samples will be discarded after 60 days unless alternate arrangements have been made.

## GROUNDWATER OBSERVATIONS:

During - indicates water level encountered during the boring
End- indicates water level immediately after drilling
Date and Depth - Measurements at indicated date

SAMPLE TYPES AND NUMBERING

| | |
|---|---|
| S | SPT, split barrel sample, ASTM D1586 |
| U | Shelby tube sample, ASTM D1587 |
| R | Rock core run |
| *S | Other than 2" split barrel sample |
| L | SPT with liner, ASTM D1586 |
| A | Auger cuttings |
| G | Geoprobe liner |

MINOR COMPONENT QUANTIFYING TERMS

| | |
|---|---|
| Less than 5% | TRACE |
| 5 to 10% | FEW |
| 15 to 25% | LITTLE |
| 30 to 40% | SOME |
| 50 to 100% | MOSTLY |

GRAIN SIZE

| | |
|---|---|
| BOULDER | >12" |
| COBBLE | 12" to 3" |
| COARSE GRAVEL | 3" to 0.75" |
| FINE GRAVEL | 0.75" to No. 4 |
| COARSE SAND | No. 4 to No. 10 |
| MEDIUM SAND | No. 10 to No.40 |
| FINE SAND | No. 40 to No. 200 |

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-1
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=286096.8 E=13289879.1 (MI South ift)
Elevation: 790.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 15.0 ft.

Date Begin: 03/11/2024 Date End: 03/11/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 8.5 |
| Sampler | SPT | 2" | End | 11.5 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 789.5 | 1 | | | | | 6" HMA, 6" Gravel Base | | | | Fill: 0' to 13.0' |
| 788.5 | 2 | S-1 | 1.0 | 14-12-12 N=24 | | 1.0 Brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist, Fill | | | | S-1 to S-3: Poor recovery; possible coarse gravel / COBBLE |
| 787.5 | 3 | | | | | | | | | |
| 786.5 | 4 | | | | | | | | | Environmental composite soil sample from 0.5' to 10' |
| 785.5 | 5 | S-2 | 0.0 | 5-5-4 N=9 | | | | | | |
| 784.5 | 6 | | | | | | | | | |
| 783.5 | 7 | S-3 | 1.0 | 1-2-2 N=4 | SC | | | | | |
| 782.5 | 8 | | | | | | | | | |
| 781.5 | 9 | | | | | | | | | |
| 780.5 | 10 | S-4 | 1.3 | 1-1-1 N=2 | | Grades wet at 8.5' | | | | |
| 779.5 | 11 | | | | | | | | | |
| 778.5 | 12 | S-5 | 1.5 | 5-6-17 N=23 | | | | | | |
| 777.5 | 13 | | | | | 13.0 | | | | Driller noted difficult drilling from 12' to 19' |
| 776.5 | 14 | | | | | Brown poorly graded GRAVEL with silt and sand; mostly coarse to fine gravel, little coarse to fine sand, few silty fines, wet | | | | |
| 775.5 | 15 | S-6 | 1.3 | 5-17-6 N=23 | | | | | | Environmental water sample at 15' |
| 774.5 | 16 | | | | | | | | | |
| 773.5 | 17 | S-7 | 1.4 | 12-14-18 N=32 | GP-GM | | | | | |
| 772.5 | 18 | | | | | | | | | |
| 771.5 | 19 | | | | | | | | | |
| 770.5 | 20 | S-8 | 1.5 | 4-10-9 N=19 | | 19.5 | | | | |
| 769.5 | 21 | | | | | Gray SILT; mostly silty fines, trace fine sand, moist | | | | |
| 768.5 | 22 | S-9 | 1.5 | 9-13-17 N=30 | ML | | | | | |
| 767.5 | 23 | | | | | Grades with trace coarse to fine gravel and few coarse to fine sand | | | | |
| 766.5 | 24 | | | | | | | | | |
| 765.5 | 25 | S-10 | 1.5 | 9-17-20 N=37 | | 25.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-8
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285995.5 E=13290005.0 (MI South ift)
Elevation: 798.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 15.0 ft.

Date Begin: 03/03/2024 Date End: 03/03/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21.0 |
| Sampler | SPT | 2" | End | 13.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 26.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 797.9 | 1 | | | | | 5" HMA (0.4) | | | | Fill: 0' to 3.0' |
| 796.9 | 2 | S-1 | 0.8 | 7-7-7 N=14 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, moist, (3.0) | | | | S-1: Poor recovery; possible coarse gravel / COBBLE |
| 795.9 | 3 | | | | | Fill | | | | |
| 794.9 | 4 | | | | | | | | | |
| 793.9 | 5 | S-2 | 1.4 | 12-5-9 N=14 | | Brown lean CLAY; mostly clayey fines, trace coarse to fine sand, trace fine gravel, moist | 4.5 | | | Driller noted difficult drilling at 4' |
| 792.9 | 6 | | | | | | | | | |
| 791.9 | 7 | S-3 | 1.5 | 7-9-21 N=30 | CL | | 4.5 | | | Environmental composite soil sample from 0.5' to 30' |
| 790.9 | 8 | | | | | | | | | |
| 789.9 | 9 | | | | | | | | | |
| 788.9 | 10 | S-4 | 1.5 | 13-17-23 N=40 | | (10.0) | 3.25 | | | |
| 787.9 | 11 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | No environmental water sample due to limited groundwater quantity |
| 786.9 | 12 | S-5 | 1.5 | 9-16-20 N=36 | | | 3.25 | | | |
| 785.9 | 13 | | | | | | | | | |
| 784.9 | 14 | | | | | | | | | |
| 783.9 | 15 | S-6 | 1.5 | 9-13-19 N=32 | | | 4.0 | | | |
| 782.9 | 16 | | | | CL | | | | | |
| 781.9 | 17 | S-7 | 1.5 | 7-12-18 N=30 | | | 4.5 | | | |
| 780.9 | 18 | | | | | Grades with trace coarse to fine sand | | | | |
| 779.9 | 19 | | | | | | | | | |
| 778.9 | 20 | S-8 | 1.5 | 9-13-20 N=33 | | Grades with wet sand seams | 4.5 | | | |
| 777.9 | 21 | | | | | (21.0) | | | | Driller noted difficult drilling at 20' |
| 776.9 | 22 | S-9 | 0.9 | 18-50/5" | | Gray silty SAND; mostly coarse to fine sand, some silty fines, trace coarse to fine gravel, wet | | | | S-9, S-10: Sampler refusal; possible coarse gravel / COBBLE |
| 775.9 | 23 | | | | | | | | | |
| 774.9 | 24 | | | | SM | | | | | |
| 773.9 | 25 | S-10 | 0.9 | 19-50/5" | | | | | | |
| 772.9 | 26 | | | | | (26.0) | | | | |
| | | | | | | End of Boring | | | | Auger refusal at 26.0' due to possible coarse gravel / BOULDER |

PID = Photoionization Detector.
Detection <50 ppm except where noted.

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-9
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285687.1 E=13289991.9 (MI South ift)
Elevation: 811.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 33.0 ft.

Date Begin: 03/07/2024 Date End: 03/07/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 30.0 |
| Sampler | SPT | 2" | End | 37.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 810.5 | 1 | | | | | 5" HMA (0.4) | | | | Fill: 0' to 8.0' |
| 809.5 | 2 | S-1 | 1.3 | 6-9-12 N=21 | | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little fine gravel, few silty fines, moist, Fill | | | | |
| 808.5 | 3 | | | | | | | | | |
| 807.5 | 4 | | | | | | | | | |
| 806.5 | 5 | S-2 | 1.5 | 9-6-6 N=12 | SP-SM | | | | | Debris at 4' |
| 805.5 | 6 | | | | | | | | | |
| 804.5 | 7 | S-3 | 1.5 | 13-11-6 N=17 | | Grades with trace recycled asphalt at 6' | | | | Driller noted difficult drilling at 6' |
| 803.5 | 8 | | | | | (8.0) | | | | |
| 802.5 | 9 | | | | | Gray gravelley SAND; mostly coarse to fine sand, some coarse to fine gravel, trace silty fines, moist | | | | |
| 801.5 | 10 | S-4 | 0.5 | 50/8" | | | | | | S-4 to S-7: Poor recovery; possible coarse gravel / COBBLE |
| 800.5 | 11 | | | | | | | | | |
| 799.5 | 12 | S-5 | 0.7 | 36-12-11 N=23 | SP | | | | | Environmental composite soil sample from 0.5' to 30' |
| 798.5 | 13 | | | | | | | | | |
| 797.5 | 14 | | | | | | | | | |
| 796.5 | 15 | S-6 | 1.0 | 16-15-15 N=30 | | (14.5) | | | | |
| 795.5 | 16 | | | | | Gray lean CLAY; mostly clayey fines, few coarse to fine sand, few coarse to fine gravel, moist | | | | No environmental water sample due to limited groundwater quantity |
| 794.5 | 17 | S-7 | 0.0 | 7-17-22 N=39 | | | | | | |
| 793.5 | 18 | | | | | | | | | |
| 792.5 | 19 | | | | | | | | | |
| 791.5 | 20 | S-8 | 1.5 | 13-25-17 N=42 | | | 4.5+ | | | |
| 790.5 | 21 | | | | | | | | | |
| 789.5 | 22 | S-9 | 1.5 | 7-14-22 N=36 | CL | | 4.5+ | | | |
| 788.5 | 23 | | | | | | | | | |
| 787.5 | 24 | | | | | | | | | |
| 786.5 | 25 | S-10 | 1.5 | 8-19-22 N=41 | | | 4.5+ | | | |
| 785.5 | 26 | | | | | | | | | Driller noted difficult drilling at 25' |
| 784.5 | 27 | S-11 | 1.5 | 8-12-14 N=26 | | | 4.5 | | | |
| 783.5 | 28 | | | | | | | | | |
| 782.5 | 29 | | | | | | | | | |
| 781.5 | 30 | S-12 | 1.5 | 14-17-18 N=35 | | (29.8) | 4.5 | | | |
| 780.5 | 31 | | | | | Gray SILT with sand; mostly silty fines, few fine sand, wet with occasional clay lenses | | | | |
| 779.5 | 32 | S-13 | 1.5 | 22-27-28 N=55 | | | | 15.5 | | S-13: LBW = 86.6% |
| 778.5 | 33 | | | | | | | | | |
| 777.5 | 34 | | | | ML | | | | | |
| 776.5 | 35 | S-14 | 1.3 | 12-28-27 N=55 | | | | | | |
| 775.5 | 36 | | | | | | | | | |
| 774.5 | 37 | S-15 | 1.5 | 21-31-28 N=59 | | (37.0) | | | | |
| 773.5 | 38 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | |
| 772.5 | 39 | | | | CL | | | | | |
| 771.5 | 40 | S-16 | 1.5 | 4-14-33 N=47 | | | 2.0 | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-9
**Sheet:** 2 of 2

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 770.5 | 41 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | S-18, S-19, S-20: Sampler refusal; possible coarse gravel / COBBLE |
| 769.5 | 42 | S-17 | 1.5 | 7-18-25 N=43 | | | 2.5 | | | |
| 768.5 | 43 | | | | | Grades with occasional sand lenses from 38' to 42' | | | | |
| 767.5 | 44 | | | | | | | | | |
| 766.5 | 45 | S-18 | 0.9 | 20-50/5" | CL | | 3.0 | | | |
| 765.5 | 46 | | | | | | | | | |
| 764.5 | 47 | S-19 | 0.7 | 21-50/3" | | | 2.5 | | | |
| 763.5 | 48 | | | | | | | | | |
| 762.5 | 49 | | | | | Grades with trace fine sand at 48' | | | | |
| 761.5 | 50 | S-20 | 0.5 | 50/8" | | 50.0 | 2.5 | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-10
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285314.8 E=13289950.9 (MI South ift)
Elevation: 814.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with grout, patched pavement with cold patch.

Date Begin: 03/13/2024 Date End: 03/13/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21.0 |
| Sampler | SPT | 2" | End | 23.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 813.4 | 1 | | | | | 8" HMA, 6" Gravel Base | | | | Fill: 0' to 21.0' |
| 812.4 | 2 | S-1 | 1.3 | 8-11-11 N=22 | | 1.4 | | | | |
| 811.4 | 3 | | | | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few coarse to fine gravel, few clayey fines, moist, Fill | | | | Driller noted difficult drilling from 2' to 5' |
| 810.4 | 4 | | | | | | | | | S-2, S-4, S-7, S-8: Poor recovery; possible coarse gravel / COBBLE |
| 809.4 | 5 | S-2 | 0.5 | 6-19-13 N=32 | | | | | 240 | |
| 808.4 | 6 | | | | | | | | | |
| 807.4 | 7 | S-3 | 1.4 | 15-12-23 N=35 | | 7.0 | | | 238 | Environmental composite soil sample from 1.5' to 7.5' |
| 806.4 | 8 | | | | | | | | | |
| 805.4 | 9 | | | | | Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist, Fill | | | | |
| 804.4 | 10 | S-4 | 1.2 | 9-19-23 N=42 | | | | | | No environmental water sample due to limited groundwater quantity |
| 803.4 | 11 | | | | | | | | | |
| 802.4 | 12 | S-5 | 1.3 | 5-17-23 N=40 | | | | | | Driller noted difficult drilling from 10' to 20' |
| 801.4 | 13 | | | | | | | | | |
| 800.4 | 14 | | | | | | | | | |
| 799.4 | 15 | S-6 | 1.4 | 21-23-23 N=46 | SP | | | | | |
| 798.4 | 16 | | | | | | | | | |
| 797.4 | 17 | S-7 | 1.0 | 9-16-33 N=49 | | | | | | |
| 796.4 | 18 | | | | | | | | | |
| 795.4 | 19 | | | | | | | | | |
| 794.4 | 20 | S-8 | 0.6 | 9-15-19 N=34 | | | | | | |
| 793.4 | 21 | | | | | 21.0 | | | | |
| 792.4 | 22 | S-9 | 1.3 | 9-15-19 N=34 | SC | Gray clayey SAND; mostly fine sand, some clayey fines, wet | | | | |
| 791.4 | 23 | | | | | 23.0 | | | | |
| 790.4 | 24 | | | | | Gray sandy lean CLAY; mostly clayey fines, little fine sand, moist | 2.75 | | | |
| 789.4 | 25 | S-10 | 1.5 | 9-13-12 N=25 | | | | | | |
| 788.4 | 26 | | | | | | | | | |
| 787.4 | 27 | S-11 | 1.5 | 9-12-15 N=27 | | | 3.0 | | | |
| 786.4 | 28 | | | | CL | | | | | |
| 785.4 | 29 | | | | | | | | | |
| 784.4 | 30 | S-12 | 1.5 | 9-11-15 N=26 | | Grades with trace fine sand | 3.5 | | | |
| 783.4 | 31 | | | | | | | | | |
| 782.4 | 32 | S-13 | 1.5 | 5-4-6 N=10 | | | | 24.7 | | S-13: LBW = 98.2% |
| 781.4 | 33 | | | | | 33.0 | | | | |
| 780.4 | 34 | | | | | Gray SILT with sand; mostly silty fines, little fine sand, wet with occasional clay seams | | | | |
| 779.4 | 35 | S-14 | 1.5 | 4-7-9 N=16 | | | | | | |
| 778.4 | 36 | | | | | | | | | |
| 777.4 | 37 | S-15 | 1.5 | 4-7-13 N=20 | ML | | | | | |
| 776.4 | 38 | | | | | | | | | |
| 775.4 | 39 | | | | | | | | | |
| 774.4 | 40 | S-16 | 1.5 | 2-3-4 N=7 | | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| | LOG OF BORING | Project No.: 241082<br>Boring No.: SB-10<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 773.4 | 41 | | | | | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 772.4 | 42 | S-17 | 1.5 | 6-9-13 N=22 | | | | | | |
| 771.4 | 43 | | | | | | | | | |
| 770.4 | 44 | | | | | | | | | |
| 769.4 | 45 | S-18 | 1.5 | 4-7-9 N=16 | SM | | | | | |
| 768.4 | 46 | | | | | | | | | |
| 767.4 | 47 | S-19 | 1.5 | 5-9-7 N=16 | | Grades with trace coarse to fine gravel | | | | |
| 766.4 | 48 | | | | | | | | | |
| 765.4 | 49 | | | | | | | | | |
| 764.4 | 50 | S-20 | 1.5 | 8-12-17 N=29 | | 50.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-11
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=284994.6 E=13289974.9 (MI South ift)
Elevation: 812 ft Datum: NAVD 88 (GPS Observation)
Notes: Elevation estimated from Washtenaw County GIS contours

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 11.4 ft.

Date Begin: 03/20/2024 Date End: 03/20/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 20.0 |
| Sampler | SPT | 2" | End | 20.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 45.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 811.0 | 1 | | | | | 4 1/2" HMA, 5 1/2" Gravel Base 0.8 | | | | Fill: 0' to 17.5' |
| 810.0 | 2 | S-1 | 1.3 | 12-18-13 N=31 | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, few coarse to fine gravel, moist, Fill | | | | Environmental composite soil sample from 0.5' to 30' |
| 809.0 | 3 | | | | | 4.5 | | | | |
| 808.0 | 4 | S-2 | 1.4 | 4-7-6 N=13 | | Gray to brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist, Fill | | | | |
| 807.0 | 5 | | | | | | | | | |
| 806.0 | 6 | | | | | | | | | |
| 805.0 | 7 | S-3 | 1.3 | 8-11-15 N=26 | | | | | | Driller noted difficult drilling at 7' |
| 804.0 | 8 | | | | | | | | | |
| 803.0 | 9 | S-4 | 1.3 | 6-13-15 N=28 | | | | | | |
| 802.0 | 10 | | | | | | | | | |
| 801.0 | 11 | | | | SP | | | | | |
| 800.0 | 12 | S-5 | 1.4 | 5-7-19 N=26 | | | | | | |
| 799.0 | 13 | | | | | | | | | |
| 798.0 | 14 | S-6 | 1.5 | 5-12-19 N=31 | | | | | | |
| 797.0 | 15 | | | | | | | | | |
| 796.0 | 16 | | | | | | | | | |
| 795.0 | 17 | S-7 | 1.1 | 32-28-33 N=61 | | | | | | |
| 794.0 | 18 | | | | | 17.5 | | | | Driller noted difficult drilling from 17' to 22' |
| 793.0 | 19 | | | | | Brown poorly graded SAND with clay and gravel; mostly coarse to fine sand, little clayey fines with occasional clay seams, little coarse to fine gravel, moist | | | | |
| 792.0 | 20 | S-8 | 1.0 | 39-16-17 N=33 | | Grades wet at 20' | | | | S-8, S-9, S-10: Poor recovery; possible coarse gravel / COBBLE |
| 791.0 | 21 | | | | | | | | | |
| 790.0 | 22 | S-9 | 0.6 | 13-21-10 N=31 | | | | | | |
| 789.0 | 23 | | | | | | | | | |
| 788.0 | 24 | | | | SP-SC | | | | | |
| 787.0 | 25 | S-10 | 0.9 | 7-6-5 N=11 | | | | | | Environmental water sample at 25' |
| 786.0 | 26 | | | | | | | | | |
| 785.0 | 27 | S-11 | 1.5 | 14-12-13 N=25 | | | | | | Charged augers with water at 26.0' |
| 784.0 | 28 | | | | | | | | | |
| 783.0 | 29 | | | | | 29.0 | | | | *End water level may be influenced by charging augers |
| 782.0 | 30 | S-12 | 1.5 | 5-5-7 N=12 | | Gray lean CLAY; mostly clayey fines, trace fine sand, moist | 2.5 | | | |
| 781.0 | 31 | | | | CL | | | | | |
| 780.0 | 32 | S-13 | 1.5 | 4-6-8 N=14 | | 32.0 | 2.75 | | | |
| 779.0 | 33 | | | | | Gray SILT; mostly silty fines, trace fine sand, wet with occasional clay seams | | | | |
| 778.0 | 34 | | | | | | | | | |
| 777.0 | 35 | S-14 | 1.5 | 4-6-9 N=15 | ML | | | 23.6 | | S-14: LBW = 99.1% |
| 776.0 | 36 | | | | | | | | | |
| 775.0 | 37 | S-15 | 1.5 | 4-6-6 N=12 | | | | | | |
| 774.0 | 38 | | | | | Grades with occasional sand seams 38.0 | | | | |
| 773.0 | 39 | | | | | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 772.0 | 40 | S-16 | 1.5 | 4-8-15 N=23 | SM | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| | LOG OF BORING | Project No.: 241082<br>Boring No.: SB-11<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 771.0 | 41 | | | | | | | | | |
| 770.0 | 42 | S-17 | 1.5 | 5-2-18<br>N=20 | SM | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 769.0 | 43 | | | | | | | | | |
| 768.0 | 44 | | | | | | | | | |
| 767.0 | 45 | S-18 | 1.5 | 5-11-15<br>N=26 | | 45.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector.<br>Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-12
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285099.4 E=13289477.2 (MI South ift)
Elevation: 798.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 7.1 ft.

Date Begin: 03/12/2024 Date End: 03/12/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 10.0 |
| Sampler | SPT | 2" | End | 5.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 797.4 | 1 | | | | | 3" HMA, 5" Concrete 0.7 | | | | Fill: 0' to 5.5' |
| 796.4 | 2 | S-1 | 1.3 | 6-5-3 N=8 | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, moist, Fill | | | | S-2, S-3, S-4, S-8, S-9: Poor recovery; possible coarse gravel / COBBLE |
| 795.4 | 3 | | | | | | | | | |
| 794.4 | 4 | | | | | Grades with few coarse to fine gravel | | | | |
| 793.4 | 5 | S-2 | 0.1 | 3-2-1 N=3 | | 5.5 | | | | Environmental composite soil sample from 0.5' to 10' |
| 792.4 | 6 | | | | | | | | | |
| 791.4 | 7 | S-3 | 0.4 | 5-6-2 N=8 | | Brown poorly graded SAND; mostly coarse to fine sand, trace silty fines, moist with frequent lenses of fibrous peat | | | | Environmental water sample at 11' |
| 790.4 | 8 | | | | | | | | | |
| 789.4 | 9 | | | | | | | | | |
| 788.4 | 10 | S-4 | 0.3 | 3-2-3 N=5 | SP/PT | Grades with little gravel and occasional clay lenses | | | | |
| 787.4 | 11 | | | | | Grades wet at 10' | | | | |
| 786.4 | 12 | S-5 | 1.5 | 2-2-2 N=4 | | 13.0 | | 48.5 | | S-5: 7.7% Organics |
| 785.4 | 13 | | | | | | | | | |
| 784.4 | 14 | | | | | Light brown poorly graded SAND; mostly coarse to fine sand, trace silty fines, wet | | | | |
| 783.4 | 15 | S-6 | 1.5 | 3-2-3 N=5 | | | | | | |
| 782.4 | 16 | | | | | | | | | |
| 781.4 | 17 | S-7 | 1.5 | 6-2-3 N=5 | | | | | | Charged augers with water at 16.0' |
| 780.4 | 18 | | | | | | | | | *End water level may be influenced by charging augers |
| 779.4 | 19 | | | | | | | | | |
| 778.4 | 20 | S-8 | 0.8 | 3-3-3 N=6 | | | | | | |
| 777.4 | 21 | | | | | | | | | |
| 776.4 | 22 | S-9 | 1.2 | 3-2-2 N=4 | SP | | | | | |
| 775.4 | 23 | | | | | | | | | |
| 774.4 | 24 | | | | | | | | | |
| 773.4 | 25 | S-10 | 1.5 | 2-2-4 N=6 | | Grades without silty fines | | | | |
| 772.4 | 26 | | | | | | | | | |
| 771.4 | 27 | S-11 | 1.3 | 4-4-5 N=9 | | | | | | |
| 770.4 | 28 | | | | | | | | | |
| 769.4 | 29 | | | | | | | | | |
| 768.4 | 30 | S-12 | 1.5 | 3-4-5 N=9 | | 30.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241691
**Boring No.:** SB-101
**Sheet:** 1 of 1

Project: Ann Arbor High Level Trunkline Sewer Improvements
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: KE Field Eng.: JV Rev. By: IM
Coordinates: N=285084.5 E=13289743.2 (MI South ift)
Elevation: 800.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with bentonite grout, patched pavement with cold patch.

Date Begin: 10/24/2024 Date End: 10/24/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 8 |
| Sampler | SPT | 2" | End | NA |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 799.4 | 1 | S-1 | 1.1 | 38-6-4 N=10 | | 4" HMA<br>8" Gravel Base (1.0) | | | | Fill: 0.0' to 2.5' |
| 798.4 | 2 | | | | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, few silty fines, few coarse to fine gravel, moist, Fill (2.5) | | | | Environmental composite soil sample from 1.0' to 30.0' |
| 797.4 | 3 | | | | | | | | | |
| 796.4 | 4 | S-2 | 0.9 | 3-3-3 N=6 | SC | Brown clayed SAND with gravel; mostly coarse to fine sand, little clayey fines, few coarse to fine gravel, moist | | | | S-2: Poor recovery; possible coarse gravel / COBBLE |
| 795.4 | 5 | | | | | | | | | |
| 794.4 | 6 | | | | | | | | | |
| 793.4 | 7 | S-3 | 1.1 | 3-6-5 N=11 | | | | | | |
| 792.4 | 8 | | | | | (8.0) | | | | |
| 791.4 | 9 | S-4 | 1.3 | 6-8-8 N=16 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, some coarse to fine gravel, few silty fines, wet (10.5) | | | | |
| 790.4 | 10 | | | | | | | | | |
| 789.4 | 11 | | | | SP | Gray poorly graded SAND with gravel; mostly coarse to fine sand, little fine gravel, trace silty fines, wet | | | | |
| 788.4 | 12 | S-5 | 1.5 | 5-6-8 N=14 | | | | | | |
| 787.4 | 13 | | | | | | | | | |
| 786.4 | 14 | S-6 | 1.5 | 3-4-11 N=15 | | | | | | Environmental water sample at 13.5' via temporary screen set from 8.5' to 13.5' |
| 785.4 | 15 | | | | | | | | | |
| 784.4 | 16 | | | | | (16.0) | | | | |
| 783.4 | 17 | S-7 | 1.5 | 4-10-8 N=18 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, wet | | | | |
| 782.4 | 18 | | | | | | | | | Augers charged with water at 16.8' |
| 781.4 | 19 | | | | | (18.9) | | | | |
| 780.4 | 20 | S-8 | 1.5 | 4-4-5 N=9 | CL | Gray lean CLAY; mostly clayey fines, moist | 2.5 | | | |
| 779.4 | 21 | | | | | | | | | |
| 778.4 | 22 | S-9 | 1.2 | 6-8-10 N=18 | | | 2.5 | | | |
| 777.4 | 23 | | | | | | | | | |
| 776.4 | 24 | S-10 | 1.5 | 6-9-12 N=21 | | | 2.5 | | 1.1* | *S-10: 1.1 ppm H2S |
| 775.4 | 25 | | | | | | | | | |
| 774.4 | 26 | | | | | | | | | |
| 773.4 | 27 | S-11 | 1.5 | 5-7-11 N=18 | | | 3.5 | | | |
| 772.4 | 28 | | | | | | | | | |
| 771.4 | 29 | S-12 | 1.5 | 7-7-10 N=17 | | | 4.0 | | | |
| 770.4 | 30 | | | | | (30.0) | | | | |
| | | | | | | End of Boring | | | | VOC content correlated from combustible gas detector. Detection below threshold except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241691
**Boring No.:** SB-102
**Sheet:** 1 of 2

Project: Ann Arbor High Level Trunkline Sewer Improvements
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: KE Field Eng.: BG Rev. By: IM
Coordinates: N=285074 E=13290014.1 (MI South ift)
Elevation: 817.3 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Installed flush-mount monitoring well MW-102

Date Begin: 10/25/2024 Date End: 10/25/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21 |
| Sampler | SPT | 2" | End | NA |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 816.3 | 1 | S-1 | 1.5 | 3-3-8 N=11 | | 3 1/2" HMA, 4" Concrete 0.6 | | | | Fill: 0.0' to 5.5' |
| 815.3 | 2 | | | | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, some coarse to fine gravel, few silty fines, moist, Fill | | | | Environmental composite soil sample from 1.0' to 50.0' |
| 814.3 | 3 | | | | | | | | | |
| 813.3 | 4 | S-2 | 1.5 | 7-15-15 N=30 | | 5.5 | | | | |
| 812.3 | 5 | | | | | | | | | |
| 811.3 | 6 | | | | | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, moist | | | | |
| 810.3 | 7 | S-3 | 1.5 | 15-14-16 N=30 | | | | | | |
| 809.3 | 8 | | | | | | | | | |
| 808.3 | 9 | S-4 | 1.0 | 9-13-16 N=29 | | | | | | S-4, S-5, S-6, S-7: Poor recovery; possible coarse gravel / COBBLE |
| 807.3 | 10 | | | | | | | | | |
| 806.3 | 11 | | | | SP-SM | | | | | |
| 805.3 | 12 | S-5 | 0.0 | 50/3" | | Grades with coarse gravel and frequent COBBLE | | | | S-5: Sampler refusal; possible coarse gravel / COBBLE |
| 804.3 | 13 | | | | | | | | | |
| 803.3 | 14 | S-6 | 1.2 | 17-18-17 N=35 | | | | | | |
| 802.3 | 15 | | | | | 15.5 | | | | |
| 801.3 | 16 | | | | | Brown poorly graded GRAVEL with silt and sand; mostly coarse to fine gravel, some coarse to fine sand, few silty fines, moist with occasional COBBLE | | | | |
| 800.3 | 17 | S-7 | 0.8 | 10-25-25 N=50 | | | | | | |
| 799.3 | 18 | | | | | | | | | |
| 798.3 | 19 | S-8 | 1.5 | 25-25-20 N=45 | | | | | | |
| 797.3 | 20 | | | | | | | | | |
| 796.3 | 21 | | | | GP-GM | | | | | |
| 795.3 | 22 | S-9 | 1.5 | 7-17-11 N=28 | | Grades wet at 21.0' | | | | |
| 794.3 | 23 | | | | | | | | | |
| 793.3 | 24 | S-10 | 1.5 | 35-23-16 N=39 | | | | | | |
| 792.3 | 25 | | | | | | | | | |
| 791.3 | 26 | | | | | 26.0 | | | | |
| 790.3 | 27 | S-11 | 1.5 | 15-14-20 N=34 | | Brown poorly graded SAND with silt and gravel; mostly fine sand, some coarse to fine gravel, few silty fines, wet | | | | Charged augers with water at 26.0' |
| 789.3 | 28 | | | | | | | | | |
| 788.3 | 29 | S-12 | 0.8 | 3-8-15 N=23 | | | | | | S-12, S-13: Poor recovery: possible coarse gravel / COBBLE |
| 787.3 | 30 | | | | SP-SM | | | | | |
| 786.3 | 31 | | | | | | | | | |
| 785.3 | 32 | S-13 | 0.8 | 14-22-23 N=45 | | | | | | S-13: LBW=6.0% |
| 784.3 | 33 | | | | | | | | | |
| 783.3 | 34 | | | | | 34.0 | | | | |
| 782.3 | 35 | S-14 | 1.5 | 23-17-15 N=32 | | Gray SILT with sand; mostly silty fines, little fine sand, wet | | | | |
| 781.3 | 36 | | | | | | | | | |
| 780.3 | 37 | S-15 | 1.5 | 11-11-15 N=26 | ML | | | | | S-15: LBW=78.2% |
| 779.3 | 38 | | | | | | | | | |
| 778.3 | 39 | | | | | | | | | |
| 777.3 | 40 | S-16 | 1.5 | 7-11-16 N=27 | | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| MTC | LOG OF BORING | Project No.: 241691<br>Boring No.: SB-102<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 776.3 | 41 | | | | | Gray SILT with sand; mostly silty fines, little fine sand, wet | | | | |
| 775.3 | 42 | S-17 | 1.5 | 7-7-12 N=19 | | | | | | |
| 774.3 | 43 | | | | | | | | | |
| 773.3 | 44 | | | | | | | | | |
| 772.3 | 45 | S-18 | 1.5 | 3-3-7 N=10 | ML | | | | | |
| 771.3 | 46 | | | | | | | | | |
| 770.3 | 47 | S-19 | 1.5 | 3-7-8 N=15 | | | | | | |
| 769.3 | 48 | | | | | | | | | |
| 768.3 | 49 | | | | | | | | | |
| 767.3 | 50 | S-20 | 1.5 | 4-5-8 N=13 | | 50.0 | | | | |
| | | | | | | End of Boring | | | | VOC content correlated from combustible gas detector. Detection below threshold except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241691
**Boring No.:** SB-103
**Sheet:** 1 of 1

Project: Ann Arbor High Level Trunkline Sewer Improvements
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: KE Field Eng.: JV Rev. By: IM
Coordinates: N=286122.3 E=13289992.4 (MI South ift)
Elevation: 792.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Installed flush-mount monitoring well MW-103.

Date Begin: 12/02/2024 Date End: 12/03/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 15.5 |
| Sampler | SPT | 2" | End | NA |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

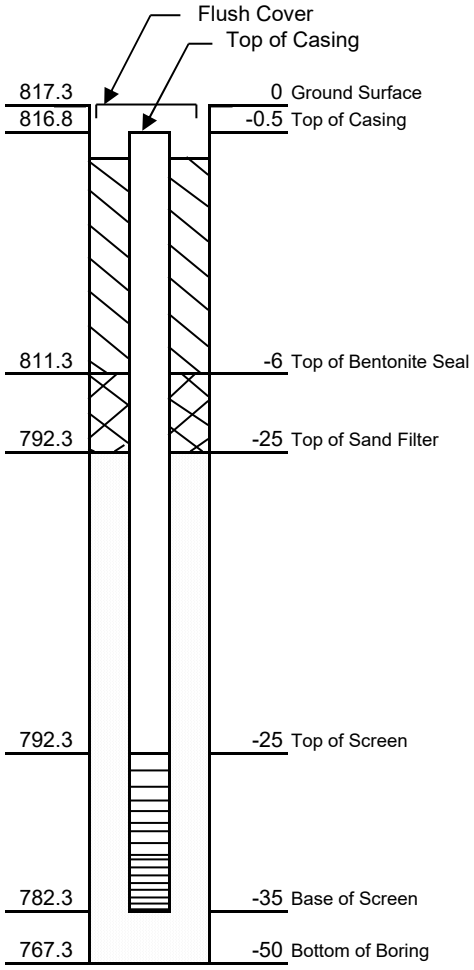
| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 791.9 | 1 | S-1 | 1.3 | 11-13-15 N=28 | | 7" HMA, 7" Gravel Base (1.2) | | | | Fill: 0' to 6.5' |
| 790.9 | 2 | | | | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, few silty fines, few coarse to fine gravel, moist, Fill | | | | Environmental composite sample from 1.2' to 30.0' |
| 789.9 | 3 | | | | | | | | | |
| 788.9 | 4 | S-2 | 1.2 | 4-4-4 N=8 | | | | | | S-2, S-4, S-6: Poor recovery; possible coarse gravel / COBBLE |
| 787.9 | 5 | | | | | | | | | |
| 786.9 | 6 | | | | | (6.5) | | | | |
| 785.9 | 7 | S-3 | 1.3 | 3-4-3 N=7 | CL | Brown lean CLAY; mostly clayey fines, few coarse to fine gravel, few coarse to fine sand, moist (8.0) | 4.5+ | | | |
| 784.9 | 8 | | | | | | | | | |
| 783.9 | 9 | S-4 | 1.2 | 2-3-5 N=8 | SP-SM | Brown poorly graded SAND with silt; mostly coarse to fine sand, few coarse to fine gravel, few silty fines, moist (9.7) | 4.5+ | | | |
| 782.9 | 10 | | | | | | | | | |
| 781.9 | 11 | | | | CL | Gray lean CLAY; mostly clayey fines, few coarse to fine gravel, moist with occasional silt lenses (13.0) | 4.0 | | | |
| 780.9 | 12 | S-5 | 1.5 | 8-15-11 N=26 | | Grades with occasional sand lenses at 11.0' | | | | |
| 779.9 | 13 | | | | | | | | | |
| 778.9 | 14 | S-6 | 0.7 | 4-3-2 N=5 | SP-SC | Gray poorly graded SAND with clay and gravel; mostly fine sand, little coarse to fine gravel, few clayey fines, moist (15.5) | | | | |
| 777.9 | 15 | | | | | Grades wet at 15.5' | | | | |
| 776.9 | 16 | | | | | | | | | |
| 775.9 | 17 | S-7 | 1.5 | 9-15-24 N=39 | SC | Gray clayey SAND; mostly fine sand, some clayey fines, trace coarse to fine gravel, wet (18.0) | | | | S-7: LBW=40.6% |
| 774.9 | 18 | | | | | | | | | |
| 773.9 | 19 | S-8 | 1.5 | 13-24-28 N=52 | SP-SC | Gray poorly graded SAND with clay; mostly fine sand, few fine gravel, few clayey fines, wet (20.5) | 4.5+ | | | |
| 772.9 | 20 | | | | | | | | | |
| 771.9 | 21 | | | | CL | Gray lean CLAY with sand; mostly clayey fines, little coarse to fine sand, few coarse to fine gravel, moist | | | | Charged augers with water at 20.0' |
| 770.9 | 22 | S-9 | 1.5 | 23-25-33 N=58 | | | 4.5+ | | | |
| 769.9 | 23 | | | | | | | | | |
| 768.9 | 24 | S-10 | 1.5 | 33-50-31 N=81 | | | 4.5+ | | | |
| 767.9 | 25 | | | | | | | | | |
| 766.9 | 26 | | | | | | | | | |
| 765.9 | 27 | S-11 | 1.5 | 12-36-40 N=76 | | | 4.5+ | | | |
| 764.9 | 28 | | | | | | | | | |
| 763.9 | 29 | S-12 | 1.5 | 15-31-35 N=66 | | | 4.5+ | | | |
| 762.9 | 30 | | | | | (30.0) | | | | |
| | | | | | | End of Boring | | | | VOC content correlated from combustible gas detector. Detection below threshold except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

Materials Testing Consultants
www.mtc-test.com • 800.968.8378

# TEMPORARY MONITORING WELL INSTALLATION RECORD

Project Name: Ann Arbor High Level Trunkline Sewer Improvements | Project No.: 241691
MW No.: 102 | Location: | Installation Date: 10/25/24
Client: OHM Advisors | Crew Chief/Inspector: KE / BG




| | | | | | |
|---|---|---|---|---|---|
| Stainless Steel | | Type | 316 or 314 | |
| Casing type SCH 40 PVC | X | | Casing Dia. | 2" |
| (Riser Type) SCH 80 PVC | | | No. 5 ft Lengths Used | 1 |
| Galvanized | | | No. 10 ft Lengths Used | 2 |
| Black Steel | | | Other Lengths | |

| | | | | |
|---|---|---|---|---|
| | Stainless Steel | | Well Screen Length | 10' |
| Screen Type | SCH 40 PVC | X | Well Screen Dia. | 2" |
| | SCH 80 PVC | | No. 5 ft Lengths Used | |
| | Galvanized | | No. 10 ft Lengths Used | 1 |
| | Black Steel | | Other Lengths | |

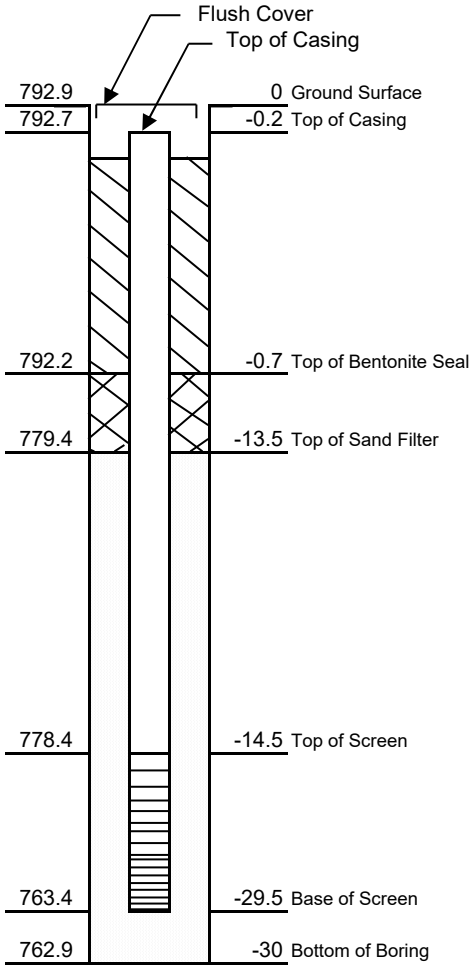
| Date | Water Level | Elevation |
|---|---|---|
| 10/25/2024 | 21 | 796.3 |
| 12/5/2024 | 21.5 | 795.8 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Remarks: Pulled auger and verified borehole cave-in from 50 ft to 35 ft.

Materials Testing Consultants
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# TEMPORARY MONITORING WELL INSTALLATION RECORD

Project Name: Ann Arbor High Level Trunkline Sewer Improvements
Project No.: 241691
MW No.: 103 Location:
Installation Date: 12/03/24
Client: OHM Advisors
Crew Chief/Inspector: KE / JV



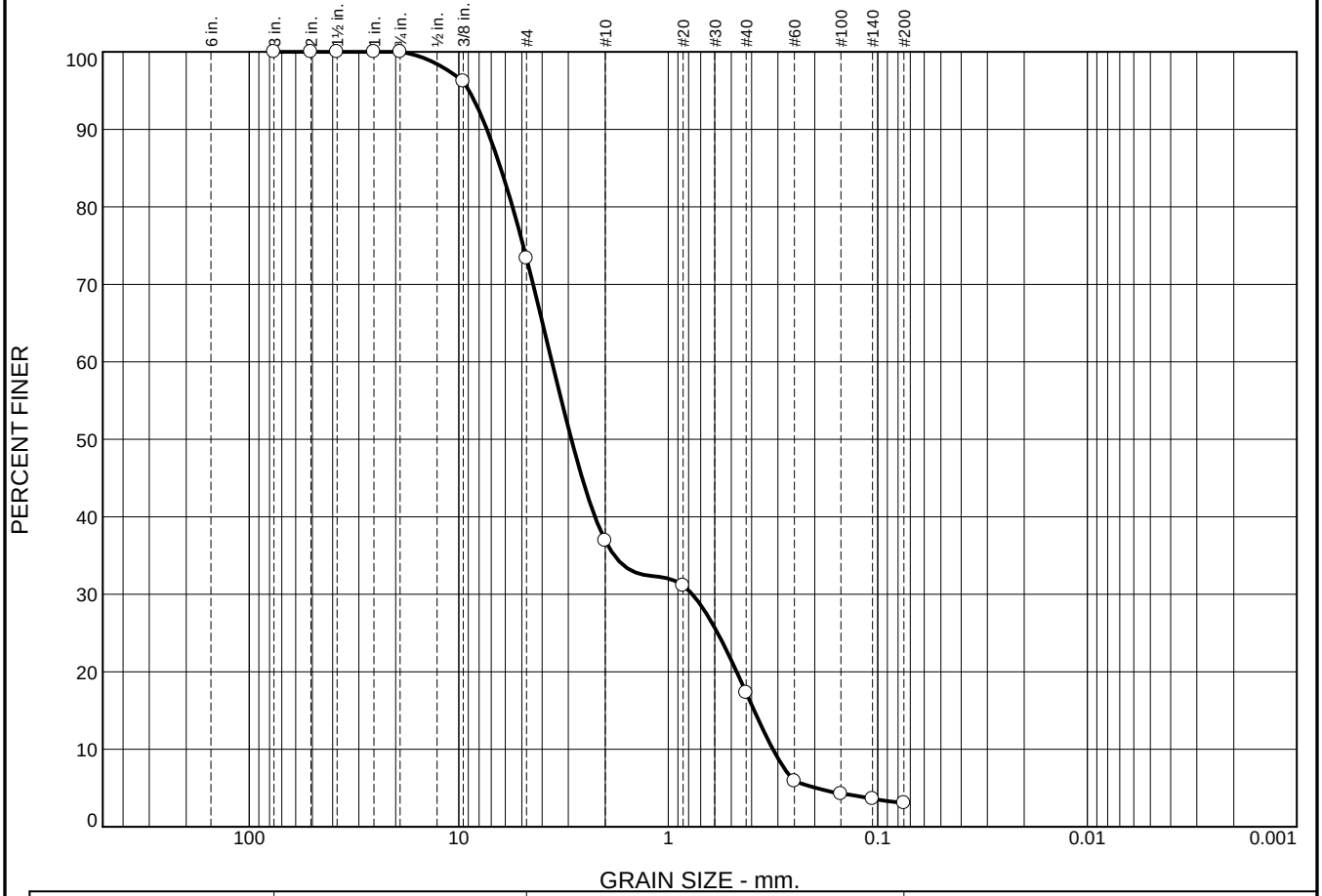

| | | | |
|---|---|---|---|
| Stainless Steel | | Type | 316 or 314 |
| Casing type SCH 40 PVC | X | | Casing Dia. 2" |
| (Riser Type) SCH 80 PVC | | | No. 5 ft Lengths Used 1 |
| Galvanized | | | No. 10 ft Lengths Used 1 |
| Black Steel | | | Other Lengths |

| | | | | |
|---|---|---|---|---|
| | Stainless Steel | | Well Screen Length | 15' |
| Screen Type | SCH 40 PVC | X | Well Screen Dia. | 2" |
| | SCH 80 PVC | | No. 5 ft Lengths Used | 1 |
| | Galvanized | | No. 10 ft Lengths Used | 1 |
| | Black Steel | | Other Lengths | |

| Date | Water Level | Elevation |
|---|---|---|
| 12/2/2024 | 15.5 | 777.4 |
| 12/5/2024 | 12.4 | 780.5 |

Remarks:

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 26.6 | 36.5 | 19.6 | 14.2 | 3.1 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 6.3084 | 3.5921 | 2.9019 | 0.7671 | 0.3889 | 0.3166 | 0.52 | 11.34 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Gravel | SP | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-101 **Sample Number:** S-5

**Date:** ○ 12/06/2024

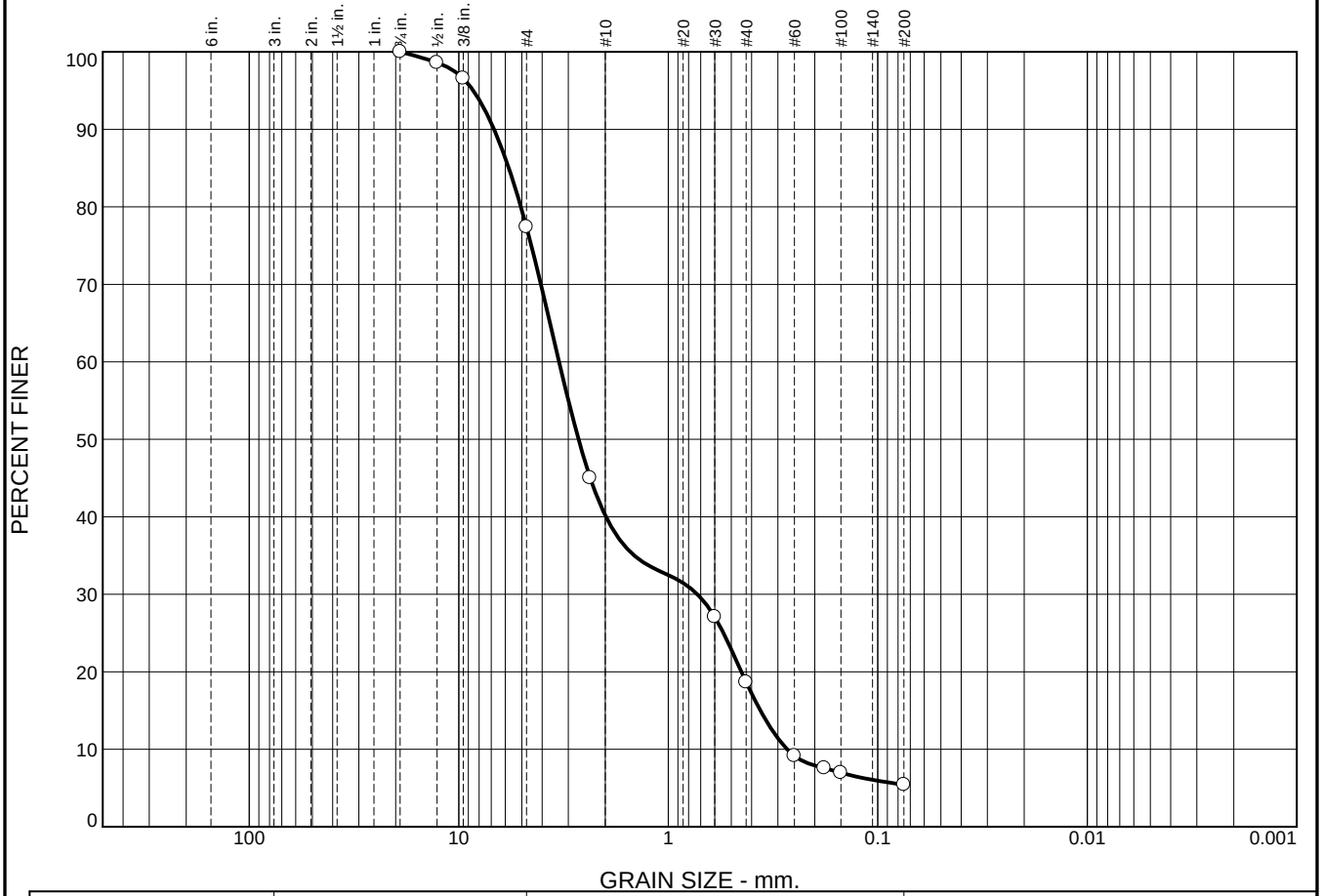
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 22.6 | 37.2 | 21.5 | 13.3 | 5.4 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 5.7684 | 3.3205 | 2.6824 | 0.7261 | 0.3632 | 0.2709 | 0.59 | 12.26 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Gravel | SP | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** B-101 **Sample Number:** S-6

**Date:** ○ 11/22/2024

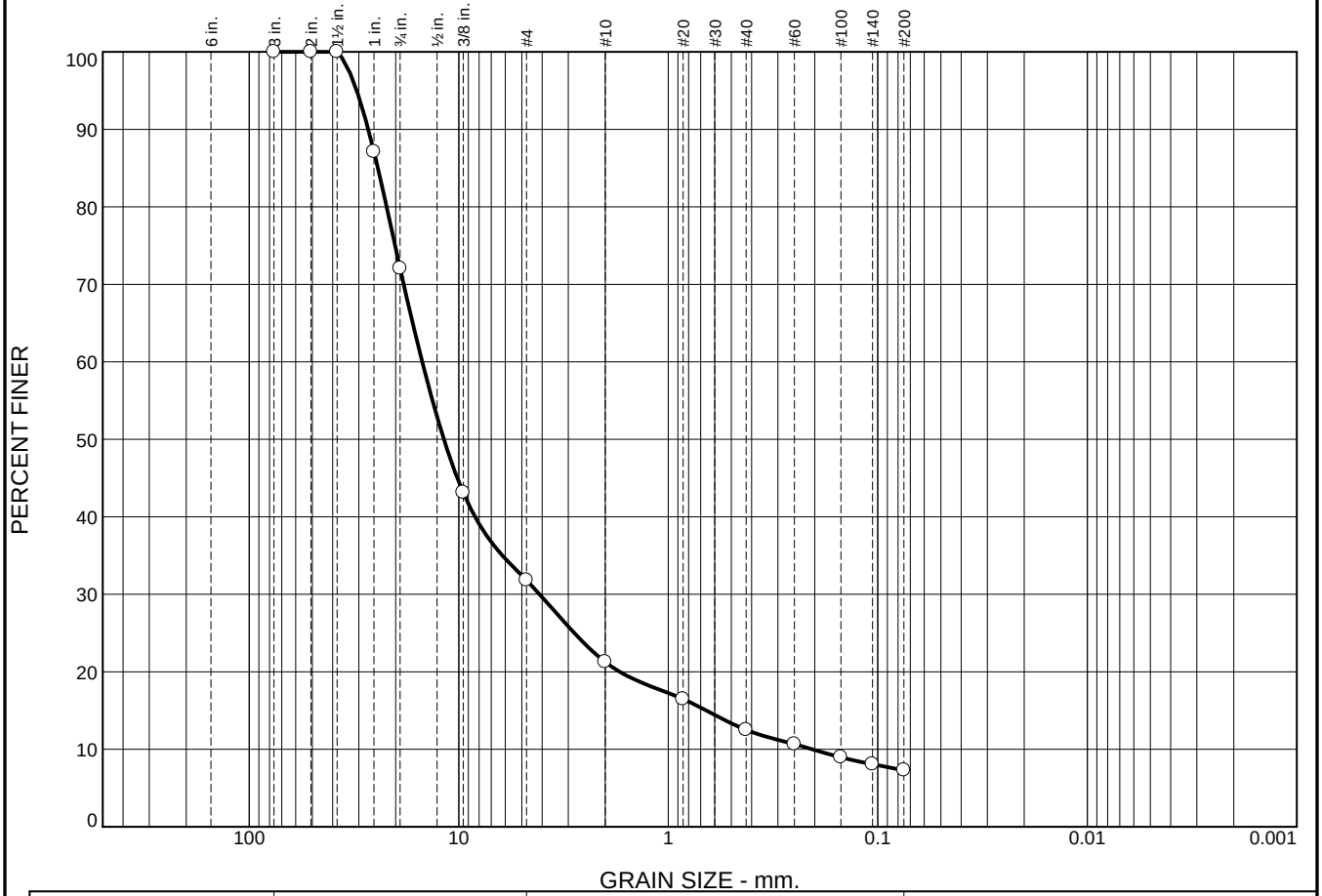
**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Remarks:**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 27.9 | 40.3 | 10.5 | 8.8 | 5.2 | 7.3 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 24.3285 | 14.9455 | 11.7718 | 4.1130 | 0.6576 | 0.2052 | 5.52 | 72.82 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Gravel with Silt | GP-GM | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-102 **Sample Number:** S-10

**Date:** ○ 12/17/2024

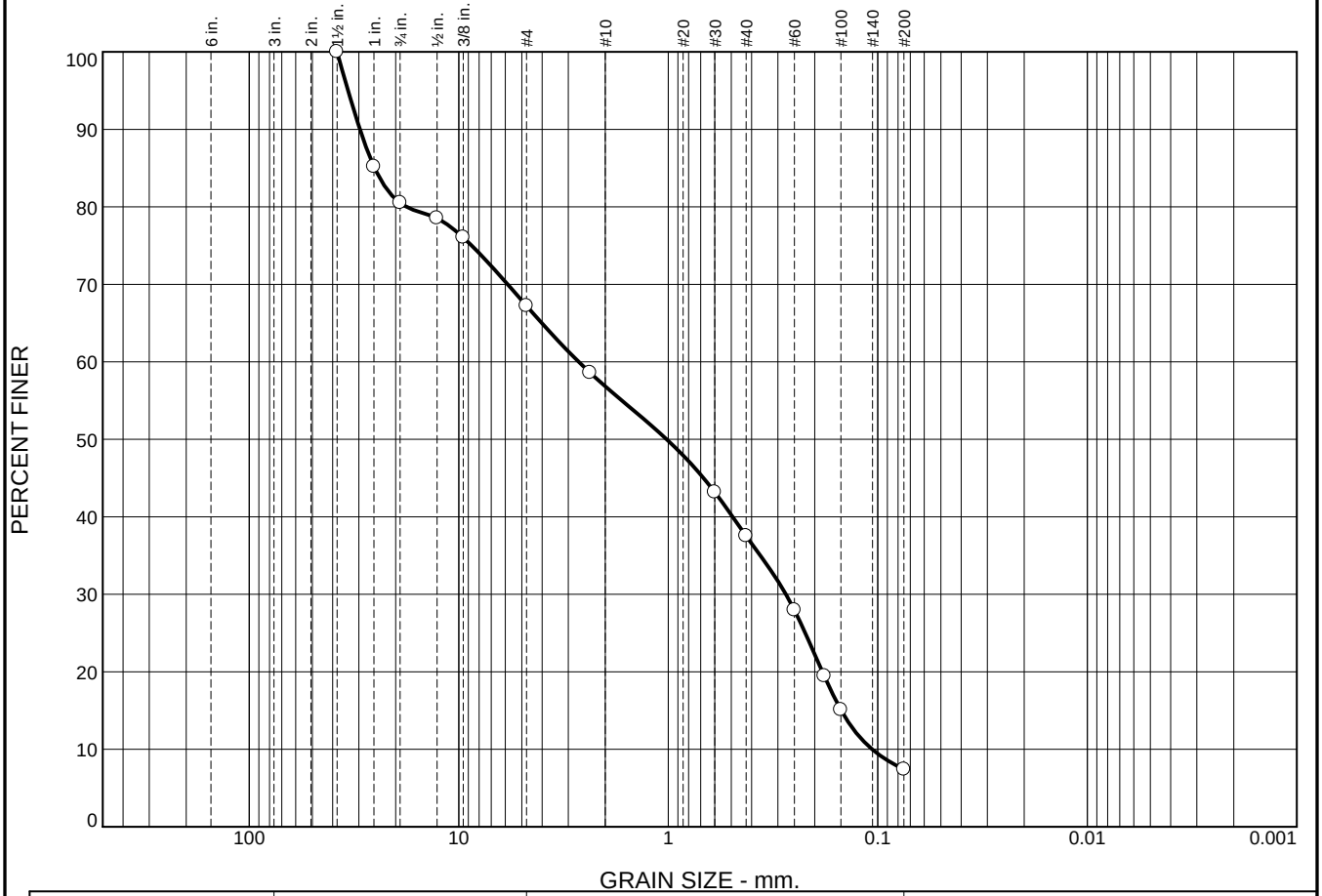
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 19.5 | 13.3 | 10.4 | 19.3 | 30.1 | 7.4 | |
| | | | | | | | | |
| | | | | | | | | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 25.2138 | 2.6765 | 1.0179 | 0.2747 | 0.1494 | 0.1064 | 0.26 | 25.15 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Silt and Gravel | SP-SM | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** B-102 **Sample Number:** S-12

**Date:** ○ 11/22/2024

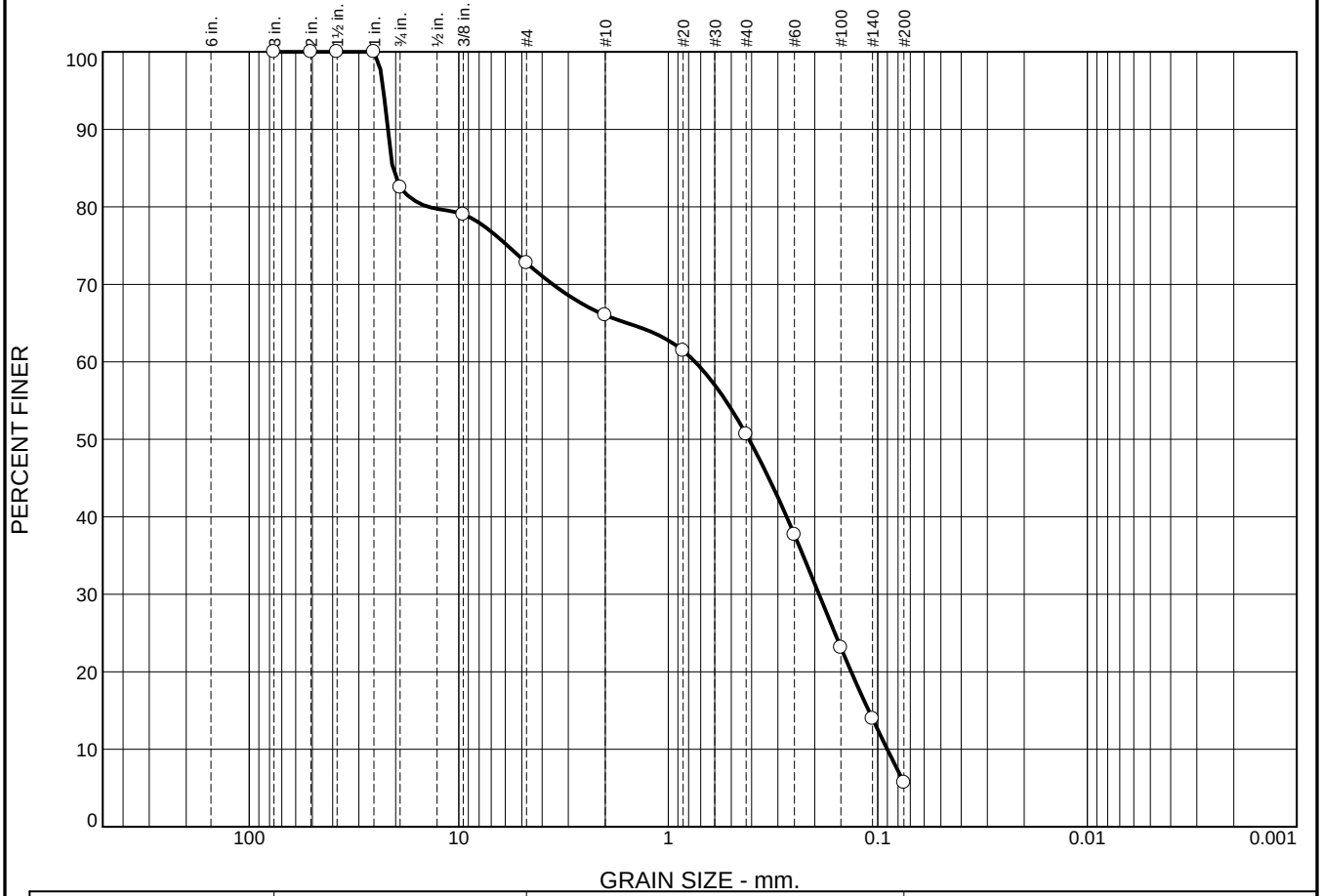
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 17.5 | 9.7 | 6.8 | 15.3 | 45.0 | 5.7 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 20.6533 | 0.7442 | 0.4120 | 0.1908 | 0.1105 | 0.0901 | 0.54 | 8.26 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Clay and Gravel | SP-SC | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-103 **Sample Number:** S-6

**Date:** ○ 12/17/2024

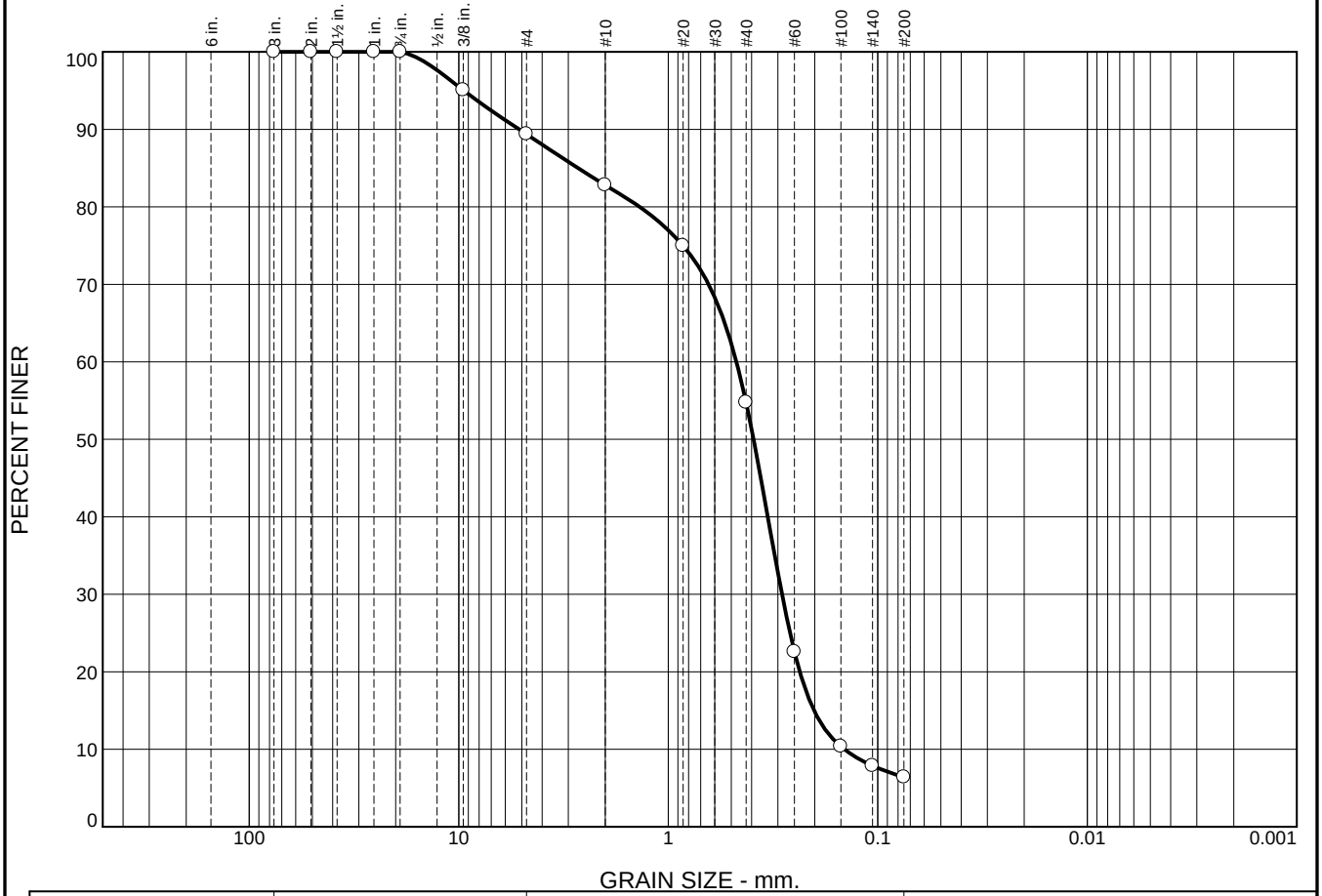
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 10.6 | 6.6 | 28.0 | 48.4 | 6.4 | |
| | | | | | | | | |
| | | | | | | | | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 2.6927 | 0.4729 | 0.3914 | 0.2866 | 0.2014 | 0.1442 | 1.20 | 3.28 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Clay | SP-SC | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-103 **Sample Number:** S-8

**Date:** ○ 12/17/2024

**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# SUMMARY OF LABORATORY TEST DATA

| Boring Number | Sample No.* | Sample Depth (ft) | Sample Description (USCS Symbol) | Loss By Wash (%) |
|---|---|---|---|---|
| SB-102 | S-13 | 31-32.5 | SP-SM | 6.0 |
| SB-102 | S-15 | 28.5-30 | ML | 78.2 |
| SB-103 | S-7 | 16-17.5 | SC | 40.6 |

*S = Split Spoon Sample (ASTM D1586)

PROJECT NO.: 241691

# TABLE 1

## 241691 - High Level Trunkline Sewer Improvements - Comparison of Soil Samples to Applicable Criteria

All criteria, unless otherwise noted, are expressed in units parts per billion (ppb). One ppb is equivalent to one micrograms per kilogram (µg/kg). Criteria with 6 or more digits are expressed in scientific notation. For example, 200,000 is presented as 2.0E+5. A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based value.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service (CAS) Number | Statewide Default Background Levels | Groundwater Protection | | | Contact | Soil Vapor | NOTES: | Composite Soil Sample Point (Depth) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Residential Drinking Water Protection Criteria (RDWP) | Nonresidential Drinking Water Protection Criteria (NRDWP) | Groundwater Surface Water Interface Protection Criteria (GSIP) | Nonresidential Direct Contact Criteria (NRDC) | Nonresidential Soil (VIAP) | | Sample Designation | SB-101 | SB-102 | SB-103 | SB-1 | SB-8 | SB-9 | SB-10 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | JV | BG | JV | IA | IA | IA | IA | IA | IA |
| | | | | | | | | | | Date | 10/24/24 | 10/25/24 | 12/2/24 | 3/11/24 | 3/6/24 | 3/7/24 | 3/13/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 285084.5 | 285074.0 | 286122.3 | 286096.8 | 285995.5 | 285687.1 | 285314.771 | 284994.6 | 285099.4 |
| | | | | | | | | | | Location E | 13289743.2 | 13290014.1 | 13289992.4 | 13289879.1 | 13290005.0 | 13289991.9 | 13289950.9 | 13289974.9 | 13289477.2 |
| | | | | | | | | | | Depth (ft) | 1.0 - 30.0 | 1.0 - 50.0 | 1.2 - 30.0 | 0.5 - 10 | 0.5 - 30 | 0.5 - 30 | 1.5 - 7.5 | 0.5 - 30 | 0.5 - 10 |
| Metals | Arsenic (B) | 7440382 | 5,800 | 4,600 | 4,600 | 4,600 | 37,000 | NA | | | **7,600** | **7,600** | **4,900** | 4,200 | 2,000 | 2,200 | **12,000** | **7,300** | **5,300** |
| | Barium (B) | 7440393 | 75,000 | 1.30E+06 | 1.30E+06 | (G) | 1.30E+08 | NA | | | 27,000 | 15,000 | 32,000 | **120,000** | 42,000 | 41,000 | 22,000 | 12,000 | 73,000 |
| | Cadmium (B) | 7440439 | 1,200 | 6,000 | 6,000 | (G,X) | 2.10E+06 | NA | | | **610** | **480** | **180** | **190** | **120** | **76** | **340** | **230** | **220** |
| | Chromium (Total) (B,H) | 7440473 | 18,000 (total) | | | | | | Data is for Total CR | | 7,300 | 6,100 | 8,100 | 5,600 | 13,000 | 14,000 | 14,000 | 6,700 | 8,500 |
| | Copper (B) | 7440508 | 32,000 | 5.80E+06 | 5.80E+06 | (G) | 7.30E+07 | NA | | | 18,000 | 15,000 | 10,000 | 18,000 | 13,000 | 7,500 | 16,000 | 11,000 | 17,000 |
| | Lead (B) | 7439921 | 21,000 | 7.00E+05 | 7.00E+05 | (G,X) | 9.0E+5 (DD) | NA | | | 6,800 | 6,400 | 8,500 | **58,000** | 6,000 | 4,200 | 15,000 | 7,100 | **53,000** |
| | Mercury (Total) (B,Z) | Varies | 130 | 1,700 | 1,700 | 50 (M); 1.2 | 5.80E+05 | 390 nc | | | ND | ND | ND | **78** | ND | ND | ND | ND | **140** |
| | Selenium (B) | 7782492 | 410 | 4,000 | 4,000 | 400 | 9.60E+06 | NA | | | **690** | **810** | **870** | ND | **200** | **280** | ND | **220** | **420** |
| | Silver (B) | 7440224 | 1,000 | 4,500 | 13,000 | 100 (M); 27 | 9.00E+06 | NA | | | **110** | ND | ND | ND | ND | ND | ND | ND | **270** |
| | Zinc (B) | 7440666 | 47000 | 2.40E+06 | 5.00E+06 | (G) | 6.30E+08 | NA | | | **48,000** | **47,000** | **29,000** | **41,000** | **29,000** | **19,000** | **35,000** | **30,000** | **54,000** |
| PNAs | Acenaphthene | 83329 | NA | 3.00E+05 | 8.80E+05 | 8,700 | 1.30E+08 | 3.60E+06 | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Acenaphthylene | 208968 | NA | 5,900 | 17,000 | ID | 5.20E+06 | DATA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Anthracene | 120127 | NA | 41,000 | 41,000 | ID | 7.30E+08 | 2.2E+08 nc | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Benzo(a)anthracene (Q) | 56553 | NA | NLL | NLL | NLL | 80,000 | 1.1E+07 ca | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Benzo(a)pyrene (Q) | 50328 | NA | NLL | NLL | NLL | 8,000 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Benzo(b)fluoranthene (Q) | 205992 | NA | NLL | NLL | NLL | 80,000 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Benzo(g,h,i)perylene | 191242 | NA | NLL | NLL | NLL | 7.00E+06 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Benzo(k)fluoranthene (Q) | 207089 | NA | NLL | NLL | NLL | 8.00E+05 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Chrysene (Q) | 218019 | NA | NLL | NLL | NLL | 8.00E+06 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Dibenzo(a,h)anthracene (Q) | 53703 | NA | NLL | NLL | NLL | 8,000 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Fluoranthene | 206440 | NA | 7.30E+05 | 7.30E+05 | 5,500 | 1.30E+08 | NA | | | ND | ND | NA | ND | ND | ND | **950** | ND | **340** |
| | Fluorene | 86737 | NA | 3.90E+05 | 8.90E+05 | 5,300 | 8.70E+07 | 8.3E+06 nc | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Indeno(1,2,3-cd)pyrene (Q) | 193395 | NA | NLL | NLL | NLL | 80,000 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | 2-Methylnaphthalene | 91576 | NA | 57,000 | 1.70E+05 | 4,200 | 2.60E+07 | 30,000 nc | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Naphthalene | 91203 | NA | 35,000 | 1.00E+05 | 730 | 5.20E+07 | 1,900 ca | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Phenanthrene | 85018 | NA | 56,000 | 1.60E+05 | 2,100 | 5.20E+06 | 29,000 nc | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Pyrene | 129000 | NA | 4.80E+05 | 4.80E+05 | ID | 8.40E+07 | 4.4E+08 nc | | | ND | ND | NA | ND | ND | ND | **410** | ND | ND |
| | 1,1,1,2-Tetrachloroethane | 630206 | NA | 1,500 | 6,400 | ID | 2.2E+6 (C) | 91 (M) ca | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,1,1-Trichloroethane | 71556 | NA | 4,000 | 4,000 | 1,800 | 1.0E+9 (C,D) | 7,500 (EE) st | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,1,2,2-Tetrachloroethane | 79345 | NA | 170 | 700 | 1,600 (X) | 2.40E+05 | 77 ca | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,1,2-Trichloroethane | 79005 | NA | 100 | 100 | 6,600 (X) | 8.40E+05 | 6.6 (M) nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,1-Dichloroethane | 75343 | NA | 18,000 | 50,000 | 15,000 | 8.7E+7 (C) | 74 ca | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,1-Dichloroethene (I) | 75354 | NA | 140 | 140 | 2,600 | 6.6E+5 (C) | 220 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2,3-Trichlorobenzene | 87616 | NA | NA | NA | NA | NA | 15,000 nc | Only in EGLE Vapor Criteria | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2,3-Trichloropropane | 96184 | NA | 840 | 2,400 | NA | 4.2E+6 (C) | 46 (M) nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2,3-Trimethylbenzene | 526738 | NA | NA | NA | NA | NA | 4,800 (JT) nc | Only in EGLE Vapor Criteria | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2,4-Trichlorobenzene | 120821 | NA | 4,200 | 4,200 | 5,900 (X) | 5.8E+6 (C,DD) | 930 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2,4-Trimethylbenzene (I) | 95636 | NA | 2,100 | 2,100 | 570 | 1.0E+8 (C) | 2,600 (JT) nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2-Dichlorobenzene | 95501 | NA | 14,000 | 14,000 | 280 | 6.3E+7 (C) | 26,000 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2-Dichloroethane (I) | 107062 | NA | 100 | 100 | 7,200 (X) | 4.20E+05 | 23 (M) ca | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2-Dichloropropane (I) | 78875 | NA | 100 | 100 | 4,600 (X) | 6.6E+5 (C) | 37 (M) nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,3,5-Trimethylbenzene (I) | 108678 | NA | 1,800 | 1,800 | 1,100 | 1.0E+8 (C) | 1,800 (JT) nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,3-Dichlorobenzene | 541731 | NA | 170 | 480 | 680 | 6.6E+5 (C) | 180 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,3-Dichloropropene, cis- | 10061015 | NA | NA | NA | NA | NA | NA | Isomers not in EGLE Criteria | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,4-Dichlorobenzene | 106467 | NA | 1,700 | 1,700 | 360 | 1.90E+06 | 660 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 2-Butanone (MEK) (I) | 78933 | NA | 2.60E+05 | 7.60E+05 | 44,000 | 7.0E+8 (C,DD) | 3.7E+05 (DD) dev | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 2-Hexanone | 591786 | NA | 20,000 | 58,000 | ID | 1.0E+8 (C) | 3,800 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 4-Isopropyltoluene | 99876 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 4-Methyl-2-pentanone (MIBK) (I) | 108101 | NA | 36,000 | 1.00E+05 | ID | 1.8E+8 (C) | 40,000 st | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |

# TABLE 1

## 241691 - High Level Trunkline Sewer Improvements - Comparison of Soil Samples to Applicable Criteria

All criteria, unless otherwise noted, are expressed in units parts per billion (ppb). One ppb is equivalent to one micrograms per kilogram (µg/kg). Criteria with 6 or more digits are expressed in scientific notation. For example, 200,000 is presented as 2.0E+5. A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based value.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service (CAS) Number | Statewide Default Background Levels | Groundwater Protection | | | Contact | Soil Vapor | NOTES: | Composite Soil Sample Point (Depth) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Residential Drinking Water Protection Criteria (RDWP) | Nonresidential Drinking Water Protection Criteria (NRDWP) | Groundwater Surface Water Interface Protection Criteria (GSIP) | Nonresidential Direct Contact Criteria (NRDC) | Nonresidential Soil (VIAP) | | Sample Designation | SB-101 | SB-102 | SB-103 | SB-1 | SB-8 | SB-9 | SB-10 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | JV | BG | JV | IA | IA | IA | IA | IA | IA |
| | | | | | | | | | | Date | 10/24/24 | 10/25/24 | 12/2/24 | 3/11/24 | 3/6/24 | 3/7/24 | 3/13/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 285084.5 | 285074.0 | 286122.3 | 286096.8 | 285995.5 | 285687.1 | 285314.771 | 284994.6 | 285099.4 |
| | | | | | | | | | | Location E | 13289743.2 | 13290014.1 | 13289992.4 | 13289879.1 | 13290005.0 | 13289991.9 | 13289950.9 | 13289974.9 | 13289477.2 |
| | | | | | | | | | | Depth (ft) | 1.0 - 30.0 | 1.0 - 50.0 | 1.2 - 30.0 | 0.5 - 10 | 0.5 - 30 | 0.5 - 30 | 1.5 - 7.5 | 0.5 - 30 | 0.5 - 10 |
| VOCs | Acetone (I) | 67641 | NA | 15,000 | 42,000 | 34,000 | 7.30E+07 | 3.1E+06 (EE) st | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Acrylonitrile (I) | 107131 | NA | 100 (M); 52 | 220 | 100 (M); 40 | 74,000 | 34 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Benzene (I) | 71432 | NA | 100 | 100 | 4,000 (X) | 8.4E+5 (C) | 47 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromobenzene (I) | 108861 | NA | 550 | 1,500 | NA | 1.7E+6 (C) | 2,800 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromochloromethane | 74975 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromodichloromethane | 75274 | NA | 1,600 (W) | 1,600 (W) | ID | 4.90E+05 | 16 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromoform | 75252 | NA | 1,600 (W) | 1,600 (W) | ID | 3.8E+6 (C) | 1,300 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromomethane | 74839 | NA | 200 | 580 | 100 | 1.00E+06 | 16 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Carbon disulfide | 75150 | NA | 16,000 | 46,000 | ID | 4.3E+7 (C,DD) | 920 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Carbon tetrachloride | 56235 | NA | 100 | 100 | 760 (X) | 4.4E+5 (C) | 8.7 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Chlorobenzene | 108907 | NA | 2,000 | 2,000 | 500 | 1.4E+7 (C) | 1,400 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Chloroethane | 75003 | NA | 8,600 | 34,000 | 22,000 (X) | 1.2E+7 (C) | 5,800 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Chloroform | 67663 | NA | 1,600 (W) | 1,600 (W) | 7,000 | 5.5E+6 (C) | 7.4 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Chloromethane | 74873 | NA | 5,200 | 22,000 | ID | 7.4E+6 (C) | 120 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | cis-1,2-Dichloroethene | 156592 | NA | 1,400 | 1,400 | 12,000 | 8.0E+6 (C) | 37 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Cyclohexane | 110827 | NA | NA | NA | NA | NA | 5,600 nc | Only in EGLE Vapor Criteria | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Dibromochloromethane | 124481 | NA | 1,600 (W) | 1,600 (W) | ID | 5.00E+05 | 27 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Dibromochloropropane | 96128 | NA | 10 (M); 4.0 | 10 (M); 4.0 | ID | 20,000 (C) | DATA | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Dibromomethane | 74953 | NA | 1,600 | 4,600 | NA | 8.0E+6 (C) | 62 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Dichlorodifluoromethane | 75718 | NA | 95,000 | 2.70E+05 | ID | 1.7E+8 (C) | 220 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Diethyl ether | 60297 | NA | 200 | 200 | ID | 3.6E+8 (C) | 6,200 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Diisopropyl ether | 108203 | NA | 600 | 1,700 (C) | ID | 3.0E+6 (C) | 2,300 (DD) dev | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Ethylbenzene (I) | 100414 | NA | 1,500 | 1,500 | 360 | 7.1E+7 (C) | 340 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Ethylene dibromide (EDB) | 106934 | NA | 20 (M); 1.0 | 20 (M); 1.0 | 110 (X) | 430 | 2.1 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Ethyl-tert-butyl ether (ETBE) | 637923 | NA | 980 | 980 | ID | ID | DATA | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Iodomethane | 74884 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Isopropyl benzene | 98828 | NA | 91,000 | 2.60E+05 | 3,200 | 8.0E+7 (C) | 110 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Methylene chloride | 75092 | NA | 100 | 100 | 30,000 (X) | 5.8E+6 (C) | 2,300 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Methyl-tert-butyl ether (MTBE) | 1634044 | NA | 800 | 800 | 1.4E+5 (X) | 7.1E+6 (C) | 2,100 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Naphthalene | 91203 | NA | 35,000 | 1.00E+05 | 730 | 5.20E+07 | 1,900 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | n-Butylbenzene | 104518 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 9,800 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | n-Propylbenzene (I) | 103651 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 21,000 (DD) dev | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | sec-Butylbenzene | 135988 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 66,000 (C) nc (40,000) | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Styrene | 100425 | NA | 2,700 | 2,700 | 2,100 (X) | 1.9E+6 (C) | 4,300 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | t-Amyl methyl ether (TAME) | 994058 | NA | 3,900 | 3,900 | NA | 9.5E+7 (C) | 600 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | t-Butyl alcohol | 75650 | NA | 78,000 | 2.20E+05 | NA | 3.9E+8 (C) | 57,000 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | t-Butylbenzene (I) | 98066 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 11 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Tetrachloroethylene | 127184 | NA | 100 | 100 | 1,200 (X) | 9.3E+5 (C) | 74 (EE) st | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Tetrahydrofuran | 109999 | NA | 1,900 | 5,400 | 2.2E+5 (X) | 9.50E+06 | 2.2E+05 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Toluene (I) | 108883 | NA | 16,000 | 16,000 | 5,400 | 1.6E+8 (C) | 64,000 (EE) st | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | trans-1,2-Dichloroethene | 156605 | NA | 2,000 | 2,000 | 30,000 (X) | 1.2E+7 (C) | 210 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | trans-1,4-Dichloro-2-butene | 110576 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Trichloroethylene (TCE) | 79016 | NA | 100 | 100 | 4,000 (X) | 6.6E+5 (C,DD) | 4.0 (M) (DD) dev | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Trichlorofluoromethane | 75694 | NA | 52,000 | 1.50E+05 | NA | 2.6E+8 (C) | 340 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Vinyl chloride | 75014 | NA | 40 | 40 | 260 (X) | 34,000 | 8.2 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Xylenes (I) | 1330207 | NA | 5,600 | 5,600 | 980 | 1.0E+9 (C,D) | 5,000 (J) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |

# TABLE 2

## 241691 - High Level Trunkline Sewer Improvements - Comparison of Groundwater Samples to Applicable Criteria

All criteria, unless otherwise noted, are expressed in units of parts per billion (ppb). One ppb is equivalent to 1 microgram per liter (ug/L). A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based or solubility value, whichever is lower.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service Number | Groundwater Protection | | | Indoor Air | Water Solubility | Soil Vapor | NOTES: | Water Sample Point (Depth) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Residential Drinking Water Criteria (RDW) | Nonresidential Drinking Water Criteria (NRDW) | Groundwater Surface Water Interface Criteria (GSI) | Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria (GVIIC) | | Nonresidential Groundwater Not in Contact (VIAP) | | Sample Designation | SB-101 | MW-102 | MW-103 | SB-1 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | JV | MDE | MDE | IA | IA | IA |
| | | | | | | | | | | Date | 10/24/24 | 12/5/24 | 12/5/24 | 3/11/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 285084.5 | 285074.0 | 286122.3 | 286096.8 | 284,995 | 285,099 |
| | | | | | | | | | | Location E | 13289743.2 | 13290014.1 | 13289992.4 | 13289879.1 | 13,289,975 | 13,289,477 |
| | | | | | | | | | | Depth (ft) | 10 | 25 | 15 | 15 | 25 | 11 |
| Metals | Arsenic | 7440382 | 10 (A) | 10 (A) | 10 | NLV | NA | NA | | | **29** | **6** | **5** | **11** | **2** | **8** |
| | Barium (B) | 7440393 | 2,000 (A) | 2,000 (A) | (G) | NLV | NA | NA | | | **600** | **200** | **200** | **200** | ND | ND |
| | Cadmium (B) | 7440439 | 5.0 (A) | 5.0 (A) | (G,X) | NLV | NA | NA | | | **2** | ND | ND | ND | ND | ND |
| | Chromium (III) (B,H) | 16065831 | 100 (A) | 100 (A) | (G,X) | NLV | NA | NA | Data is for Total CR | | **38** | **7** | ND | **8** | ND | ND |
| | Copper (B) | 7440508 | 1,000 (E) | 1,000 (E) | (G) | NLV | NA | NA | | | **76** | **16** | **6** | **13** | **58** | ND |
| | Lead (B) | 7439921 | 4.0 (L) | 4.0 (L) | (G,X) | NLV | NA | NA | | | **42** | **13** | **4** | **22** | ND | ND |
| | Mercury (Total) (B,Z) | Varies | 2.0 (A) | 2.0 (A) | 0.0013 | 56 (S) | 56 | 3.7 nc | | | **0.2** | ND | ND | ND | ND | ND |
| | Selenium (B) | 7782492 | 50 (A) | 50 (A) | 5 | NLV | NA | NA | | | ND | ND | ND | ND | ND | ND |
| | Silver (B) | 7440224 | 34 | 98 | 0.2 (M); 0.06 | NLV | NA | NA | | | **0.3** | ND | ND | ND | ND | ND |
| | Zinc (B) | 7440666 | 2,400 | 5,000 (E) | (G) | NLV | NA | NA | | | **190** | **50** | **60** | **70** | **20** | ND |
| PNAs | Acenaphthene | 83329 | 1,300 | 3,800 | 38 | 4,200 (S) | 4,240 | 3,900 (S) sol | | | ND | ND | ND | NA | ND | ND |
| | Acenaphthylene | 208968 | 52 | 150 | ID | 3,900 (S) | 3,930 | 710 (CC) nc | | | ND | ND | ND | NA | ND | ND |
| | Anthracene | 120127 | 43 (S) | 43 (S) | ID | 43 (S) | 43.4 | 43 (S) sol | | | ND | ND | ND | NA | ND | ND |
| | Benzo(a)anthracene (Q) | 56553 | 2.1 | 8.5 | ID | NLV | 9.4 | 9.4 (S) (MM) sol | | | ND | ND | ND | NA | ND | ND |
| | Benzo(a)pyrene (Q) | 50328 | 5.0 (A) | 5.0 (A) | ID | NLV | 1.62 | NA | | | ND | ND | ND | NA | ND | ND |
| | Benzo(b)fluoranthene (Q) | 205992 | 1.5 (S,AA) | 1.5 (S,AA) | ID | ID | 1.5 | NA | | | ND | ND | ND | NA | ND | ND |
| | Benzo(g,h,i)perylene | 191242 | 1.0 (M); 0.26 (S) | 1.0 (M); 0.26 (S) | ID | NLV | 0.26 | NA | | | ND | ND | ND | NA | ND | ND |
| | Benzo(k)fluoranthene (Q) | 207089 | 1.0 (M); 0.8 (S) | 1.0 (M); 0.8 (S) | NA | NLV | 0.8 | NA | | | ND | ND | ND | NA | ND | ND |
| | Chrysene (Q) | 218019 | 1.6 (S) | 1.6 (S) | ID | ID | 1.6 | NA | | | ND | ND | ND | NA | ND | ND |
| | Dibenz(a,h)anthracene (Q) | 53703 | 2.0 (M); 0.21 | 2.0 (M); 0.85 | ID | NLV | 2.49 | NA | | | ND | ND | ND | NA | ND | ND |
| | Fluoranthene | 206440 | 210 (S) | 210 (S) | 1.6 | 210 (S) | 206 | NA | | | ND | ND | ND | NA | ND | ND |
| | Fluorene | 86737 | 880 | 2,000 (S) | 12 | 2,000 (S) | 1,980 | 1,700 (S) sol | | | ND | ND | ND | NA | ND | ND |
| | Indeno(1,2,3-cd)pyrene (Q) | 193395 | 2.0 (M); 0.022 (S) | 2.0 (M); 0.022 (S) | ID | NLV | 0.022 | NA | | | ND | ND | ND | NA | ND | ND |
| | 2-Methylnaphthalene | 91576 | 260 | 750 | 19 | 25,000 (S) | 24,600 | 2,900 nc | | | ND | ND | ND | NA | ND | ND |
| | Naphthalene | 91203 | 520 | 1,500 | 11 | 31,000 (S) | 31,000 | 300 ca | | | ND | ND | ND | NA | ND | ND |
| | Phenanthrene | 85018 | 52 | 150 | 2.0 (M); 1.7 | 1,000 (S) | 1,000 | 420 nc | | | ND | ND | ND | NA | ND | ND |
| | Pyrene | 129000 | 140 (S) | 140 (S) | ID | 140 (S) | 135 | 140 (S) sol | | | ND | ND | ND | NA | ND | ND |
| | Acetone (I) | 67641 | 730 | 2,100 | 1,700 | 1.0E+9 (D,S) | 1.00E+09 | 4.0E+07 (FF) st | | | ND | ND | ND | **86** | ND | **36** |
| | Acrylonitrile (I) | 107131 | 2.6 | 11 | 2.0 (M); 1.2 | 1.90E+05 | 7.50E+07 | 330 ca | | | ND | ND | ND | ND | ND | ND |
| | Benzene (I) | 71432 | 5.0 (A) | 5.0 (A) | 200 (X) | 35,000 | 1.75E+06 | 66 ca | | | ND | ND | ND | ND | ND | ND |
| | Bromobenzene (I) | 108861 | 18 | 50 | NA | 3.90E+05 | 4.13E+05 | 2,700 nc | | | ND | ND | ND | ND | ND | ND |
| | Bromochloromethane | 74975 | | | | | | | Not in EGLE Criteria | | ND | ND | ND | ND | ND | ND |
| | Bromodichloromethane | 75274 | 80 (A,W) | 80 (A,W) | ID | 37,000 | 6.74E+06 | 73 nc | | | ND | ND | ND | ND | ND | ND |
| | Bromoform | 75252 | 80 (A,W) | 80 (A,W) | ID | 3.1E+6 (S) | 3.10E+06 | 6,200 ca | | | ND | ND | ND | ND | ND | ND |
| | Bromomethane | 74839 | 10 | 29 | 5.0 (M); 4.2 | 9,000 | 1.45E+07 | 80 nc | | | ND | ND | ND | ND | ND | ND |
| | 2-Butanone (MEK) (I) | 78933 | 13,000 | 38,000 | 2,200 | 2.4E+8 (S) | 2.40E+08 | 4.3E+06 (DD) dev | | | ND | ND | ND | **24** | ND | ND |
| | Carbon disulfide (I,R) | 75150 | 800 | 2,300 | ID | 5.50E+05 | 1.19E+06 | 3,100 nc | | | ND | ND | ND | ND | ND | ND |
| | Carbon tetrachloride | 56235 | 5.0 (A) | 5.0 (A) | 38 (X) | 2,400 | 7.93E+05 | 18 ca | | | ND | ND | ND | ND | ND | ND |
| | Chlorobenzene (I) | 108907 | 100 (A) | 100 (A) | 25 | 4.7E+5 (S) | 4.72E+05 | 1,400 nc | | | ND | ND | ND | ND | ND | ND |
| | Chloroethane | 75003 | 430 | 1,700 | 1,100 (X) | 5.7E+6 (S) | 5.74E+06 | 22,000 nc | | | ND | ND | ND | ND | ND | ND |
| | Chloroform | 67663 | 80 (A,W) | 80 (A,W) | 350 | 1.80E+05 | 7.92E+06 | 32 ca | | | ND | ND | ND | ND | ND | ND |
| | Chloromethane (I) | 74873 | 260 | 1,100 | ID | 45,000 | 6.34E+06 | 560 ca | | | ND | ND | **1** | **1** | ND | ND |
| | Cyclohexane | 110827 | | | | | | 8,100 (GW) nc | Only in EGLE Vapor Criteria | | ND | ND | ND | ND | ND | ND |
| | Dibromochloromethane | 124481 | 80 (A,W) | 80 (A,W) | ID | 1.10E+05 | 2.60E+06 | 130 ca | | | ND | ND | ND | ND | ND | ND |
| | Dibromochloropropane | 96128 | 0.2 (A) | 0.2 (A) | ID | 1,200 (S) | 1,230 | 2.1E-02 (M) (CC) | | | ND | ND | ND | ND | ND | ND |
| | 1,2-Dibromoethane Ethylene dibromide (EDB) | 106934 | 0.05 (A) | 0.05 (A) | 5.7 (X) | 15,000 | 4.20E+06 | 8.9 ca | | | ND | ND | ND | ND | ND | ND |
| | Dibromomethane | 74953 | 80 | 230 | NA | ID | 1.10E+07 | 380 nc | | | ND | ND | ND | ND | ND | ND |
| | 1,2-Dichlorobenzene | 95501 | 600 (A) | 600 (A) | 13 | 1.6E+5 (S) | 1.56E+05 | 16,000 nc | | | ND | ND | ND | ND | ND | ND |
| | 1,3-Dichlorobenzene | 541731 | 6.6 | 19 | 28 | 41,000 | 1.11E+05 | 110 nc | | | ND | ND | ND | ND | ND | ND |
| | 1,4-Dichlorobenzene | 106467 | 75 (A) | 75 (A) | 17 | 74,000 (S) | 73,800 | 400 ca | | | ND | ND | ND | ND | ND | ND |

# TABLE 2

## 241691 - High Level Trunkline Sewer Improvements - Comparison of Groundwater Samples to Applicable Criteria

All criteria, unless otherwise noted, are expressed in units of parts per billion (ppb). One ppb is equivalent to 1 microgram per liter (ug/L). A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based or solubility value, whichever is lower.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service Number | Groundwater Protection | | | Indoor Air | Water Solubility | Soil Vapor | NOTES: | Water Sample Point (Depth) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Residential Drinking Water Criteria (RDW) | Nonresidential Drinking Water Criteria (NRDW) | Groundwater Surface Water Interface Criteria (GSI) | Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria (GVIIC) | | Nonresidential Groundwater Not in Contact (VIAP) | | Sample Designation | SB-101 | MW-102 | MW-103 | SB-1 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | JV | MDE | MDE | IA | IA | IA |
| | | | | | | | | | | Date | 10/24/24 | 12/5/24 | 12/5/24 | 3/11/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 285084.5 | 285074.0 | 286122.3 | 286096.8 | 284,995 | 285,099 |
| | | | | | | | | | | Location E | 13289743.2 | 13290014.1 | 13289992.4 | 13289879.1 | 13,289,975 | 13,289,477 |
| | | | | | | | | | | Depth (ft) | 10 | 25 | 15 | 15 | 25 | 11 |
| VOCs | Dichlorodifluoromethane | 75718 | 1,700 | 4,800 | ID | 3.0E+5 (S) | 3.00E+05 | 410 (GW) nc | | ND | ND | ND | ND | ND | ND | |
| | 1,1-Dichloroethane | 75343 | 880 | 2,500 | 740 | 2.30E+06 | 5.06E+06 | 300 ca | | ND | ND | ND | ND | ND | ND | |
| | 1,2-Dichloroethane (I) | 107062 | 5.0 (A) | 5.0 (A) | 360 (X) | 59,000 | 8.52E+06 | 97 ca | | ND | ND | ND | ND | ND | ND | |
| | 1,1-Dichloroethylene (I) | 75354 | 7.0 (A) | 7.0 (A) | 130 | 1,300 | 2.25E+06 | 480 nc | | ND | ND | ND | ND | ND | ND | |
| | cis-1,2-Dichloroethylene | 156592 | 70 (A) | 70 (A) | 620 | 2.10E+05 | 3.50E+06 | 140 nc | | ND | ND | **2** | ND | ND | ND | |
| | 1,2-Dichloropropane (I) | 78875 | 5.0 (A) | 5.0 (A) | 230 (X) | 36,000 | 2.80E+06 | 110 nc | | ND | ND | ND | ND | ND | ND | |
| | Diethyl ether | 60297 | 10 (E) | 10 (E) | ID | 6.1E+7 (S) | 6.10E+07 | 53,000 nc | | ND | ND | ND | ND | ND | ND | |
| | Diisopropyl ether DIPE) | 108203 | 30 | 86 | ID | 8,000 (S) | 8,041 | 13,000 (DD) dev | | ND | ND | ND | ND | ND | ND | |
| | Ethylbenzene (I) | 100414 | 74 (E) | 74 (E) | 18 | 1.7E+5 (S) | 1.69E+05 | 170 ca | | ND | ND | ND | ND | ND | ND | |
| | Ethyl-tert-butyl ether (ETBE) | 637923 | 49 (E) | 49 (E) | ID | 5.6E+6 (S) | 5.63E+06 | 580 (CC) nc | | ND | ND | ND | ND | ND | ND | |
| | 2-Hexanone | 591786 | 1,000 | 2,900 | ID | 8.70E+06 | 1.60E+07 | 29,000 nc | | ND | ND | ND | ND | ND | ND | |
| | Isopropyl benzene | 98828 | 800 | 2,300 | 28 | 56,000 (S) | 56,000 | 36 ca | | ND | ND | ND | ND | ND | ND | |
| | Iodomethane | 74884 | | | | | | | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | |
| | Methylene chloride | 75092 | 5.0 (A) | 5.0 (A) | 1,500 (X) | 1.40E+06 | 1.70E+07 | 12,000 nc | | ND | ND | ND | ND | ND | ND | |
| | 2-Methylnaphthalene | 91576 | 260 | 750 | 19 | 25,000 (S) | 2.46E+04 | 2,900 nc | | ND | ND | ND | ND | ND | ND | |
| | 4-Methyl-2-pentanone (MIBK) (I) | 108101 | 1,800 | 5,200 | ID | 2.0E+7 (S) | 2.00E+07 | 3.3E+05 st | | ND | ND | ND | ND | ND | ND | |
| | Methyl-tert-butyl ether (MTBE) | 1634044 | 40 (E) | 40 (E) | 7,100 (X) | 4.7E+7 (S) | 4.68E+07 | 17,000 ca | | ND | ND | ND | ND | ND | ND | |
| | Naphthalene | 91203 | 520 | 1,500 | 11 | 31,000 (S) | 3.10E+04 | 300 ca | | ND | ND | ND | ND | ND | ND | |
| | n-Butylbenzene | 104518 | 80 | 230 | ID | ID | NA | 1,600 nc | | ND | ND | ND | ND | ND | ND | |
| | n-Propylbenzene (I) | 103651 | 80 | 230 | ID | ID | NA | 6,100 (DD) dev | | ND | ND | ND | ND | ND | ND | |
| | p-Isopropyltoluene | 99876 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | |
| | sec-Butylbenzene | 135988 | 80 | 230 | ID | ID | NA | 12,000 nc | | ND | ND | ND | ND | ND | ND | |
| | Styrene | 100425 | 100 (A) | 100 (A) | 80 (X) | 3.1E+5 (S) | 3.10E+05 | 2,300 ca | | ND | ND | ND | ND | ND | ND | |
| | t-Butyl alcohol | 75650 | 3,900 | 11,000 | NA | 1.0E+9 (D,S) | 1.00E+09 | 7.5E+05 nc | | ND | ND | ND | ND | ND | ND | |
| | t-Amyl methyl ether (TAME) | 994058 | 190 (E) | 190 (E) | NA | 5.70E+05 | 2.64E+06 | 3,500 nc | | ND | ND | ND | ND | ND | ND | |
| | t-Butylbenzene (I) | 98066 | 80 | 230 | ID | ID | NA | 2.6 nc | | ND | ND | ND | ND | ND | ND | |
| | 1,1,1,2-Tetrachloroethane | 630206 | 77 | 320 | ID | 96,000 | 1.10E+06 | 210 ca | | ND | ND | ND | ND | ND | ND | |
| | 1,1,2,2-Tetrachloroethane | 79345 | 8.5 | 35 | 78 (X) | 77,000 | 2.97E+06 | 170 ca | | ND | ND | ND | ND | ND | ND | |
| | Tetrachloroethylene | 127184 | 5.0 (A) | 5.0 (A) | 60 (X) | 1.70E+05 | 2.00E+05 | 130 (EE) st | | ND | **12** | ND | ND | ND | ND | |
| | Tetrahydrofuran | 109999 | 95 | 270 | 11,000 (X) | 1.60E+07 | 1.00E+09 | 2.0E+06 nc | | ND | ND | ND | ND | ND | ND | |
| | Toluene (I) | 108883 | 790 (E) | 790 (E) | 270 | 5.3E+5 (S) | 5.26E+05 | 59,00 (EE) st | | ND | ND | ND | ND | ND | ND | |
| | trans-1,4-Dichloro-2-butene | 110576 | | | | | | | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | |
| | trans-1,2-Dichloroethylene | 156605 | 100 (A) | 100 (A) | 1,500 (X) | 2.00E+05 | 6.30E+06 | 580 nc | | ND | ND | ND | ND | ND | ND | |
| | 1,2,3-Trichlorobenzene | 87616 | NA | NA | NA | NA | NA | 2,600 nc | Rule 57 & EGLE Vapor Criteria | ND | ND | ND | ND | ND | ND | |
| | 1,2,4-Trichlorobenzene | 120821 | 70 (A) | 70 (A) | 99 (X) | 3.0E+5 (S) | 3.00E+05 | 160 nc | | ND | ND | ND | ND | ND | ND | |
| | 1,1,1-Trichloroethane | 71556 | 200 (A) | 200 (A) | 89 | 1.3E+6 (S) | 1.33E+06 | 19,000 (EE) st | | ND | ND | ND | ND | ND | ND | |
| | 1,1,2-Trichloroethane | 79005 | 5.0 (A) | 5.0 (A) | 330 (X) | 1.10E+05 | 4.42E+06 | 20 nc | | ND | ND | ND | ND | ND | ND | |
| | Trichloroethylene (TCE) | 79016 | 5.0 (A) | 5.0 (A) | 200 (X) | 4,900 | 1.10E+06 | 10 (DD) dev | | ND | ND | ND | ND | ND | ND | |
| | Trichlorofluoromethane | 75694 | 2,600 | 7,300 | NA | 1.1E+6 (S) | 1.10E+06 | 560 (GW) nc | | ND | ND | ND | ND | ND | ND | |
| | 1,2,3-Trichloropropane | 96184 | 42 | 120 | NA | 18,000 | 1.90E+06 | 84 nc | | ND | ND | ND | ND | ND | ND | |
| | 1,2,3-Trimethylbenzene | 526738 | NA | NA | NA | NA | NA | 1,800 (JT) nc | Rule 57 & EGLE Vapor Criteria | ND | ND | ND | ND | ND | ND | |
| | 1,2,4-Trimethylbenzene (I) | 95636 | 63 (E) | 63 (E) | 17 | 56,000 (S) | 55,890 | 990 (JT) nc | | ND | ND | ND | ND | ND | ND | |
| | 1,3,5-Trimethylbenzene (I) | 108678 | 72 (E) | 72 (E) | 45 | 61,000 (S) | 61,150 | 690 (JT) nc | | ND | ND | ND | ND | ND | ND | |
| | Vinyl chloride | 75014 | 2.0 (A) | 2.0 (A) | 13 (X) | 13,000 | 2,760,000 | 18 ca | | ND | ND | ND | ND | ND | ND | |
| | Xylenes (I) | 1330207 | 280 (E) | 280 (E) | 49 | 1.9E+5 (S) | 1.86E+05 | 3,000 (J) nc | | ND | ND | ND | ND | ND | ND | |

## R 299.49 FOOTNOTES FOR GENERIC CLEANUP CRITERIA TABLES

### Cleanup Criteria Requirements for Response Activity

### R 299.49 Footnotes for generic cleanup criteria tables.

Rule 49. (1) The footnotes that apply to the generic criteria tables in R 299.44, R 299.46, and R 299.48 are as follows:

(A) Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.

(B) Background, as defined in R 299.1(b), may be substituted if higher than the calculated cleanup criterion. Background levels may be less than criteria for some inorganic compounds.

(G) Groundwater surface water interface (GSI) criterion depends on the pH or water hardness, or both, of the receiving surface water. The final chronic value (FCV) for the protection of aquatic life shall be calculated based on the pH or hardness of the receiving surface water. Where water hardness exceeds 400 mg CaCO3/L, use 400 mg CaCO3/L for the FCV calculation. The FCV formula provides values in units of µg/L or ppb. The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV), and the surface water human non-drinking water value (HNDV). The soil GSI protection criteria for these hazardous substances are the greater of the 20 times the GSI criterion or the GSI soil-water partition values using the GSI criteria developed with the procedure described in this footnote.

| Hazardous Substance | FCV Formula (ug/L) | FCV Conversion Factor (CF) | WV (µg/L) | HNDV (µg/L) |
|---|---|---|---|---|
| Acetate | EXP(0.2732*(pH) + 7.0362) | NA | NA | 1300000 |
| Acetic Acid | EXP(0.2732*(pH) + 7.0362) | NA | NA | 1300000 |
| Barium | EXP(1.0629*(LnH + 1.11869) | NA | NA | 160000 |
| Beryllium | EXP(1.6839*(LnH - 5.8575) | NA | NA | 1200 |
| Cadmium ¤ | (EXP(0.7852*(LnH - 2.715))*CF | 1.101672 - ((LnH)*(0.041838)) | NA | 130 |
| Chromium (III) ¤ | (EXP(0.819*(lnH) + 0.6848))*CF | 0.86 | NA | 9400 |
| Copper | (EXP(0.8545*(LnH - 1.702))*CF | 0.96 | NA | 38000 |
| Lead ¤ | (EXP(0.9859*(LnH) - 1.0967))*CF | 1.46203 - ((LnH)*(0.14571)) | NA | 190 |
| Manganese ¤ | EXP(0.8784*(LnH) + 3.5385) | NA | NA | 59000 |
| Nickel | (EXP(0.846*(LnH) + 0.0584))*CF | 0.997 | NA | 210000 |
| Pentachlorophenol ¤ | EXP(1.005*(pH) - 5.134) | NA | NA | 2.8 |
| Zinc | (EXP(0.8473*(LnH) + 0.0884))*CF | 0.986 | NA | 16000 |

Where EXP(x) = The base of the natural logarithm raised to the power x(ex)

LnH = The natural logarithm of water hardness in mg CaCO3/L

* = The multiplication symbol.

¤ = The GSI criterion developed here may not be protective for surface water that is used as a drinking water source. Refer to footnote (X) for further guidance.

A spreadsheet that may be used to calculate GSI and GSI protection criteria for (G)-footnoted hazardous substances is available on the Department of Environmental Quality (DEQ) internet web site.

(H) Valence-specific chromium data (Cr III and Cr VI) shall be compared to the corresponding valence-specific cleanup criteria. If both Cr III and Cr VI are present in groundwater, the total concentration of both cannot exceed the drinking water criterion of 100 µg/L. If analytical data are provided for total chromium only, they shall be compared to the cleanup criteria for Cr VI. Cr III soil cleanup criterion for protection of drinking water can only be used at sites where groundwater is prevented from being used as a public water supply, currently and in the future, through an approved land or resource use restriction.

(L) Criteria for lead are derived using a biologically based model, as allowed for under Section 20120a(9) of the NREPA, and are not calculated using the algorithms and assumptions specified in pathway-specific rules. The generic residential drinking water criterion of 4 µg/L is linked to the generic residential soil direct contact criterion of 400 mg/kg. A higher concentration in the drinking water, up to the state action level of 15 µg/L, may be allowed as a site-specific remedy and still allow for drinking water use, under Section 20120a(2) and 20120b of the NREPA if soil concentrations are appropriately lower than 400 mg/kg. If a site-specific criterion is approved based on this subdivision, a notice shall be filed on the deed for all property where the groundwater concentrations will exceed 4 µg/L to provide notice of the potential for unacceptable risk if soil or groundwater concentrations increase. Acceptable combinations of site-specific soil and drinking water concentrations are presented in the following table:

| Acceptable Combinations of Lead in Drinking Water and Soil | |
|---|---|
| Drinking Water Conc. (µg/L) | Soil Conc. (mg/kg) |
| 5 | 386-395 |
| 6 | 376-385 |
| 7 | 376-385 |
| 8 | 366-375 |
| 9 | 356-365 |
| 10 | 246-355 |
| 11 | 336-345 |
| 12 | 336-345 |
| 13 | 326-335 |
| 14 | 316-325 |
| 15 | 306-315 |

(M) Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit.

(X) The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV) listed in the table in this footnote, except for those HDV indicated with an asterisk. For HDV with an asterisk, the generic GSI criterion shall be the lowest of the HDV, the WV, and the calculated FCV. See formulas in footnote (G). Soil protection criteria based on the HDV shall be as listed in the table in this footnote, except for those values with an asterisk. Soil GSI protection criteria based on the HDV shall be as listed in the table in this footnote, except for those values with an asterisk. Soil GSI protection criteria for compounds with an asterisk shall be the greater of 20 times the GSI criterion or the GSI soil-water partition values using the GSI criteria developed with the procedure described in this footnote.

| Hazardous Substance | CAS Number | Surface Water Human Drinking Water Values (HDV) (µg/L) | Soil GSI Protection Criteria for HDV (µg/kg) |
|---|---|---|---|
| Acetonitrile | 75058 | 5600 | 110000 |
| Acrylamide | 79061 | 0.5 (M); 0.12 | 10 |
| Alachlor | 15972608 | 3.5 | 88 |
| Antimony | 7440360 | 2.0 (M); 1.7 | 1200 |
| Benzene | 71432 | 12 | 240 |
| Boron | 7440428 | 4000 | 80000 |
| Bromate | 15541454 | 10 (M); 0.5 | 200 |
| n-Butanol | 71363 | 3500 | 70000 |
| Butyl benzyl phthalate | 85687 | 6.9 | 13000 |
| Cadmium | 7440439 | 2.5* | * |
| Carbon tetrachloride | 56235 | 4.7 | 94 |
| Chloride | 16887006 | 50000 | 1000000 |
| Chloroethane | 75003 | 170 | 3400 |
| Chromium (III) | 16065831 | 120* | * |
| Cyanazine | 21725462 | 2.0 (M); 0.93 | 200 (M); 40 |
| 1,2-Dichloroethane | 107062 | 6 | 120 |
| trans-1,2-Dichloroethylene | 156605 | 470 | 9400 |
| 1,2-Dichloropropane | 78875 | 9.1 | 180 |
| 1,3-Dichloropropene | 542756 | 3.3 | 100 (M); 66 |
| N,N-Dimethylacetamide | 127195 | 700 | 14000 |
| 1,4-Dioxane | 123911 | 3.5 | 70 |
| Ethylene dibromide | 106934 | 0.17 | 20 (M); 3.4 |
| Ethylene glycol | 107211 | 56000 | 1100000 |
| Hexachloroethane | 67721 | 5.3 | 310 |
| Isophorone | 78591 | 310 | 6200 |
| Isopropyl alcohol | 67630 | 28000 | 560000 |

| | | | |
|---|---|---|---|
| Lead | 7439921 | 14* | * |
| Manganese | 7439965 | 1,300* | * |
| Methanol | 67561 | 14000 | 280000 |
| Methyl-tert-butyl ether (MTBE) | 1634044 | 100 | 2000 |
| Methylene chloride | 75092 | 47 | 940 |
| Molybdenum | 7439987 | 120 | 2400 |
| Nitrobenzene | 98953 | 4.7 | 330 (M); 94 |
| Pentachlorophenol | 87865 | 1.8* | * |
| Perfluorobutane sulfonic acid (PFBS) | 375735 | 8.3 | 166 |
| Perfluorooctanoic acid (PFOA) | 335671 | 0.066 | 350 |
| Perfluorooctane sulfonic acid (PFOS) | 1763231 | 0.011 | 0.22 |
| Styrene | 100425 | 20 | 530 |
| 1,2,4,5-Tetrachlorobenzene | 95943 | 2.8 | 3300 |
| 1,1,2,2-Tetrachloroethane | 79345 | 3.2 | 64 |
| Tetrachloroethylene | 127184 | 11 | 220 |
| Tetrahydrofuran | 109999 | 350 | 7000 |
| Thallium | 7440280 | 2.0 (M); 1.2 | 1400 |
| 1,2,4-Trichlorobenzene | 120821 | 80 | 4700 |
| 1,1,2-Trichloroethane | 79005 | 12 | 240 |
| Trichloroethylene | 79016 | 29 | 580 |
| Vinyl chloride | 75014 | 1.0 (M); 0.25 | 40 (M); 20 |

(Z) Mercury is typically measured as total mercury. The generic cleanup criteria, however, are based on data for different species of mercury. Specifically, data for elemental mercury, chemical abstract service (CAS) number 7439976, serve as the basis for the soil volatilization to indoor air criteria, groundwater volatilization to indoor air, and soil inhalation criteria. Data for methyl mercury, CAS number 22967926, serve as the basis for the GSI criterion; and data for mercuric chloride, CAS number 7487947, serve as the basis for the drinking water, groundwater contact, soil direct contact, and the groundwater protection criteria. Comparison to criteria shall be based on species-specific analytical data only if sufficient facility characterization has been conducted to rule out the presence of other species of mercury.

Brighton Analytical L.L.C. TM

2105 Pless Drive Brighton, Michigan 48114 Phone (810)229-7575 Fax (810)229-8650 E-mail labs@brightonanalytical.com

November 07, 2024

Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

Subject: 241691 AA Sewer
241691

Dear : Mr. MacMillan

Thank you for making Brighton Analytical, L.L.C. your laboratory of choice. Attached are the results for the samples submitted on 10/25/2024 for the above mentioned project. NELAP/TNI Accredited Analysis and EGLE Drinking Water Certified Analysis will be identified in their respective reporting formats. Hard copies can be supplied at your request for a fee of $20.00 per copy.

The invoice for this project will be emailed separately. If you have any questions concerning the data or invoice, please don't hesitate to contact our office. We welcome your comments and suggestions to improve our quality systems. Please reference Brighton Analytical, L.L.C. Project ID 103779 when calling or emailing. We thank you for this opportunity to partner with you on this project and hope to work with you again in the future.

Sincerely,
Brighton Analytical, L.L.C.

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06859** Project Number: **241691**
Sample ID: **SB-101 Solids**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **7600** | ug/Kg | 100 | SW846 6010B | JG | 10/30/2024 |
| Total Barium | **27000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Cadmium | **610** | ug/Kg | 50 | SW846 6010B | JG | 10/30/2024 |
| Total Chromium | **7300** | ug/Kg | 500 | SW846 6010B | JG | 10/30/2024 |
| Total Copper | **18000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Lead | **6800** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | MH | 10/29/2024 |
| Total Selenium | **690** | ug/Kg | 200 | SW846 6010B | JG | 10/30/2024 |
| Total Silver | **110** | ug/Kg | 100 | SW846 6010B | JG | 10/30/2024 |
| Total Zinc | **48000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 10/30/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 10/29/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | MH | 11/04/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 10/29/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |

**Brighton Analytical LLC**
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Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06859** Project Number: **241691**
Sample ID: **SB-101 Solids**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 10/29/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 10/29/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 10/29/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 10/29/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |

**Brighton Analytical LLC**
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Brighton, Michigan 48114
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e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06859** Project Number: **241691**
Sample ID: **SB-101 Solids**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 10/29/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 10/29/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 10/29/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 10/24/2024 |
| %Solid | **82** | % | | ASTM D2216 | AP | 10/28/2024 |

**Brighton Analytical LLC**
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Brighton, Michigan 48114
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EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06859** Project Number: **241691**

Sample ID: **SB-101 Solids**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 11/7/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06860** Project Number: **241691**
Sample ID: **SB-101 Water Sample**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **29** | ug/L | 1 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Barium | **600** | ug/L | 100 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Cadmium | **2.0** | ug/L | 0.2 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Chromium | **38** | ug/L | 5 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Copper | **76** | ug/L | 4 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Lead | **42** | ug/L | 3 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Mercury | **0.2** | ug/L | 0.2 | EPA 245.1 | MH | 10/29/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Silver | **0.3** | ug/L | 0.2 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Zinc | **190** | ug/L | 10 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 10/29/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 10/30/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 11/06/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 11/06/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 11/06/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 11/06/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | MH | 11/05/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | BY | 10/28/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |

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Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06860** Project Number: **241691**
Sample ID: **SB-101 Water Sample**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 10/28/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06860** Project Number: **241691**

Sample ID: **SB-101 Water Sample**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 10/28/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 10/28/2024 |

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2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
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EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06860** Project Number: **241691**

Sample ID: **SB-101 Water Sample**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Sample does not meet method holding time requirement for pna extraction.

Released by Cynthia L Williams

Date 11/7/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
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Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06861** Project Number: **241691**

Sample ID: **SB-102 Soil**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **7600** | ug/Kg | 100 | SW846 6010B | JG | 10/30/2024 |
| Total Barium | **15000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Cadmium | **480** | ug/Kg | 50 | SW846 6010B | JG | 10/30/2024 |
| Total Chromium | **6100** | ug/Kg | 500 | SW846 6010B | JG | 10/30/2024 |
| Total Copper | **15000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Lead | **6400** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | MH | 10/29/2024 |
| Total Selenium | **810** | ug/Kg | 200 | SW846 6010B | JG | 10/30/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6010B | JG | 10/30/2024 |
| Total Zinc | **47000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 10/30/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 10/29/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | MH | 11/04/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 10/29/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |

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Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06861** Project Number: **241691**
Sample ID: **SB-102 Soil**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 10/29/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 10/29/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 10/29/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 10/29/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |

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Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06861** Project Number: **241691**
Sample ID: **SB-102 Soil**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 10/29/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 10/29/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 10/29/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 10/25/2024 |
| %Solid | **81** | % | | ASTM D2216 | AP | 10/28/2024 |

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To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06861** Project Number: **241691**

Sample ID: **SB-102 Soil**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 11/7/2024

**Brighton Analytical LLC**
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Brighton, Michigan 48114
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Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06862** Project Number: **241691**
Sample ID: **Trip Blank**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | BY | 10/28/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 10/28/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06862** Project Number: **241691**
Sample ID: **Trip Blank**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 10/28/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 10/28/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06862** Project Number: **241691**

Sample ID: **Trip Blank**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 11/7/2024

# Brighton Analytical, L.L.C™

2105 Pless Drive
Brighton, MI 48114
Phone: 810-229-7575 Fax: 810-229-8650
email:bai-brighton@sbcglobal.net

BA PROJECT #: 103779

| | |
|---|---|
| COMPANY NAME | MTC |
| PROJECT NAME (48 SPACES MAXIMUM) | 241691 AA Sewer |
| PROJECT NUMBER (25 SPACES MAXIMUM) | 241691 |
| Sample collected by | Ben Goike |

ABBREVIATIONS FOR SAMPLE MATRIX
S = Solid
L = Liquid
DW = Drinking H2O
WW = Wastewater
O = Oil
P = Wipe
A = Air (Tedlar Bag)
F = Filter
T = Tube
GW = Groundwater
SW = Surface Water
M - Misc.

REQUESTED TURNAROUND: (X BOX WITH TAT NEEDED)
Default TAT Standard: 7 - 10 Business days
RUSH: 1 Business day (verify with lab) @3x Surcharge
RUSH: 2 Business days @2x Surcharge (Non TCLP)
RUSH: 3 Business days @1.5x Surcharge (TCLP @ 2X)
☐ STD ☐ 1 DAY ☐ 2 DAY ☐ 3 DAY

If RUSH approved by

Analysis Requested/Method

| Brighton ID # | Sample Description (35 Characters Limit) | Sampling Date | Sampling Time | VOA'S (PRES) Y/N | HDPE UNPRESERVED | HDPE $HNO_3$ | HDPE $H_2SO_4$ | HDPE NAOH | AMBER GLASS (UNPRESERVED) | AMBER GLASS (PRESERVED) | GLASS, NO PRESERVATIVE | STERILIZED BACTERIA | METALS FILTERED: (F)field OR (L)lab | MEOH Preserved: (Field or (L)ab Preserved | Sample Matrix | VOC | PNA | MI 10 Metals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1) 6859 | SB-101 solids | 10/24 | 14:00 | | | | | | | | 1 | | | F | S | X | X | X |
| 2) 6860 | SB-101 water sample | 10/24 | 14:00 | 2 | X | 1 | | | 1 | | | | | | GW | X | X | X |
| 3) 6861 | SB-102 soil | 10/25 | 15:00 | | | | | | | | 1 | | | F | S | X | X | X |
| 4) 6862 | Trip Blank | 10/25 | 15:00 | * | | | | | | | | | | | | X | | |
| 5) | | | | | | | | | | | | | | | | | | |
| 6) | | | | | | | | | | | | | | | | | | |
| 7) | | | | | | | | | | | | | | | | | | |
| 8) | | | | | | | | | | | | | | | | | | |
| 9) | | | | | | | | | | | | | | | | | | |
| 10) | | | | | | | | | | | | | | | | | | |

* air bubble dh 10/25/24

Special Instructions:

PAGE: ___ OF ___

COMPANY INFO:
MTC

Attn: Isaac MacMillan
PHONE:
SEND:
EMAIL: IMacmillan@MTC-Test.com

For Laboratory Use Only:
Sample received within holding time? yes ☒ no ☐
Temperature of samples °C: ON ICE
pH verified in login? yes ☒ no ☐
Headspace/bubbles in VOA'S? yes ☐ no ☒ n/a ☐
Sample containers and COC match? yes ☒ no ☐

P.O. NUMBER:
BILLING ADDRESS (IF REQUIRED)
MeOH (2)
MTC

For Laboratory Use Only: Field pH/Temp/Time/Initials

Drinking Water Only:
Send to LCHD? yes ☐ no ☐
Chlorinated Water Supply? yes ☐ no ☐
MCL Failure yes ☐ no ☐
Client Notified (date/time/initials): _____

*Please fill out the Chain of Custody completely and review. Incorrect or incomplete information will result in a "hold" on all analyses. All hold samples = $10.*

| Trans. # | RELINQUISHED BY: | RECEIVED BY: | DATE: | TIME: | Trans # | RELINQUISHED BY: | RECEIVED BY: | DATE/TIME: |
|---|---|---|---|---|---|---|---|---|
| 1 | Ryan Watkins | | 10/25 | | 3 | | | |
| 2 | | | | | 4 | | | |

Brighton Analytical L.L.C.

# BRIGHTON ANALYTICAL, LLC

# QUALITY ASSURANCE/QUALITY CONTROL

# GC/MS

## SEMI-VOLATILE METHOD 8270/625

### REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 11/6/2024 Std ID: #4420/#4436 Inst./Detec: HP5973/GC-MS

Laboratory ID#: CW07245 Matrix: WATER Analyst: RG Ext.date:11/05/2024

| SURROGATES | Matrix Spike-Precision* | | | Matrix Spike-Acuracy | | | | LCS-%recovery | |
|---|---|---|---|---|---|---|---|---|---|
| | Spike 1 | Spike 2 | RPD | Spike Conc. ug/L | Recovery(% | Range (%) | Sample(%) surr.recov. | LCS-MStd | Method Blank |
| 2-Fluorophenol | 78 | 75 | 3.9 | 100 | 77 | 37-114 | 33** | 52 | 37 |
| D5-Phenol | 86 | 108 | 22.7** | 100 | 97 | 23-141 | 22** | 44 | 33 |
| D5-Nitrobenzene | 77 | 74 | 4.0 | 100 | 76 | 28-130 | 72 | 69 | 65 |
| 2-Fluorobiphenyl | 89 | 82 | 8.2 | 100 | 86 | 37-117 | 58 | 60 | 54 |
| 2,4,6-Tribromophenol | 60 | 75 | 22.2** | 100 | 68 | 35-130 | 50 | 61 | 44 |
| D14-Terphenyl | 91 | 82 | 10.4 | 100 | 87 | 46-117 | 94 | 80 | 87 |
| COMPOUNDS | | | | | | | | | |
| Phenol | 80 | 102 | 24.2** | 100 | 91 | 25-137 | ND | 41 | <5 |
| 2-Chlorophenol | 90 | 87 | 3.4 | 100 | 89 | 46-129 | ND | 80 | <5 |
| 1,4-Dichlorobenzene | 59 | 49 | 18.5 | 100 | 54 | 14-89 | ND | 32 | <5 |
| 2-Methylphenol | 73 | 91 | 22.0** | 100 | 82 | 25-144 | ND | 61 | <5 |
| N-nitrosodipropylamine | 78 | 73 | 6.6 | 100 | 76 | 32-151 | ND | 64 | <5 |
| 1,2,4-Trichlorobenzene | 72 | 73 | 1.4 | 100 | 73 | 23-116 | ND | 45 | <5 |
| 4-Chloro-3-methylphenol | 73 | 145 | 66.1** | 100 | 109 | 5-210 | ND | 88 | <5 |
| 2-Methylnapthalene | 66 | 79 | 17.9 | 100 | 73 | 29-121 | ND | 50 | <5 |
| 2,4,5-Trichlorophenol | 67 | 95 | 34.6** | 100 | 81 | 20-144 | ND | 69 | <5 |
| Acenaphthene | 83 | 84 | 1.2 | 100 | 84 | 49-119 | ND | 100 | <5 |
| 3-Nitroaniline | 56 | 75 | 29.0** | 100 | 66 | 5-180 | ND | 53 | <5 |
| Dibenzofuran | 76 | 79 | 3.9 | 100 | 78 | 53-119 | ND | 66 | <5 |
| 2,4- Dinitrotoluene | 51 | 75 | 38.1** | 100 | 63 | 5-178 | ND | 54 | <5 |
| 4 - Nitrophenol | 33 | 39 | 16.7 | 100 | 36 | 5-184 | ND | 32 | <5 |
| Pentachlorophenol | 39 | 67 | 52.8** | 100 | 53 | 5-166 | ND | 44 | <5 |
| DI-n-butylphthalate | 108 | 128 | 16.9 | 100 | 118 | 63-166 | ND | 107 | <5 |
| Pyrene | 91 | 81 | 11.6 | 100 | 86 | 47-126 | ND | 98 | <5 |

* Matrix Spike Precision +/-20 RPD

Comments: **Out of range due to sample matrix.

# GC/MS

## SEMI-VOLATILE METHOD 8270

### REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 11/5/2024 Std ID: #4420/#4436 Inst./Detec:HP5973/GC-MS

Laboratory ID#: CW07147 Matrix: soil Analyst: RG Ext.date:11/04/2024

| SURROGATES | Matrix Spike-Precision* | | | Matrix Spike-Acuracy | | | | LCS-%recovery | |
|---|---|---|---|---|---|---|---|---|---|
| | Spike 1 | Sp[ike 2 | RPD | Spike Conc. ug/L | % Recovery | Range (%) | Sample surr.recov. | LCS-MStd | Method Blank |
| 2-Fluorophenol | 67 | 62 | 7.8 | 100 | 65 | 12-135 | 71 | 77 | 62 |
| D5-Phenol | 68 | 65 | 4.5 | 100 | 67 | 14-145 | 92 | 73 | 65 |
| D5-Nitrobenzene | 66 | 65 | 1.5 | 100 | 66 | 14-137 | 65 | 91 | 75 |
| 2-Fluorobiphenyl | 85 | 83 | 2.4 | 100 | 84 | 27-122 | 74 | 122 | 94 |
| 2,4,6-Tribromophenol | 63 | 59 | 6.6 | 100 | 61 | 18-127 | 55 | 66 | 52 |
| D14-Terphenyl | 74 | 75 | 1.3 | 100 | 75 | 35-124 | 82 | 124 | 102 |
| **COMPOUNDS** | | | | | | | | | |
| Phenol | 61 | 60 | 1.7 | 100 | 61 | 14-143 | ND | 72 | <330 |
| 2-Chlorophenol | 66 | 65 | 1.5 | 100 | 66 | 24-143 | ND | 87 | <330 |
| 1,4-Dichlorobenzene | 49 | 48 | 2.1 | 100 | 49 | 17-101 | ND | 74 | <330 |
| 2-Methylphenol | 59 | 62 | 5.0 | 100 | 61 | 18-142 | ND | 79 | <330 |
| N-nitrosodipropylamine | 60 | 59 | 1.7 | 100 | 60 | 26-143 | ND | 84 | <330 |
| 1,2,4-Trichlorobenzene | 62 | 62 | 0.0 | 100 | 62 | 25-123 | ND | 95 | <330 |
| 4-Chloro-3-methylphenol | 62 | 56 | 10.2 | 100 | 59 | 22-160 | ND | 50 | <330 |
| 2-Methylnapthalene | 61 | 63 | 3.2 | 100 | 62 | 20-143 | ND | 83 | <330 |
| 2,4,5-Trichlorophenol | 68 | 54 | 23.0** | 100 | 61 | 24-125 | ND | 61 | <330 |
| Acenaphthene | 77 | 73 | 5.3 | 100 | 75 | 26-141 | ND | 98 | <330 |
| 3-Nitroaniline | 59 | 50 | 16.5 | 100 | 55 | 21-153 | ND | 58 | <830 |
| Dibenzofuran | 74 | 68 | 8.5 | 100 | 71 | 5-171 | ND | 92 | <330 |
| 2,4- Dinitrotoluene | 52 | 43 | 18.9 | 100 | 48 | 23-146 | ND | 49 | <330 |
| 4 - Nitrophenol | 59 | 51 | 14.5 | 100 | 55 | 5-156 | ND | 35 | <830 |
| Pentachlorophenol | 39 | 36 | 8.0 | 100 | 38 | 5-134 | ND | 28 | <800 |
| DI-n-butylphthalate | 93 | 90 | 3.3 | 100 | 92 | 22-171 | ND | 126 | <330 |
| Pyrene | 74 | 76 | 2.7 | 100 | 75 | 38-142 | ND | 115 | <330 |

* Matrix Spike Precision +/-20 RPD

Comments: **Out of range due to sample matrix.

# GC/MS

# VOLATILE METHOD 8260C

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: October 28, 2024 Spike Std. ID: 4607.4.4 Inst./Detec: HP7890/5973 Vol 6

Laboratory ID: CW06860 Matrix: Water Analyst: BY

| | Matrix Spike - Precision | | | Matrix Spike - Accuracy | | | | Sample background | LCS | Method Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| d4-1,2-Dichloroethane | 52.2 | 53.6 | 2.6 | 50 | 104 | 107 | 70-130 | 106% | 105% | 106% |
| d8-Toluene | 48.9 | 49.0 | 0.3 | 50 | 98 | 98 | 70-130 | 97% | 98% | 100% |
| 4-Bromofluorobenzene | 51.9 | 50.9 | 1.8 | 50 | 104 | 102 | 70-130 | 116% | 101% | 117% |
| **COMPOUNDS** | | | | | | | | | | |
| 1,1- Dichloroethene | 50.3 | 47.6 | 5.5 | 50 | 101% | 95% | 70-130 | <1 | 101% | <1 |
| 1,1- Dichloroethane | 48.9 | 47.3 | 3.4 | 50 | 98% | 95% | 70-130 | <1 | 102% | <1 |
| Chloroform | 50.0 | 46.8 | 6.6 | 50 | 100% | 94% | 70-130 | <1 | 101% | <1 |
| 1,2- Dichlororethane | 51.0 | 48.4 | 5.2 | 50 | 102% | 97% | 70-130 | <1 | 104% | <1 |
| Carbon tetrachloride | 48.6 | 45.8 | 6.0 | 50 | 97% | 92% | 70-130 | <1 | 102% | <1 |
| 1,2- Dichloropropane | 47.0 | 44.1 | 6.4 | 50 | 94% | 88% | 70-130 | <1 | 95% | <1 |
| cis- 1,3 -dichloropropene | 45.0 | 42.8 | 4.9 | 50 | 90% | 86% | 70-130 | <1 | 101% | <1 |
| Trichloroethene | 46.7 | 43.4 | 7.3 | 50 | 93% | 87% | 70-130 | <1 | 96% | <1 |
| Dibromochloromethane | 49.5 | 47.1 | 4.8 | 50 | 99% | 94% | 70-130 | <1 | 102% | <1 |
| 1,1,2- Trichloroethane | 48.2 | 44.7 | 7.5 | 50 | 96% | 89% | 70-130 | <1 | 93% | <1 |
| Tetrachloroethane | 47.2 | 43.4 | 8.5 | 50 | 94% | 87% | 70-130 | <1 | 102% | <1 |
| 1,1,2,2 -Tetrachloroethane | 47.5 | 46.7 | 1.6 | 50 | 95% | 93% | 70-130 | <1 | 96% | <1 |
| Chlorobenzene | 50.2 | 47.5 | 5.7 | 50 | 100% | 95% | 70-130 | <1 | 96% | <1 |
| 1,3- Dichlorobenzene | 51.1 | 48.8 | 4.6 | 50 | 102% | 98% | 70-130 | <1 | 101% | <1 |
| 1,4- Dichlorobenzene | 48.6 | 48.4 | 0.3 | 50 | 97% | 97% | 70-130 | <1 | 97% | <1 |
| 1,2-Dichlorobenzene | 51.1 | 50.1 | 2.0 | 50 | 102% | 100% | 70-130 | <1 | 100% | <1 |

ug/L is equivalent to ppb

Comments: _____

# REPRESENTATIVE BATCH QUALITY CONTROL

## Accuracy & Precision

**Analyst:** MH **Parameter:** Mercury

**Analysis Date:** 10/29/24 **Method Reference:** 245.1/7470/7471

**Matrix:** Total / Dissolved **Batch:** W1

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Spike Concentration (ug/L)** | **Background (ug/L)** | **Recoveries (%)** | **Acceptable Range (%)** | **Method Blank Concentration (ug/L)** |
| CW06860 | 2.00 | 0.200 | 101 / 104 | 70 - 130 | <0.2 |

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Observed A (ug/L)** | **Observed B (ug/L)** | **RPD (%)** | **Acceptable Range (%)** | |
| CW06860 | 2.21 | 2.29 | 0.81 | 0 - 20 | |

| Method Standard (Laboratory Control Spike): | | | | |
|---|---|---|---|---|
| | **Standard ID #** | **Recovery (%)** | **Acceptable Range (%)** | |
| Independent Secondary Reference Material: | Spex 102924 | 92.9 | 90 - 110 | |
| Method Standard (Laboratory Control Spike): | Hg- 102924 | 102.1 | 85 - 115 | |

**COMMENTS:** _____

# REPRESENTATIVE BATCH QUALITY CONTROL

## Accuracy & Precision

**Analyst:** MH **Parameter:** Mercury

**Analysis Date:** 10/29/24 **Method Reference:** 245.1/7470/7471

**Matrix:** SOIL **Batch:** S1

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Spike Concentration (ug/Kg)** | **Background (ug/Kg)** | **Recoveries (%)** | **Acceptable Range (%)** | **Method Blank Concentration (ug/Kg)** |
| CW06861 | 100 | 6.3 | 87 / 99 | 70 - 130 | <50 |

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Observed A (ug/Kg)** | **Observed B (ug/Kg)** | **RPD (%)** | **Acceptable Range (%)** | |
| CW06861 | 93.4 | 105.7 | 12.4 | 0 - 20 | |

| MISCELLANEOUS | | | | |
|---|---|---|---|---|
| | **Standard ID #** | **Recovery (%)** | **Acceptable Range (%)** | |
| Independent Secondary Reference Material: | Spex 102924 | 92.9 | 90 - 110 | |
| Method Standard (Laboratory Control Spike): | Hg- 102924 | 103.2 | 85 - 115 | |

**COMMENTS:** _____

# ICP-OES
## METHOD 6010

REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 10/30/2024 Standard ID: 070824 S Batch: 10/30/2024 S1

Matrix Spike Lab ID: MSTD1&2 Matrix: Soil Analyst: JG

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/L) | Matrix Spike Dup (ug/L) | RPD (%) | Spk Conc (ug/L) | MS Recovery (%) | MSD Recovery (%) | Blank Conc (ug/L) | Method Blk (ug/L) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Silver | 1029.00 | 1030.00 | 0.1 | 1000 | 102.9 | 103.0 | 0.0 | <100 | 102.9 | 102.9 |
| Arsenic | 96712 | 97414 | 0.7 | 100000 | 96.7 | 97.4 | 0.0 | <100 | 96.7 | 102.4 |
| Barium | 100044 | 100087 | 0.0 | 100000 | 100.0 | 100.1 | 0.0 | <100 | 100.0 | 103.6 |
| Cadmium | 99758 | 100044 | 0.3 | 100000 | 99.8 | 100.0 | 0.0 | <100 | 99.8 | 106.1 |
| Chromium | 101957 | 102096 | 0.1 | 100000 | 102.0 | 102.1 | 0.0 | <100 | 102.0 | 105.9 |
| Copper | 102687 | 102715 | 0.0 | 100000 | 102.7 | 102.7 | 0.0 | <100 | 102.7 | 104.7 |
| Lead | 101543 | 101746 | 0.2 | 100000 | 101.5 | 101.7 | 0.0 | <100 | 101.5 | 108.3 |
| Selenium | 88275 | 88522 | 0.3 | 100000 | 88.3 | 88.5 | 0.0 | <100 | 88.3 | 101.5 |
| Zinc | 95268 | 95446 | 0.2 | 100000 | 95.3 | 95.4 | 0.0 | <100 | 95.3 | 104.6 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments:

# ICP-MS
# EPA METHOD 200.8/6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 10/30/2024 Standard ID: 092024 H2O Batch: 10/30/2024 W2

Matrix Spike Lab ID: CW07024 Matrix: Total Analyst: MH

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/L) | Matrix Spike Dup (ug/L) | RPD (%) | Spk Conc (ug/L) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/L) | Method Blk (ug/L) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Beryllium | 1057 | 997 | 5.8 | 1000 | 105.7 | 99.7 | 0 | <1 | 100.6 | 101.8 |
| Sodium | 94544 | 94542 | 0.0 | 10000 | 89.4 | 89.4 | 85604 | <1000 | 99.5 | 101.2 |
| Magnesium | 11053 | 11174 | 1.1 | 10000 | 98.9 | 100.1 | 1163 | <100 | 102.4 | 102.7 |
| Calcium | 17038 | 17408 | 2.1 | 10000 | 95.2 | 98.9 | 7521 | <100 | 106.0 | 105.2 |
| Chromium | 1009 | 1023 | 1.4 | 1000 | 100.8 | 102.2 | 1 | <1 | 101.9 | 97.3 |
| Manganese | 1006 | 1036 | 2.9 | 1000 | 99.3 | 102.3 | 13 | <5 | 103.3 | 102.1 |
| Iron | 10176 | 10173 | 0.0 | 10000 | 101.8 | 101.7 | 0 | <20 | 100.9 | 103.2 |
| Cobalt | 1035 | 1052 | 1.6 | 1000 | 103.5 | 105.2 | 0 | <10 | 105.9 | 103.2 |
| Nickel | 978 | 987 | 0.9 | 1000 | 97.8 | 98.7 | 0 | <1 | 99.9 | 102.0 |
| Copper | 1026 | 1042 | 1.5 | 1000 | 102.4 | 104.0 | 2 | <1 | 105.6 | 105.1 |
| Zinc | 1343 | 1081 | 21.6 | 1000 | 128.3 | 102.1 | 60 | <10 | 102.4 | 100.6 |
| Arsenic | 1156 | 1032 | 11.3 | 1000 | 114.4 | 102.0 | 12 | <1 | 99.5 | 99.9 |
| Selenium | 972 | 995 | 2.3 | 1000 | 97.2 | 99.5 | 0 | <1 | 98.9 | 100.4 |
| Molybdenum | 1150 | 1030 | 11.0 | 1000 | 114.9 | 102.9 | 1 | <10 | 99.5 | 97.0 |
| Silver | 11.59 | 10.37 | 11.1 | 10 | 115.9 | 103.7 | 0 | <0.2 | 106.5 | 105.6 |
| Cadmium | 1185 | 1054 | 11.7 | 1000 | 118.5 | 105.4 | 0 | <0.2 | 103.3 | 102.5 |
| Antimony | 1165 | 1069 | 8.6 | 1000 | 116.5 | 106.9 | 0 | <1 | 106.5 | 97.6 |
| Barium | 1189 | 1063 | 11.2 | 1000 | 117.9 | 105.3 | 10 | <5 | 104.5 | 102.9 |
| Thallium | 1108 | 1010 | 9.3 | 1000 | 110.8 | 101.0 | 0 | <0.5 | 98.7 | 104.3 |
| Lead | 1140 | 1031 | 10.0 | 1000 | 114.0 | 103.1 | 0 | <1 | 98.1 | 99.3 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: _____

# GC/MS

# VOLATILE METHOD 8260C

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: October 29, 2024 Spike Std. ID: 4607.4.4 Inst./Detec: HP7890/5973 Vol 5

Laboratory ID: CW06688 Matrix: Soil Analyst: BY

| | Matrix Spike - Precision | | | Matrix Spike - Accuracy | | | | Sample background | LCS | Method Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| d4-1,2-Dichloroethane | 54.2 | 54.3 | 0.1 | 50 | 108 | 109 | 70-130 | 102% | 89% | 102% |
| d8-Toluene | 49.6 | 49.6 | 0.1 | 50 | 99 | 99 | 70-130 | 101% | 91% | 101% |
| 4-Bromofluorobenzene | 46.9 | 46.6 | 0.6 | 50 | 94 | 93 | 70-130 | 100% | 93% | 100% |
| **COMPOUNDS** | | | | | | | | | | |
| 1,1- Dichloroethene | 40.9 | 41.5 | 1.4 | 50 | 82% | 83% | 70-130 | <1 | 106% | <1 |
| 1,1- Dichloroethane | 39.7 | 40.5 | 1.9 | 50 | 79% | 81% | 70-130 | <1 | 109% | <1 |
| Chloroform | 36.4 | 36.9 | 1.4 | 50 | 73% | 74% | 70-130 | <1 | 111% | <1 |
| 1.2- Dichlororethane | 40.9 | 41.1 | 0.3 | 50 | 82% | 82% | 70-130 | <1 | 94% | <1 |
| Carbon tetrachloride | 36.3 | 36.6 | 0.8 | 50 | 73% | 73% | 70-130 | <1 | 111% | <1 |
| 1,2- Dichloropropane | 39.1 | 39.5 | 1.0 | 50 | 78% | 79% | 70-130 | <1 | 103% | <1 |
| cis- 1,3 -dichloropropene | 37.5 | 37.7 | 0.5 | 50 | 75% | 75% | 70-130 | <1 | 104% | <1 |
| Trichloroethene | 41.3 | 41.9 | 1.4 | 50 | 83% | 84% | 70-130 | <1 | 97% | <1 |
| Dibromochloromethane | 38.8 | 39.7 | 2.2 | 50 | 78% | 79% | 70-130 | <1 | 104% | <1 |
| 1,1,2- Trichloroethane | 40.2 | 40.7 | 1.2 | 50 | 80% | 81% | 70-130 | <1 | 94% | <1 |
| Tetrachloroethane | 38.7 | 38.5 | 0.6 | 50 | 77% | 77% | 70-130 | <1 | 111% | <1 |
| 1,1,2,2 -Tetrachloroethane | 40.2 | 38.7 | 3.7 | 50 | 80% | 77% | 70-130 | <1 | 93% | <1 |
| Chlorobenzene | 35.1 | 35.1 | 0.0 | 50 | 70% | 70% | 70-130 | <1 | 93% | <1 |
| 1,3- Dichlorobenzene | 39.1 | 39.0 | 0.3 | 50 | 78% | 78% | 70-130 | <1 | 103% | <1 |
| 1,4- Dichlorobenzene | 39.9 | 39.3 | 1.6 | 50 | 80% | 79% | 70-130 | <1 | 104% | <1 |
| 1,2-Dichlorobenzene | 39.4 | 38.6 | 2.0 | 50 | 79% | 77% | 70-130 | <1 | 103% | <1 |

ug/L is equivalent to ppb

Comments: _____

Brighton Analytical L.L.C.

# METHODS REGULATED BY NELAC AND OR STATE OF MICHIGAN

EPA 120.1-1982
EPA 150.1-1982
EPA 160.2-1979
EPA 160.3-1979
EPA 1631E-2002
EPA 200.7-1994
EPA 200.8 REV 5.4-1994
EPA 245.1-1994
EPA 245.2-1974
EPA 300.0R2.1-1993
EPA 310.1-1978
EPA 335.1-1974
EPA 335.4-1993
EPA 350.1 REV.2-1993
EPA 351.2 REV.2-1993
EPA 365.2-1971
EPA 405.1-1974
EPA 410.4 REV.2-1993
EPA 415.1-1974
EPA 420.1-1978
EPA 524.4-2013
EPA 608.3-2016
EPA 615-1993
EPA 624-1984
EPA 624.1-2016
EPA 625-1984
EPA 625.1-2016
SM 2540C-1997
SM 2540D-1997
SM 4500 H+B-1996
SM 4500 PE-1997
SM 5210B-1997
SM 5310B-1996
SM 9223B-1997
SW846 6010B-1996
SW846 6020A-2007
SW846 7471-1994
SW846 8081B-2007
SW846 8082A-2000
SW846 8151A-1996
SW846 8260C-2006
SW846 8270D-2007
SW846 9040B-1994

Brighton Analytical L.L.C. TM

2105 Pless Drive Brighton, Michigan 48114 Phone (810)229-7575 Fax (810)229-8650 E-mail labs@brightonanalytical.com

December 12, 2024

Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

Subject: High Level Trunkline Sewer Improvement
241691

Dear : Mr. MacMillan

Thank you for making Brighton Analytical, L.L.C. your laboratory of choice. Attached are the results for the samples submitted on 12/06/2024 for the above mentioned project. NELAP/TNI Accredited Analysis and EGLE Drinking Water Certified Analysis will be identified in their respective reporting formats. Hard copies can be supplied at your request for a fee of $20.00 per copy.

The invoice for this project will be emailed separately. If you have any questions concerning the data or invoice, please don't hesitate to contact our office. We welcome your comments and suggestions to improve our quality systems. Please reference Brighton Analytical, L.L.C. Project ID 104551 when calling or emailing. We thank you for this opportunity to partner with you on this project and hope to work with you again in the future.

Sincerely,
Brighton Analytical, L.L.C.

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 12/02/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09084**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-103 0-30'**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **4900** | ug/Kg | 100 | SW846 6020A | JG | 12/09/2024 |
| Total Barium | **32000** | ug/Kg | 1000 | SW846 6020A | JG | 12/09/2024 |
| Total Cadmium | **180** | ug/Kg | 50 | SW846 6020A | JG | 12/09/2024 |
| Total Chromium | **8100** | ug/Kg | 500 | SW846 6020A | JG | 12/09/2024 |
| Total Copper | **10000** | ug/Kg | 1000 | SW846 6020A | JG | 12/09/2024 |
| Total Lead | **8500** | ug/Kg | 1000 | SW846 6020A | JG | 12/09/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | MH | 12/10/2024 |
| Total Selenium | **870** | ug/Kg | 200 | SW846 6020A | JG | 12/09/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6020A | JG | 12/10/2024 |
| Total Zinc | **29000** | ug/Kg | 1000 | SW846 6020A | JG | 12/09/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | JG | 12/09/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 12/10/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 12/06/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 12/06/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 12/06/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 12/06/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 12/06/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 12/02/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551** Project Name: **High Level Trunkline Sewer Improvement**

BA Sample ID: **CW09084** Project Number: **241691**

Sample ID: **SB-103 0-30'**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 12/06/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 12/06/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 12/06/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 12/06/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |

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EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 12/02/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551** Project Name: **High Level Trunkline Sewer Improvement**

BA Sample ID: **CW09084** Project Number: **241691**

Sample ID: **SB-103 0-30'**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 12/06/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 12/06/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 12/02/2024 |
| %Solid | **92** | % | | ASTM D2216 | AP | 12/06/2024 |

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 12/12/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551** Project Name: **High Level Trunkline Sewer Improvement**

BA Sample ID: **CW09085** Project Number: **241691**

Sample ID: **SB-103**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **5** | ug/L | 1 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Barium | **200** | ug/L | 100 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Chromium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Copper | **6** | ug/L | 4 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Lead | **4** | ug/L | 3 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | MH | 12/10/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Zinc | **60** | ug/L | 10 | EPA 200.8 rev5.4 | JG | 12/11/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 12/10/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | JG | 12/10/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | MH | 12/11/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | BY | 12/11/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09085**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-103**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloromethane(Methyl Chloride) | **1** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| cis-1,2-Dichloroethene | **2** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 12/11/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09085**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-103**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 12/11/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 12/11/2024 |

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Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09085**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-103**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 12/12/2024

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Brighton, Michigan 48114
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Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09086**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-102**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **6** | ug/L | 1 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Barium | **200** | ug/L | 100 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Chromium | **7** | ug/L | 5 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Copper | **16** | ug/L | 4 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Lead | **13** | ug/L | 3 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | MH | 12/10/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Zinc | **50** | ug/L | 10 | EPA 200.8 rev5.4 | JG | 12/11/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 12/10/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | JG | 12/10/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | MH | 12/11/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | BY | 12/11/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |

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Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551** Project Name: **High Level Trunkline Sewer Improvement**

BA Sample ID: **CW09086** Project Number: **241691**

Sample ID: **SB-102**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 12/11/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |

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Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551** Project Name: **High Level Trunkline Sewer Improvement**
BA Sample ID: **CW09086** Project Number: **241691**
Sample ID: **SB-102**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 12/11/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tetrachloroethene | **12** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 12/11/2024 |

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Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09086**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-102**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by 

Date 12/12/2024

# Brighton Analytical, L.L.C™

2105 Pless Drive
Brighton, MI 48114
Phone: 810-229-7575 Fax: 810-229-8650
email:bai-brighton@sbcglobal.net

BA PROJECT #: 10455-1

**ABBREVIATIONS FOR SAMPLE MATRIX**

S = Solid
L = Liquid
DW = Drinking H,0
WW = Wastewater
O = Oil
P = Wipe
A = Air (Tedlar Bag)
F = Filter
T = Tube
GW = Groundwater
SW = Surface Water
M - Misc.

**Analysis Requested/Method**

PAGE: ___ OF ___

**COMPANY INFO:**

Materials Testing Consultants

Attn: Isaac MacMillan
PHONE:
SEND:
EMAIL: imacmillan@MTC-test.com

| | |
|---|---|
| COMPANY NAME | MTC |
| PROJECT NAME (48 SPACES MAXIMUM) | High level trunkline sewer improvement |
| PROJECT NUMBER (25 SPACES MAXIMUM) | 241691 |
| Sample collected by | MDE |

If RUSH approved by:

REQUESTED TURNAROUND: (X BOX WITH TAT NEEDED)
Default TAT Standard: 7 - 10 Business days
RUSH: 1 Business day (verify with lab) @3x Surcharge
RUSH: 2 Business days @2x Surcharge (Non TCLP)
RUSH: 3 Business days @1.5x Surcharge (TCLP @ 2X)

☐ STD ☐ 1 DAY ☐ 2 DAY ☐ 3 DAY

**Container Type & Quantity**

| Brighton ID # | Sample Description (35 Characters Limit) | Sampling Date | Sampling Time | VOA'S (PRES) Y N | HDPE UNPRESERVED | HDPE $HNO_3$ | HDPE $H_2SO_4$ | HDPE NAOH | AMBER GLASS (UNPRESERVED) | AMBER GLASS (PRESERVED) | GLASS, NO PRESERVATIVE | STERILIZED BACTERIA | METALS FILTERED: (F)ield OR (L)ab | MEOH Preserved: (F)ield or (L)ab Preserved | Sample Matrix | MI 10 Metals | VOCs | PNAs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9084 | SB-103 0-30ft | 12/2 | 15:00 | | | | | | | | 1 | | | 1 | S | X | X | |
| 2) 9085 | SB-103 | 12/5 | 14:15 | 2 | 1 | | | | 1 | | | | | | GW | X | X | X |
| 3) 9086 | SB-102 | 12/5 | 16:30 | 2 | 1 | | | | 1 | | | | | | GW | X | X | X |
| 4) | | | | | | | | | | | | | | | | | | |
| 5) | | | | | | | | | | | | | | | | | | |
| 6) | | | | | | | | | | | | | | | | | | |
| 7) | | | | | | | | | | | | | | | | | | |
| 8) | | | | | | | | | | | | | | | | | | |
| 9) | | | | | | | | | | | | | | | | | | |
| 10) | | | | | | | | | | | | | | | | | | |

Sample received within holding time? yes ☒ no ☐
Temperature of samples °C: ICE
pH verified in login? yes ☒ no ☐
Headspace/bubbles in VOA'S? yes ☐ no ☒ n/a ☐
Sample containers and COC match? yes ☒ no ☐

P.O. NUMBER:

BILLING ADDRESS (IF REQUIRED)
Methanol
EPA5035 MTC

**For Laboratory Use Only: Field pH/Temp/Time/Initials**

**Drinking Water Only:**

Send to LCHD? yes ☐ no ☐
Chlorinated Water Supply? yes ☐ no ☐

MCL Failure yes ☐ no ☐
Client Notified (date/time/initials): _____

**Special Instructions:**

***Please fill out the Chain of Custody completely and review. Incorrect or incomplete information will result in a "hold" on all analyses. All hold samples = $10.***

| Trans. # | RELINQUISHED BY: | RECEIVED BY: | DATE: | TIME: | Trans. # | RELINQUISHED BY: | RECEIVED BY: | DATE/TIME: |
|---|---|---|---|---|---|---|---|---|
| 1 | [signature] | Samantha Staggs | 12-5-24 | 17:20 | 3 | [signature] | [signature] | 12/6/24 11:45 |
| 2 | Samantha Staggs | Ben Goike | 12-6-24 | ~~17:2~~ 9:25 | 4 | | | |

Brighton Analytical L.L.C.

# BRIGHTON ANALYTICAL, LLC

# QUALITY ASSURANCE/QUALITY CONTROL

# GC/MS

## SEMI-VOLATILE METHOD 8270/625

### REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 12/11/2024 Std ID: #4420/#4436 Inst./Detec: HP5973/GC-MS

Laboratory ID#: CW09127 Matrix: WATER Analyst: RG Ext.date:12/11/2024

| SURROGATES | Matrix Spike-Precision* | | | Matrix Spike-Acuracy | | | | LCS-%recovery | |
|---|---|---|---|---|---|---|---|---|---|
| | Spike 1 | Spike 2 | RPD | Spike Conc. ug/L | Recovery(% | Range (%) | Sample(%) surr.recov. | LCS-MStd | Method Blank |
| 2-Fluorophenol | 82 | 79 | 3.7 | 100 | 81 | 45-108 | 56 | 54 | 47 |
| D5-Phenol | 80 | 88 | 9.5 | 100 | 84 | 35-131 | 47 | 40 | 39 |
| D5-Nitrobenzene | 80 | 82 | 2.5 | 100 | 81 | 34-116 | 79 | 74 | 60 |
| 2-Fluorobiphenyl | 85 | 82 | 3.6 | 100 | 84 | 35-121 | 68 | 65 | 44 |
| 2,4,6-Tribromophenol | 97 | 101 | 4.0 | 100 | 99 | 30-125 | 105 | 95 | 75 |
| D14-Terphenyl | 91 | 89 | 2.2 | 100 | 90 | 49-114 | 93 | 79 | 86 |
| COMPOUNDS | | | | | | | | | |
| Phenol | 90 | 101 | 11.5 | 100 | 96 | 38-129 | ND | 43 | <5 |
| 2-Chlorophenol | 97 | 97 | 0.0 | 100 | 97 | 53-125 | ND | 77 | <5 |
| 1,4-Dichlorobenzene | 62 | 60 | 3.3 | 100 | 61 | 11-93 | ND | 29 | <5 |
| 2-Methylphenol | 77 | 87 | 12.2 | 100 | 82 | 29-132 | ND | 59 | <5 |
| N-nitrosodipropylamine | 90 | 87 | 3.4 | 100 | 89 | 39-131 | ND | 68 | <5 |
| 1,2,4-Trichlorobenzene | 84 | 83 | 1.2 | 100 | 84 | 29-111 | ND | 43 | <5 |
| 4-Chloro-3-methylphenol | 106 | 129 | 19.6 | 100 | 118 | 5-204 | ND | 113 | <5 |
| 2-Methylnapthalene | 100 | 112 | 11.3 | 100 | 106 | 37-111 | ND | 78 | <5 |
| 2,4,5-Trichlorophenol | 106 | 117 | 9.9 | 100 | 112 | 25-139 | ND | 101 | <5 |
| Acenaphthene | 103 | 98 | 5.0 | 100 | 101 | 55-109 | ND | 80 | <5 |
| 3-Nitroaniline | 97 | 110 | 12.6 | 100 | 104 | 5-169 | ND | 89 | <5 |
| Dibenzofuran | 98 | 99 | 1.0 | 100 | 99 | 55-114 | ND | 79 | <5 |
| 2,4- Dinitrotoluene | 101 | 123 | 19.6 | 100 | 112 | 5-162 | ND | 94 | <5 |
| 4 - Nitrophenol | 112 | 132 | 16.4 | 100 | 122 | 5-174 | ND | 69 | <5 |
| Pentachlorophenol | 88 | 99 | 11.8 | 100 | 94 | 5-160 | ND | 92 | <5 |
| Dl-n-butylphthalate | 139 | 127 | 9.0 | 100 | 133 | 65-159 | ND | 120 | <5 |
| Pyrene | 102 | 94 | 8.2 | 100 | 98 | 48-122 | ND | 75 | <5 |

* Matrix Spike Precision +/-20 RPD

Comments: _____

# ICP-MS
## EPA METHOD 200.8/6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 12/11/2024 Standard ID: 103024 H2O Batch: 12/10/2024 W1

Matrix Spike Lab ID: CW09089 Matrix: Total Analyst: JG

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/L) | Matrix Spike Dup (ug/L) | RPD (%) | Spk Conc (ug/L) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/L) | Method Blk (ug/L) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Sodium | 175557 | 185330 | 5.4 | 10000 | 0.0 | 24.9 | 182844 | <1000 | 99.7 | 90.1 |
| Magnesium | 11243 | 11646 | 3.5 | 10000 | 109.8 | 113.8 | 264 | <100 | 98.9 | 90.9 |
| Potassium | 12435 | 12656 | 1.8 | 10000 | 118.4 | 120.6 | 595 | <100 | 101.1 | 91.1 |
| Zinc | 1363 | 1431 | 4.9 | 1000 | 95.8 | 102.6 | 405 | <10 | 101.9 | 99.9 |
| Selenium | 1013 | 1048 | 3.4 | 1000 | 101.1 | 104.6 | 2 | <1 | 102.2 | 97.5 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: Na out of range due to sample matrix

# GC/MS

# VOLATILE METHOD 8260C

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: December 11, 2024 Spike Std. ID: 4653.2.1 Inst./Detec: HP7890/5973 Vol 5

Laboratory ID: CW09043 Matrix: Water Analyst: BY

| | Matrix Spike - Precision | | | Matrix Spike - Accuracy | | | | Sample background | LCS | Method Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| d4-1,2-Dichloroethane | 46.9 | 47.2 | 0.5 | 50 | 94 | 94 | 70-130 | 92% | 89% | 91% |
| d8-Toluene | 48.1 | 48.4 | 0.5 | 50 | 96 | 97 | 70-130 | 95% | 91% | 96% |
| 4-Bromofluorobenzene | 45.7 | 44.9 | 1.8 | 50 | 91 | 90 | 70-130 | 94% | 93% | 99% |
| **COMPOUNDS** | | | | | | | | | | |
| 1,1- Dichloroethene | 48.7 | 47.0 | 3.5 | 50 | 97% | 94% | 70-130 | <1 | 87% | <1 |
| 1,1- Dichloroethane | 47.2 | 44.8 | 5.3 | 50 | 94% | 90% | 70-130 | <1 | 87% | <1 |
| Chloroform | 49.6 | 47.9 | 3.5 | 50 | 99% | 96% | 70-130 | <1 | 92% | <1 |
| 1,2- Dichlororethane | 46.3 | 45.2 | 2.5 | 50 | 93% | 90% | 70-130 | <1 | 90% | <1 |
| Carbon tetrachloride | 54.0 | 53.8 | 0.4 | 50 | 108% | 108% | 70-130 | <1 | 95% | <1 |
| 1,2- Dichloropropane | 45.3 | 46.4 | 2.3 | 50 | 91% | 93% | 70-130 | <1 | 86% | <1 |
| cis- 1,3 -dichloropropene | 47.5 | 49.0 | 3.1 | 50 | 95% | 98% | 70-130 | <1 | 90% | <1 |
| Trichloroethene | 51.4 | 51.8 | 0.8 | 50 | 103% | 104% | 70-130 | <1 | 93% | <1 |
| Dibromochloromethane | 50.6 | 53.3 | 5.1 | 50 | 101% | 107% | 70-130 | <1 | 98% | <1 |
| 1,1,2- Trichloroethane | 50.0 | 52.6 | 5.1 | 50 | 100% | 105% | 70-130 | <1 | 97% | <1 |
| Tetrachloroethane | 54.2 | 54.5 | 0.5 | 50 | 108% | 109% | 70-130 | <1 | 98% | <1 |
| 1,1,2,2 -Tetrachloroethane | 46.9 | 49.5 | 5.5 | 50 | 94% | 99% | 70-130 | <1 | 92% | <1 |
| Chlorobenzene | 46.3 | 45.8 | 1.1 | 50 | 93% | 92% | 70-130 | <1 | 91% | <1 |
| 1,3- Dichlorobenzene | 49.5 | 49.1 | 0.9 | 50 | 99% | 98% | 70-130 | <1 | 94% | <1 |
| 1,4- Dichlorobenzene | 49.5 | 49.8 | 0.7 | 50 | 99% | 100% | 70-130 | <1 | 95% | <1 |
| 1,2-Dichlorobenzene | 49.9 | 49.7 | 0.3 | 50 | 100% | 99% | 70-130 | <1 | 95% | <1 |

ug/L is equivalent to ppb

Comments: _____

# ICP-MS
# EPA METHOD 200.8/6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 12/10/2024 Standard ID: 103024 H2O Batch: 12/10/2024 W2

Matrix Spike Lab ID: CW09114 Matrix: Total Analyst: JG

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/L) | Matrix Spike Dup (ug/L) | RPD (%) | Spk Conc (ug/L) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/L) | Method Blk (ug/L) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Calcium | 65308 | 67181 | 2.8 | 10000 | 54.7 | 73.4 | 59843 | <100 | 97.1 | 97.0 |
| Chromium | 1067 | 1111 | 4.0 | 1000 | 106.5 | 110.9 | 2 | <1 | 93.0 | 91.6 |
| Iron | 10519 | 10871 | 3.3 | 10000 | 104.7 | 108.2 | 48 | <20 | 91.4 | 91.7 |
| Nickel | 1063 | 1104 | 3.8 | 1000 | 105.3 | 109.4 | 10 | <1 | 92.7 | 96.3 |
| Copper | 1110 | 1153 | 3.8 | 1000 | 110.7 | 115.0 | 3 | <1 | 92.2 | 95.3 |
| Arsenic | 979 | 1134 | 14.7 | 1000 | 97.7 | 113.2 | 2 | <1 | 101.3 | 95.7 |
| Selenium | 933 | 960 | 2.9 | 1000 | 93.1 | 95.8 | 2 | <1 | 96.1 | 98.4 |
| Silver | 10.23 | 12.11 | 16.8 | 10 | 102.3 | 121.1 | 0 | <0.2 | 108.3 | 98.6 |
| Cadmium | 976 | 1156 | 16.9 | 1000 | 97.6 | 115.6 | 0 | <0.2 | 98.6 | 95.1 |
| Barium | 1009 | 1155 | 13.5 | 1000 | 99.8 | 114.4 | 11 | <5 | 101.0 | 96.6 |
| Lead | 993 | 1143 | 14.0 | 1000 | 99.3 | 114.3 | 0 | <1 | 98.7 | 90.7 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: Ca out of range due to sample matrix

# ICP-MS
# METHOD 6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 12/10/2024 Standard ID: 070824 S Batch: 12/9/2024 S1

Matrix Spike Lab ID: CW09084 Matrix: Soil Analyst: JG

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/Kg) | Matrix Spike Dup (ug/Kg) | RPD (%) | Spk Conc (ug/Kg) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/Kg) | Method Blk (ug/Kg) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Silver | 1241 | 1253 | 1.0 | 1000 | 120.3 | 121.5 | 38 | <100 | 101.2 | 98.6 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: _____

# REPRESENTATIVE BATCH QUALITY CONTROL

## Accuracy & Precision

**Analyst:** MH **Parameter:** Mercury

**Analysis Date:** 12/10/24 **Method Reference:** 245.1/7470/7471

**Matrix:** SOIL **Batch:** S1

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Spike Concentration (ug/Kg)** | **Background (ug/Kg)** | **Recoveries (%)** | **Acceptable Range (%)** | **Method Blank Concentration (ug/Kg)** |
| CW08975 | 100 | 21.5 | 105 / 103 | 70 - 130 | <50 |

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Observed A (ug/Kg)** | **Observed B (ug/Kg)** | **RPD (%)** | **Acceptable Range (%)** | |
| CW08975 | 126.5 | 124.9 | 1.3 | 0 - 20 | |

| MISCELLANEOUS | | | | |
|---|---|---|---|---|
| | **Standard ID #** | **Recovery (%)** | **Acceptable Range (%)** | |
| Independent Secondary Reference Material: | Spex 121024 | 93.9 | 90 - 110 | |
| Method Standard (Laboratory Control Spike): | Hg- 121024 | 106.8 | 85 - 115 | |

**COMMENTS:** _____

# REPRESENTATIVE BATCH QUALITY CONTROL

## Accuracy & Precision

**Analyst:** MH **Parameter:** Mercury

**Analysis Date:** 12/10/24 **Method Reference:** 245.1/7470/7471

**Matrix:** Total **Batch:** W1

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Spike Concentration (ug/L)** | **Background (ug/L)** | **Recoveries (%)** | **Acceptable Range (%)** | **Method Blank Concentration (ug/L)** |
| CW09081 | 2.00 | 0.008 | 107 / 100 | 70 - 130 | <0.2 |

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Observed A (ug/L)** | **Observed B (ug/L)** | **RPD (%)** | **Acceptable Range (%)** | |
| CW09081 | 2.14 | 2.02 | 1.52 | 0 - 20 | |
| | | | | | |
| | **Standard ID #** | **Recovery (%)** | **Acceptable Range (%)** | | |
| Independent Secondary Reference Material: | Spex 121024 | 93.9 | 90 - 110 | | |
| Method Standard (Laboratory Control Spike): | Hg- 121024 | 105.5 | 85 - 115 | | |

**COMMENTS:** _____

# ICP-MS
# METHOD 200.8/6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 12/09/2024 Standard ID: 070824 S Batch: 12/9/2024 S1

Matrix Spike Lab ID: CW09084 Matrix: Soil Analyst: JG

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/Kg) | Matrix Spike Dup (ug/Kg) | RPD (%) | Spk Conc (ug/Kg) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/Kg) | Method Blk (ug/Kg) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Chromium | 108946 | 90768 | 18.2 | 100000 | 101.5 | 83.3 | 7479 | <500 | 90.7 | 93.2 |
| Copper | 103785 | 90276 | 13.9 | 100000 | 94.4 | 80.9 | 9396 | <1000 | 95.6 | 97.6 |
| Zinc | 120453 | 104391 | 14.3 | 100000 | 94.0 | 78.0 | 26406 | <1000 | 94.2 | 93.0 |
| Arsenic | 98399 | 86059 | 13.4 | 100000 | 93.9 | 81.5 | 4515 | <100 | 93.8 | 95.1 |
| Selenium | 92861 | 80659 | 14.1 | 100000 | 92.1 | 79.9 | 799 | <100 | 93.2 | 96.5 |
| Cadmium | 109143 | 93937 | 15.0 | 100000 | 109.0 | 93.8 | 171 | <50 | 90.7 | 102.9 |
| Barium | 155083 | 129584 | 17.9 | 100000 | 125.3 | 99.8 | 29748 | <100 | 89.7 | 94.6 |
| Lead | 140157 | 121053 | 14.6 | 100000 | 132.3 | 113.2 | 7842 | <1000 | 107.8 | 109.2 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: Pb out of range due to sample matrix

# GC/MS

# VOLATILE METHOD 8260C

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: December 6, 2024 Spike Std. ID: 4653.1.5 Inst./Detec: HP7890/5973 Vol 5

Laboratory ID: CW08835 Matrix: Soil Analyst: BY

| | Matrix Spike - Precision | | | Matrix Spike - Accuracy | | | | Sample background | LCS | Method Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| d4-1,2-Dichloroethane | 46.6 | 45.9 | 1.7 | 50 | 93 | 92 | 70-130 | 96% | 89% | 93% |
| d8-Toluene | 44.6 | 46.8 | 4.7 | 50 | 89 | 94 | 70-130 | 88% | 91% | 93% |
| 4-Bromofluorobenzene | 44.5 | 44.9 | 1.0 | 50 | 89 | 90 | 70-130 | 91% | 93% | 95% |
| **COMPOUNDS** | | | | | | | | | | |
| 1,1- Dichloroethene | 36.3 | 36.9 | 1.6 | 50 | 73% | 74% | 70-130 | <1 | 90% | <1 |
| 1,1- Dichloroethane | 38.2 | 39.7 | 4.0 | 50 | 76% | 79% | 70-130 | <1 | 81% | <1 |
| Chloroform | 44.7 | 43.9 | 1.9 | 50 | 89% | 88% | 70-130 | <1 | 93% | <1 |
| 1.2- Dichlororethane | 45.8 | 43.4 | 5.2 | 50 | 92% | 87% | 70-130 | <1 | 89% | <1 |
| Carbon tetrachloride | 36.9 | 39.8 | 7.7 | 50 | 74% | 80% | 70-130 | <1 | 90% | <1 |
| 1,2- Dichloropropane | 40.5 | 40.5 | 0.0 | 50 | 81% | 81% | 70-130 | <1 | 84% | <1 |
| cis- 1,3 -dichloropropene | 42.3 | 40.8 | 3.6 | 50 | 85% | 82% | 70-130 | <1 | 84% | <1 |
| Trichloroethene | 42.6 | 43.8 | 2.8 | 50 | 85% | 88% | 70-130 | <1 | 95% | <1 |
| Dibromochloromethane | 45.1 | 43.6 | 3.5 | 50 | 90% | 87% | 70-130 | <1 | 99% | <1 |
| 1,1,2- Trichloroethane | 50.4 | 47.5 | 5.9 | 50 | 101% | 95% | 70-130 | <1 | 102% | <1 |
| Tetrachloroethane | 46.1 | 46.5 | 0.8 | 50 | 92% | 93% | 70-130 | <1 | 103% | <1 |
| 1,1,2,2 -Tetrachloroethane | 49.6 | 45.6 | 8.5 | 50 | 99% | 91% | 70-130 | <1 | 96% | <1 |
| Chlorobenzene | 42.9 | 43.6 | 1.5 | 50 | 86% | 87% | 70-130 | <1 | 87% | <1 |
| 1,3- Dichlorobenzene | 48.2 | 47.0 | 2.4 | 50 | 96% | 94% | 70-130 | <1 | 95% | <1 |
| 1,4- Dichlorobenzene | 48.2 | 47.6 | 1.3 | 50 | 96% | 95% | 70-130 | <1 | 97% | <1 |
| 1,2-Dichlorobenzene | 48.7 | 48.0 | 1.4 | 50 | 97% | 96% | 70-130 | <1 | 96% | <1 |

ug/L is equivalent to ppb

Comments: _____

Brighton Analytical L.L.C.

# METHODS REGULATED BY NELAC AND OR STATE OF MICHIGAN

EPA 120.1-1982
EPA 150.1-1982
EPA 160.2-1979
EPA 160.3-1979
EPA 1631E-2002
EPA 200.7-1994
EPA 200.8 REV 5.4-1994
EPA 245.1-1994
EPA 245.2-1974
EPA 300.0R2.1-1993
EPA 310.1-1978
EPA 335.1-1974
EPA 335.4-1993
EPA 350.1 REV.2-1993
EPA 351.2 REV.2-1993
EPA 365.2-1971
EPA 405.1-1974
EPA 410.4 REV.2-1993
EPA 415.1-1974
EPA 420.1-1978
EPA 524.4-2013
EPA 608.3-2016
EPA 615-1993
EPA 624-1984
EPA 624.1-2016
EPA 625-1984
EPA 625.1-2016
SM 2540C-1997
SM 2540D-1997
SM 4500 H+B-1996
SM 4500 PE-1997
SM 5210B-1997
SM 5310B-1996
SM 9223B-1997
SW846 6010B-1996
SW846 6020A-2007
SW846 7471-1994
SW846 8081B-2007
SW846 8082A-2000
SW846 8151A-1996
SW846 8260C-2006
SW846 8270D-2007
SW846 9040B-1994

# **Appendix E** Dewatering Supplement Miller-Chapin Sanitary Relief Sewer

September 16, 2025
Project No. 241691R

OHM Advisors
355 South Zeeb Road, Suite A
Ann Arbor, MI 48103

Attention: Chris Elenbaas, P.E.

Reference: Dewatering Supplement
Miller-Chapin Sanitary Relief Sewer
Ann Arbor, Michigan

Dear Mr. Elenbaas:

We have completed additional environmental testing and geotechnical engineering services for the above-referenced project. This letter is a supplement to our preliminary geotechnical report no. 241082R dated April 9, 2024 and our supplemental data package no. 241691 dated January 10, 2025. As requested, we have collected groundwater samples for environmental testing and prepared the test results, boring logs, grain size analyses and general dewatering commentary to be included with the Geotechnical Baseline Report for microtunneling.

## SUPPLEMENTAL INVESTIGATION

### Environmental Sampling and Testing

Groundwater samples were collected from Monitoring wells MW-102 and MW-103 via low-flow sampling techniques using a peristaltic pump. The groundwater samples were submitted to our subcontracted analytical laboratory on July 2, 2025 and analyzed for 1,4 Dioxane. The dioxane content of both groundwater samples was below the detection threshold of 1 part per billion (ppb), also commonly noted as 1 microgram per liter (ug). The analytical test results are attached to this letter.

## DESIGN CONSIDERATIONS

### Available Information

In addition to the information received previously, we have been provided the following documents and updated information for use in this analysis:

- A 30% design plan set dated January 9, 2025 detailing the planned sewer installation, shaft locations and depths was received from Mr. Chris Elenbaas, P.E. of OHM Advisors on June 2, 2025.

- A 90% design plan set dated August 14, 2025 with updated details was received from Mr. Chris Elenbaas, P.E. of OHM Advisors on August 26, 2025.
- Telephone and email conversations with Mr. Chris Elenbass, P.E. of OHM Advisors regarding the proposed construction and supplemental scope of services.

Project Description

The proposed project will consist of installing a new 36-inch sanitary sewer via microtunneling methods. The microtunneling operation will include the construction of at least 5 different access shafts to facilitate launching, turning and retrieving the microtunnel boring machine (MTBM) along with the installation of various manhole structures. Shafts for this purpose are commonly constructed using secant auger cast piles. For the planned sewer, we understand steel sheet piling or other means of shaft construction are under consideration. The specific size, depth and extent of shafts was not provided and a qualified Contractor will be responsible for the design and maintenance of any shaft for this project. All access shafts for this microtunnel are expected to include a tremie seal at the floor of the pit for groundwater control. In addition, we understand various existing utilities will remain in service during construction of the new sewer. Construction of shafts around the existing utility pipes may be proposed, necessitating penetrations in the shaft sidewalls at various depths.

SHAFT DEWATERING CONSIDERATIONS

The specific means and methods of construction including, but not limited to, design, installation and maintenance of access shafts, selection and implementation of dewatering procedures and monitoring of nearby structures and utilities should be selected by the Contractor. The Contractor should work to complete the installations in a safe manner while protecting the integrity of the ground surface and while complying with any applicable permit requirements.

The Contractor may elect to excavate some shafts and manholes in the wet with watertight shoring, which may reduce or eliminate the need for dewatering once closure is provided in the shaft base. However, shafts with penetrations for existing utilities will likely require dewatering until the penetrations can be sealed.

The following table summarizes the shafts anticipated to extend below the water level which will require dewatering. Representative soil borings and estimated groundwater levels are identified for each shaft location. The estimated groundwater levels are based on the conditions observed at the time of our investigations. Groundwater levels may fluctuate due to seasonal variations such as precipitation, snowmelt, nearby river or lake levels and other factors that may not be evident at the time of measurement. Groundwater levels may be different at the time of construction.

*Shaft Summary*

| Shaft or Structure ID | Shaft Type | Approx. STA. | Applicable Soil Boring | Est. Groundwater Elevation | Est. Groundwater Head over Tunnel Invert (ft) |
|---|---|---|---|---|---|
| S-1, S-5 | Launch MTBM | 100+50 | SB-12 | 788.4 | 6.2 |
| S-7 | Manhole | 103+80 | SB-101 | 792.4 | 10.6 |
| S-2, S-11 | Retrieve MTBM | 150+70 | SB-102 | 795.8 | 14.4 |
| S-9 | Manhole | 155+45 | SB-9 | 788.0 | 10.2 |
| S-3, S-13 | Launch MTBM | 161+30 | SB-103 | 780.5 | 4.6 |

Dewatering projections, including proposed dewatering methods and estimated flow rates, should be prepared by a qualified Contractor prior to construction. The soil grain size analyses provided with this letter may be used as an input for dewatering projections. Other methods for estimating dewatering flow rates could also be utilized. If additional subsurface soil or groundwater information is desired for dewatering projections, the Contractor should indicate any proposed testing for this purpose in their submittal. MTC remains available to assist with further subsurface investigations if proposed.

In general, the highest dewatering flow rates are expected at the deepest shaft located near STA. 150+70. The actual flow rates will largely depend on the Contractor's dewatering methods, the size of area to be dewatered and the magnitude of groundwater head reduction. Dewatering for shaft penetrations will likely be achieved with lower pumping rates relative to the pumping rates needed for lowering groundwater levels to the tunnel invert.

CLOSURE

We appreciate this opportunity to provide engineering services and express our interest in providing continuing services as the project progresses. Please contact our office should you have any questions or require further assistance.

Sincerely,

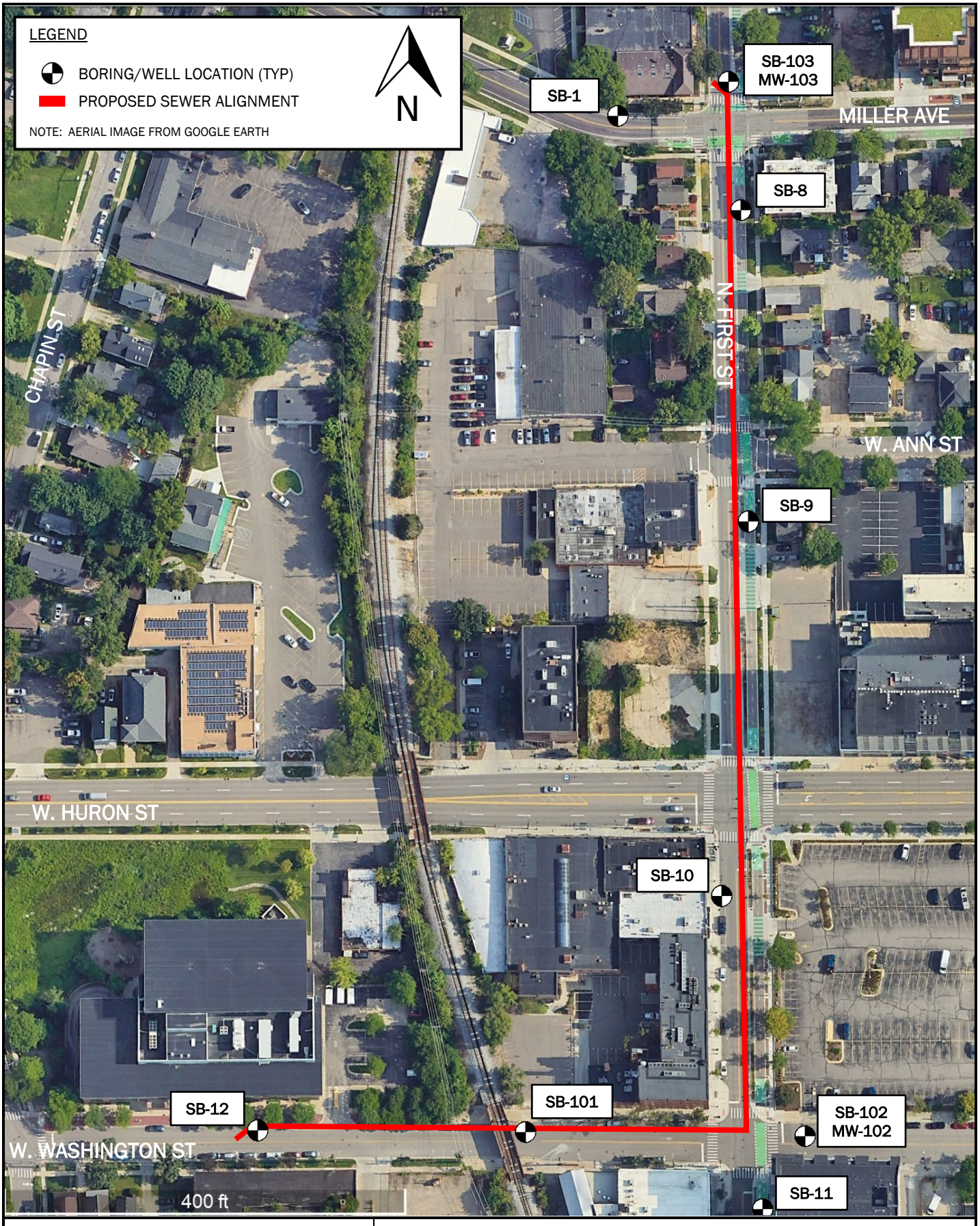
MATERIALS TESTING CONSULTANTS, INC.

Isaac L. MacMillan, P.E.
Project Manager

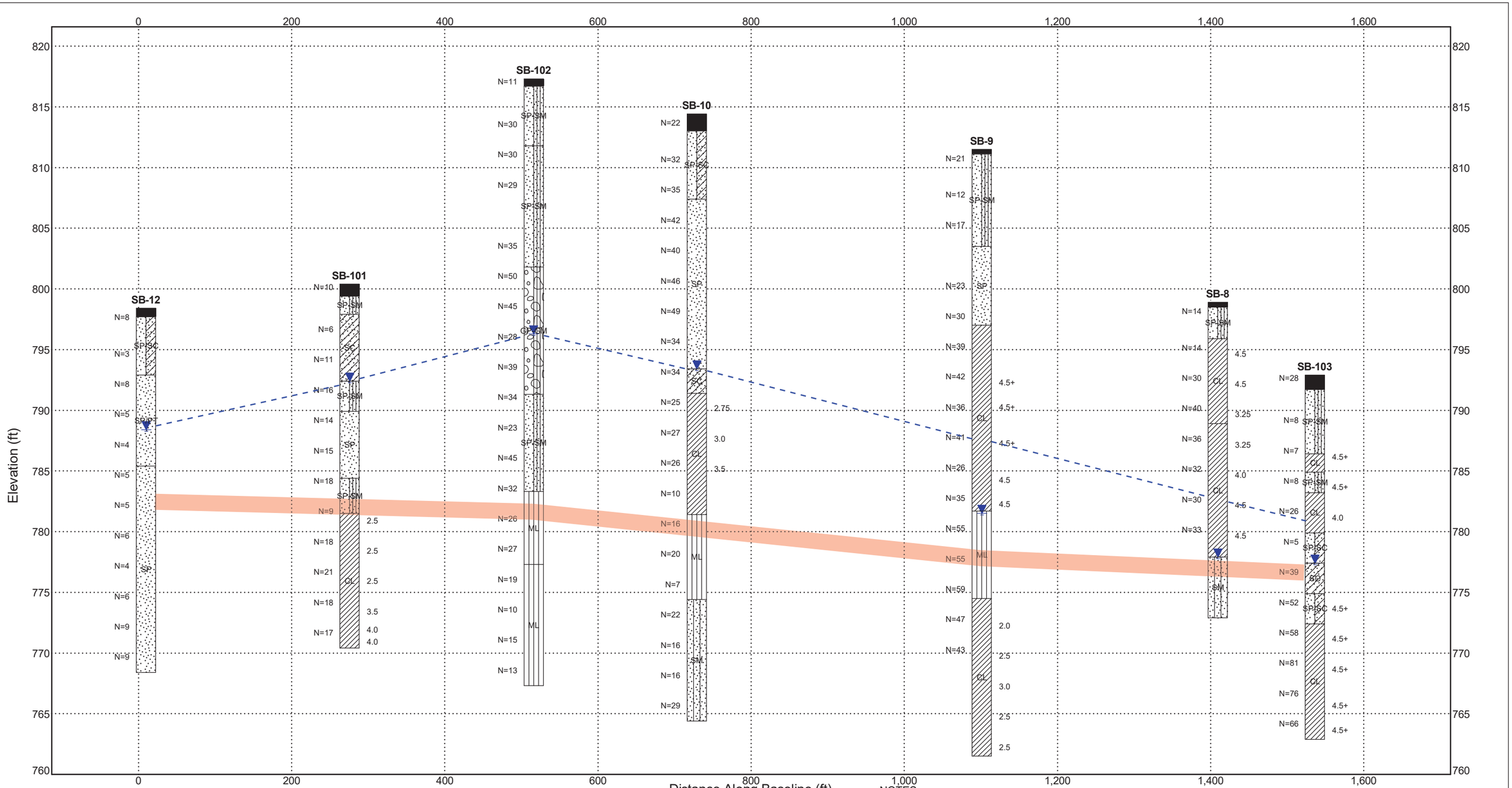
Robert J. Warren, P.E.
Senior Project Manager

Attachments: Figure No. 1 – Boring Location Plan
Figure No. 2 – Generalized Subsurface Profile
Limitations
Test Drilling and Sampling Procedures
Boring Log Terminology and Classification Outline
Boring Logs
Monitoring Well Installation Records
Particle Size Distribution Reports
Analytical Test Results






| | | | |
|---|---|---|---|
| TITLE: BORING LOCATION PLAN | | PROJECT: ANN ARBOR HIGH LEVEL TRUNKLINE SEWER IMPROVEMENTS | |
| SCALE: AS SHOWN | DATE: 1/10/2025 | PROJECT NO.: 241691 | MTC MATERIALS TESTING CONSULTANTS |
| FIG. NO.: 1 | DR. BY: IM | REV. BY: RW | |




NOTES:

1. SUBSURFACE CONDITONS ARE GENERALIZED. REFER TO BORING LOGS FOR SPECIFIC DESCRIPTIONS.
2. CONDITIONS BETWEEN BORINGS AND GROUNDWATER ELEVATIONS BETWEEN BORINGS MAY VARY.

| | | | |
|---|---|---|---|
| TITLE: GENERALIZED SUBSURFACE PROFILE | | | PROJECT: ANN ARBOR HIGH LEVEL TRUNKLINE SEWER IMPROVEMENTS |
| SCALE: NTS | DATE: 8/11/2025 | PROJECT NO.: 241691 | **Materials Testing Consultants, INC** |
| FIG. NO.: 4 | DR. BY: IM | REV. BY: SE | |

# LIMITATIONS

## Soil Variations

The recommendations in this report are based upon the data obtained from the soil borings. This report does not reflect variations which may occur between these borings, and which would not become evident until construction. If variations then become evident, it would be necessary for a re-evaluation of recommendations of this report, after performing on-site observations.

## Warranties

We have prepared this report in accordance with generally accepted soil and foundation engineering practices. We make no other warranties, either expressed or implied, as to the professional advice provided under the terms of our agreement and included in this report. This report is prepared exclusively for our client and may not be relied upon by other parties without written consent from our office.

## Boring Logs

In the process of obtaining and testing samples and preparing this report, we follow reasonable and accepted practice in the field of soil engineering. Field logs maintained during drilling describe field occurrences, sampling locations, and other information. The samples obtained in the field are subjected to additional testing in the laboratory and differences may exist between the field logs and the final logs. The engineer reviews the field logs and laboratory test data, and then prepares the final boring logs. Our recommendations are based on the contents of the final logs.

## Review of Design Plans and Specifications

In the event that any changes in the design of the building or the location, however slight, are planned, our recommendations shall not be considered valid unless modified or approved in writing by our office. We recommend that we be provided the opportunity to review the final design and specifications in order to determine whether changes in the original concept may have affected the validity of our recommendations, and whether our recommendations have, in fact, been implemented in the design and specifications.

# TEST DRILLING AND SAMPLING PROCEDURES

Test Drilling Methods:

- [X] Hollow stem auger, ASTM D6151
- [ ] Mud rotary, ASTM D5783
- [ ] Casing advancer, ASTM D5872
- [ ] Rock coring, ASTM D2113
- [ ] Core/Hand Auger

*Note: Cone penetration test data can be used to interpret subsurface stratigraphy and can provide data on engineering properties of soils. The ASTM procedure does not include a procedure for determining soil classification from CPT testing. Soil classifications shown on CPT logs are based on published procedures and are not based on physical ASTM soil classification tests.*

Sampling Methods:

- [X] SPT, ASTM D1586, Auto hammer (140 lb., 30" drop, 2" OD split spoon sampler)
- [ ] Thin-walled tube sampler (Shelby), ASTM D1587
- [X] Grab Samples

*Note: The number of hammer blows required to drive the SPT sampler 12 inches, after seating 6 inches, is termed the soil N-value and provides an indication of the soil's relative density and strength parameters at the sample location. SPT blow counts in 6 inch increments are recorded on the boring logs.*

Drill Rig:

- [X] CME 55 (ATV)
- [ ] Acker Renegade (ATV)
- [X] CME 45 Truck
- [ ] Geoprobe 7822 (ATV)
- [ ] Geoprobe Rotary Sonic

Boreholes Backfilled With:

- [X] Excavated soil
- [X] Cement bentonite grout
- [X] Piezometer or Monitoring Well (see notes on logs)
- [X] Concrete or asphalt patch where appropriate

Sample Handling and Disposition:

- [X] Samples labeled, placed in jars, returned to MTC Laboratory
- [X] Discard after 60 days

# BORING LOG TERMINOLOGY AND ASTM D 2488 CLASSIFICATION OUTLINE

## TERMS DESCRIBING CONSISTENCY OR CONDITION

**COARSE-GRAINED** SOILS (major portions retained on No. 200 sieve): includes (1) clean gravel and sands and (2) silty or clayey gravels and sands. Condition is rated according to relative density as determined by laboratory tests or standard penetration resistance tests.

| Descriptive Terms | Relative Density | SPT Blow Count |
|---|---|---|
| Very loose | 0 to 15 % | < 5 |
| Loose | 15 to 35 % | 5 to 10 |
| Medium dense | 35 to 65 % | 10 to 30 |
| Dense | 65 to 85 % | 30 to 50 |
| Very dense | 85 to 100 % | > 50 |

Per ASTM D2487, the following conditions must be met based on laboratory testing to justify the label 'well graded' in a soil description.

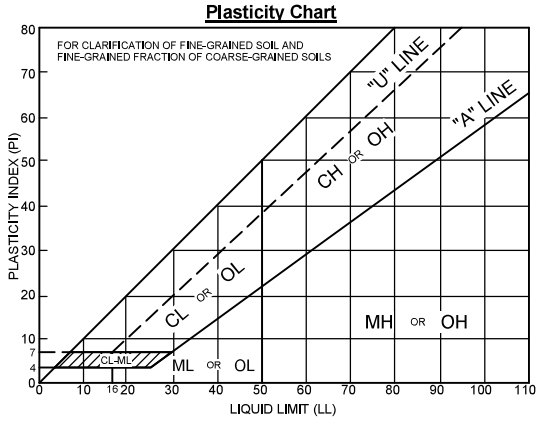
Gravel: $C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

Sand: $C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

**FINE-GRAINED** SOILS (major portions passing on No. 200 sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings, SPT blow count, or unconfined compression tests.

| Descriptive Terms | Unconfined Compressive Strength TSF | SPT Blow Count |
|---|---|---|
| Very soft | < 0.25 | < 2 |
| Soft | 0.25 to 0.5 | 2 to 4 |
| Medium stiff | 0.5 to 1.0 | 4 to 8 |
| Stiff | 1.0 to 2.0 | 8 to 15 |
| Very stiff | 2.0 to 4.0 | 15 to 30 |
| Hard | > 4.0 | > 30 |

### Plasticity Chart




| MAJOR DIVISIONS | | | | | TYPICAL NAMES |
|---|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE | CLEAN GRAVELS WITH LESS THAN 15% FINES | GW | | WELL-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | | GP | | POORLY-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | GRAVELS WITH 15% OR MORE FINES | GM | | SILTY GRAVELS WITH OR WITHOUT SAND |
| | | | GC | | CLAYEY GRAVELS WITH OR WITHOUT SAND |
| | SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LESS THAN 15% FINES | SW | | WELL-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP | | POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP-SM | | POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL |
| | | SANDS WITH 15% OR MORE FINES | SM | | SILTY SANDS WITH OR WITHOUT GRAVEL |
| | | | SC | | CLAYEY SANDS WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | | INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CL | | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OL | | ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | | INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CH | | INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OH | | ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| HIGHLY ORGANIC SOILS | | | PT/OL | | PEAT AND OTHER HIGHLY ORGANIC SOILS |

## GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. "Grades with" or "Grades without" may be used to describe soil when characteristics vary within a stratum.
3. Preserved soil samples will be discarded after 60 days unless alternate arrangements have been made.

## GROUNDWATER OBSERVATIONS:

During - indicates water level encountered during the boring
End- indicates water level immediately after drilling
Date and Depth - Measurements at indicated date

SAMPLE TYPES AND NUMBERING

| | |
|---|---|
| S | SPT, split barrel sample, ASTM D1586 |
| U | Shelby tube sample, ASTM D1587 |
| R | Rock core run |
| *S | Other than 2" split barrel sample |
| L | SPT with liner, ASTM D1586 |
| A | Auger cuttings |
| G | Geoprobe liner |

MINOR COMPONENT QUANTIFYING TERMS

| | |
|---|---|
| Less than 5% | TRACE |
| 5 to 10% | FEW |
| 15 to 25% | LITTLE |
| 30 to 40% | SOME |
| 50 to 100% | MOSTLY |

GRAIN SIZE

| | |
|---|---|
| BOULDER | >12" |
| COBBLE | 12" to 3" |
| COARSE GRAVEL | 3" to 0.75" |
| FINE GRAVEL | 0.75" to No. 4 |
| COARSE SAND | No. 4 to No. 10 |
| MEDIUM SAND | No. 10 to No.40 |
| FINE SAND | No. 40 to No. 200 |

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-1
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=286096.8 E=13289879.1 (MI South ift)
Elevation: 790.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 15.0 ft.

Date Begin: 03/11/2024 Date End: 03/11/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 8.5 |
| Sampler | SPT | 2" | End | 11.5 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 789.5 | 1 | | | | | 6" HMA, 6" Gravel Base | | | | Fill: 0' to 13.0' |
| 788.5 | 2 | S-1 | 1.0 | 14-12-12 N=24 | | 1.0 Brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist, Fill | | | | S-1 to S-3: Poor recovery; possible coarse gravel / COBBLE |
| 787.5 | 3 | | | | | | | | | |
| 786.5 | 4 | | | | | | | | | Environmental composite soil sample from 0.5' to 10' |
| 785.5 | 5 | S-2 | 0.0 | 5-5-4 N=9 | | | | | | |
| 784.5 | 6 | | | | | | | | | |
| 783.5 | 7 | S-3 | 1.0 | 1-2-2 N=4 | SC | | | | | |
| 782.5 | 8 | | | | | | | | | |
| 781.5 | 9 | | | | | | | | | |
| 780.5 | 10 | S-4 | 1.3 | 1-1-1 N=2 | | Grades wet at 8.5' | | | | |
| 779.5 | 11 | | | | | | | | | |
| 778.5 | 12 | S-5 | 1.5 | 5-6-17 N=23 | | | | | | |
| 777.5 | 13 | | | | | 13.0 | | | | Driller noted difficult drilling from 12' to 19' |
| 776.5 | 14 | | | | | Brown poorly graded GRAVEL with silt and sand; mostly coarse to fine gravel, little coarse to fine sand, few silty fines, wet | | | | |
| 775.5 | 15 | S-6 | 1.3 | 5-17-6 N=23 | | | | | | Environmental water sample at 15' |
| 774.5 | 16 | | | | | | | | | |
| 773.5 | 17 | S-7 | 1.4 | 12-14-18 N=32 | GP-GM | | | | | |
| 772.5 | 18 | | | | | | | | | |
| 771.5 | 19 | | | | | | | | | |
| 770.5 | 20 | S-8 | 1.5 | 4-10-9 N=19 | | 19.5 | | | | |
| 769.5 | 21 | | | | | Gray SILT; mostly silty fines, trace fine sand, moist | | | | |
| 768.5 | 22 | S-9 | 1.5 | 9-13-17 N=30 | ML | | | | | |
| 767.5 | 23 | | | | | Grades with trace coarse to fine gravel and few coarse to fine sand | | | | |
| 766.5 | 24 | | | | | | | | | |
| 765.5 | 25 | S-10 | 1.5 | 9-17-20 N=37 | | 25.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-8
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285995.5 E=13290005.0 (MI South ift)
Elevation: 798.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 15.0 ft.

Date Begin: 03/03/2024 Date End: 03/03/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21.0 |
| Sampler | SPT | 2" | End | 13.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 26.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 797.9 | 1 | | | | | 5" HMA (0.4) | | | | Fill: 0' to 3.0' |
| 796.9 | 2 | S-1 | 0.8 | 7-7-7 N=14 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, moist, (3.0) | | | | S-1: Poor recovery; possible coarse gravel / COBBLE |
| 795.9 | 3 | | | | | Fill | | | | |
| 794.9 | 4 | | | | | | | | | |
| 793.9 | 5 | S-2 | 1.4 | 12-5-9 N=14 | | Brown lean CLAY; mostly clayey fines, trace coarse to fine sand, trace fine gravel, moist | 4.5 | | | Driller noted difficult drilling at 4' |
| 792.9 | 6 | | | | | | | | | |
| 791.9 | 7 | S-3 | 1.5 | 7-9-21 N=30 | CL | | 4.5 | | | Environmental composite soil sample from 0.5' to 30' |
| 790.9 | 8 | | | | | | | | | |
| 789.9 | 9 | | | | | | | | | |
| 788.9 | 10 | S-4 | 1.5 | 13-17-23 N=40 | | (10.0) | 3.25 | | | |
| 787.9 | 11 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | No environmental water sample due to limited groundwater quantity |
| 786.9 | 12 | S-5 | 1.5 | 9-16-20 N=36 | | | 3.25 | | | |
| 785.9 | 13 | | | | | | | | | |
| 784.9 | 14 | | | | | | | | | |
| 783.9 | 15 | S-6 | 1.5 | 9-13-19 N=32 | | | 4.0 | | | |
| 782.9 | 16 | | | | CL | | | | | |
| 781.9 | 17 | S-7 | 1.5 | 7-12-18 N=30 | | | 4.5 | | | |
| 780.9 | 18 | | | | | Grades with trace coarse to fine sand | | | | |
| 779.9 | 19 | | | | | | | | | |
| 778.9 | 20 | S-8 | 1.5 | 9-13-20 N=33 | | Grades with wet sand seams | 4.5 | | | |
| 777.9 | 21 | | | | | (21.0) | | | | Driller noted difficult drilling at 20' |
| 776.9 | 22 | S-9 | 0.9 | 18-50/5" | | Gray silty SAND; mostly coarse to fine sand, some silty fines, trace coarse to fine gravel, wet | | | | S-9, S-10: Sampler refusal; possible coarse gravel / COBBLE |
| 775.9 | 23 | | | | | | | | | |
| 774.9 | 24 | | | | SM | | | | | |
| 773.9 | 25 | S-10 | 0.9 | 19-50/5" | | | | | | |
| 772.9 | 26 | | | | | (26.0) | | | | |
| | | | | | | End of Boring | | | | Auger refusal at 26.0' due to possible coarse gravel / BOULDER |

PID = Photoionization Detector.
Detection <50 ppm except where noted.

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-9
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285687.1 E=13289991.9 (MI South ift)
Elevation: 811.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 33.0 ft.

Date Begin: 03/07/2024 Date End: 03/07/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 30.0 |
| Sampler | SPT | 2" | End | 37.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 810.5 | 1 | | | | | 5" HMA (0.4) | | | | Fill: 0' to 8.0' |
| 809.5 | 2 | S-1 | 1.3 | 6-9-12 N=21 | | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little fine gravel, few silty fines, moist, Fill | | | | |
| 808.5 | 3 | | | | | | | | | |
| 807.5 | 4 | | | | | | | | | |
| 806.5 | 5 | S-2 | 1.5 | 9-6-6 N=12 | SP-SM | | | | | Debris at 4' |
| 805.5 | 6 | | | | | | | | | |
| 804.5 | 7 | S-3 | 1.5 | 13-11-6 N=17 | | Grades with trace recycled asphalt at 6' | | | | Driller noted difficult drilling at 6' |
| 803.5 | 8 | | | | | (8.0) | | | | |
| 802.5 | 9 | | | | | Gray gravelley SAND; mostly coarse to fine sand, some coarse to fine gravel, trace silty fines, moist | | | | |
| 801.5 | 10 | S-4 | 0.5 | 50/8" | | | | | | S-4 to S-7: Poor recovery; possible coarse gravel / COBBLE |
| 800.5 | 11 | | | | | | | | | |
| 799.5 | 12 | S-5 | 0.7 | 36-12-11 N=23 | SP | | | | | Environmental composite soil sample from 0.5' to 30' |
| 798.5 | 13 | | | | | | | | | |
| 797.5 | 14 | | | | | | | | | |
| 796.5 | 15 | S-6 | 1.0 | 16-15-15 N=30 | | (14.5) | | | | |
| 795.5 | 16 | | | | | Gray lean CLAY; mostly clayey fines, few coarse to fine sand, few coarse to fine gravel, moist | | | | No environmental water sample due to limited groundwater quantity |
| 794.5 | 17 | S-7 | 0.0 | 7-17-22 N=39 | | | | | | |
| 793.5 | 18 | | | | | | | | | |
| 792.5 | 19 | | | | | | | | | |
| 791.5 | 20 | S-8 | 1.5 | 13-25-17 N=42 | | | 4.5+ | | | |
| 790.5 | 21 | | | | | | | | | |
| 789.5 | 22 | S-9 | 1.5 | 7-14-22 N=36 | CL | | 4.5+ | | | |
| 788.5 | 23 | | | | | | | | | |
| 787.5 | 24 | | | | | | | | | |
| 786.5 | 25 | S-10 | 1.5 | 8-19-22 N=41 | | | 4.5+ | | | |
| 785.5 | 26 | | | | | | | | | Driller noted difficult drilling at 25' |
| 784.5 | 27 | S-11 | 1.5 | 8-12-14 N=26 | | | 4.5 | | | |
| 783.5 | 28 | | | | | | | | | |
| 782.5 | 29 | | | | | | | | | |
| 781.5 | 30 | S-12 | 1.5 | 14-17-18 N=35 | | (29.8) | 4.5 | | | |
| 780.5 | 31 | | | | | Gray SILT with sand; mostly silty fines, few fine sand, wet with occasional clay lenses | | | | |
| 779.5 | 32 | S-13 | 1.5 | 22-27-28 N=55 | | | | 15.5 | | S-13: LBW = 86.6% |
| 778.5 | 33 | | | | | | | | | |
| 777.5 | 34 | | | | ML | | | | | |
| 776.5 | 35 | S-14 | 1.3 | 12-28-27 N=55 | | | | | | |
| 775.5 | 36 | | | | | | | | | |
| 774.5 | 37 | S-15 | 1.5 | 21-31-28 N=59 | | (37.0) | | | | |
| 773.5 | 38 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | |
| 772.5 | 39 | | | | CL | | | | | |
| 771.5 | 40 | S-16 | 1.5 | 4-14-33 N=47 | | | 2.0 | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-9
**Sheet:** 2 of 2

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 770.5 | 41 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | S-18, S-19, S-20: Sampler refusal; possible coarse gravel / COBBLE |
| 769.5 | 42 | S-17 | 1.5 | 7-18-25 N=43 | | | 2.5 | | | |
| 768.5 | 43 | | | | | Grades with occasional sand lenses from 38' to 42' | | | | |
| 767.5 | 44 | | | | | | | | | |
| 766.5 | 45 | S-18 | 0.9 | 20-50/5" | CL | | 3.0 | | | |
| 765.5 | 46 | | | | | | | | | |
| 764.5 | 47 | S-19 | 0.7 | 21-50/3" | | | 2.5 | | | |
| 763.5 | 48 | | | | | | | | | |
| 762.5 | 49 | | | | | Grades with trace fine sand at 48' | | | | |
| 761.5 | 50 | S-20 | 0.5 | 50/8" | | 50.0 | 2.5 | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-10
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285314.8 E=13289950.9 (MI South ift)
Elevation: 814.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with grout, patched pavement with cold patch.

Date Begin: 03/13/2024 Date End: 03/13/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21.0 |
| Sampler | SPT | 2" | End | 23.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 813.4 | 1 | | | | | 8" HMA, 6" Gravel Base | | | | Fill: 0' to 21.0' |
| 812.4 | 2 | S-1 | 1.3 | 8-11-11 N=22 | | 1.4 | | | | |
| 811.4 | 3 | | | | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few coarse to fine gravel, few clayey fines, moist, Fill | | | | Driller noted difficult drilling from 2' to 5' |
| 810.4 | 4 | | | | | | | | | S-2, S-4, S-7, S-8: Poor recovery; possible coarse gravel / COBBLE |
| 809.4 | 5 | S-2 | 0.5 | 6-19-13 N=32 | | | | | 240 | |
| 808.4 | 6 | | | | | | | | | |
| 807.4 | 7 | S-3 | 1.4 | 15-12-23 N=35 | | 7.0 | | | 238 | Environmental composite soil sample from 1.5' to 7.5' |
| 806.4 | 8 | | | | | | | | | |
| 805.4 | 9 | | | | | Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist, Fill | | | | |
| 804.4 | 10 | S-4 | 1.2 | 9-19-23 N=42 | | | | | | No environmental water sample due to limited groundwater quantity |
| 803.4 | 11 | | | | | | | | | |
| 802.4 | 12 | S-5 | 1.3 | 5-17-23 N=40 | | | | | | Driller noted difficult drilling from 10' to 20' |
| 801.4 | 13 | | | | | | | | | |
| 800.4 | 14 | | | | | | | | | |
| 799.4 | 15 | S-6 | 1.4 | 21-23-23 N=46 | SP | | | | | |
| 798.4 | 16 | | | | | | | | | |
| 797.4 | 17 | S-7 | 1.0 | 9-16-33 N=49 | | | | | | |
| 796.4 | 18 | | | | | | | | | |
| 795.4 | 19 | | | | | | | | | |
| 794.4 | 20 | S-8 | 0.6 | 9-15-19 N=34 | | | | | | |
| 793.4 | 21 | | | | | 21.0 | | | | |
| 792.4 | 22 | S-9 | 1.3 | 9-15-19 N=34 | SC | Gray clayey SAND; mostly fine sand, some clayey fines, wet | | | | |
| 791.4 | 23 | | | | | 23.0 | | | | |
| 790.4 | 24 | | | | | Gray sandy lean CLAY; mostly clayey fines, little fine sand, moist | 2.75 | | | |
| 789.4 | 25 | S-10 | 1.5 | 9-13-12 N=25 | | | | | | |
| 788.4 | 26 | | | | | | | | | |
| 787.4 | 27 | S-11 | 1.5 | 9-12-15 N=27 | | | 3.0 | | | |
| 786.4 | 28 | | | | CL | | | | | |
| 785.4 | 29 | | | | | | | | | |
| 784.4 | 30 | S-12 | 1.5 | 9-11-15 N=26 | | Grades with trace fine sand | 3.5 | | | |
| 783.4 | 31 | | | | | | | | | |
| 782.4 | 32 | S-13 | 1.5 | 5-4-6 N=10 | | | | 24.7 | | S-13: LBW = 98.2% |
| 781.4 | 33 | | | | | 33.0 | | | | |
| 780.4 | 34 | | | | | Gray SILT with sand; mostly silty fines, little fine sand, wet with occasional clay seams | | | | |
| 779.4 | 35 | S-14 | 1.5 | 4-7-9 N=16 | | | | | | |
| 778.4 | 36 | | | | | | | | | |
| 777.4 | 37 | S-15 | 1.5 | 4-7-13 N=20 | ML | | | | | |
| 776.4 | 38 | | | | | | | | | |
| 775.4 | 39 | | | | | | | | | |
| 774.4 | 40 | S-16 | 1.5 | 2-3-4 N=7 | | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| | LOG OF BORING | Project No.: 241082<br>Boring No.: SB-10<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 773.4 | 41 | | | | | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 772.4 | 42 | S-17 | 1.5 | 6-9-13 N=22 | | | | | | |
| 771.4 | 43 | | | | | | | | | |
| 770.4 | 44 | | | | | | | | | |
| 769.4 | 45 | S-18 | 1.5 | 4-7-9 N=16 | SM | | | | | |
| 768.4 | 46 | | | | | | | | | |
| 767.4 | 47 | S-19 | 1.5 | 5-9-7 N=16 | | Grades with trace coarse to fine gravel | | | | |
| 766.4 | 48 | | | | | | | | | |
| 765.4 | 49 | | | | | | | | | |
| 764.4 | 50 | S-20 | 1.5 | 8-12-17 N=29 | | 50.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-11
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=284994.6 E=13289974.9 (MI South ift)
Elevation: 812 ft Datum: NAVD 88 (GPS Observation)
Notes: Elevation estimated from Washtenaw County GIS contours

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 11.4 ft.

Date Begin: 03/20/2024 Date End: 03/20/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 20.0 |
| Sampler | SPT | 2" | End | 20.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 45.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 811.0 | 1 | | | | | 4 1/2" HMA, 5 1/2" Gravel Base 0.8 | | | | Fill: 0' to 17.5' |
| 810.0 | 2 | S-1 | 1.3 | 12-18-13 N=31 | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, few coarse to fine gravel, moist, Fill | | | | Environmental composite soil sample from 0.5' to 30' |
| 809.0 | 3 | | | | | 4.5 | | | | |
| 808.0 | 4 | S-2 | 1.4 | 4-7-6 N=13 | | Gray to brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist, Fill | | | | |
| 807.0 | 5 | | | | | | | | | |
| 806.0 | 6 | | | | | | | | | |
| 805.0 | 7 | S-3 | 1.3 | 8-11-15 N=26 | | | | | | Driller noted difficult drilling at 7' |
| 804.0 | 8 | | | | | | | | | |
| 803.0 | 9 | S-4 | 1.3 | 6-13-15 N=28 | | | | | | |
| 802.0 | 10 | | | | | | | | | |
| 801.0 | 11 | | | | SP | | | | | |
| 800.0 | 12 | S-5 | 1.4 | 5-7-19 N=26 | | | | | | |
| 799.0 | 13 | | | | | | | | | |
| 798.0 | 14 | S-6 | 1.5 | 5-12-19 N=31 | | | | | | |
| 797.0 | 15 | | | | | | | | | |
| 796.0 | 16 | | | | | | | | | |
| 795.0 | 17 | S-7 | 1.1 | 32-28-33 N=61 | | | | | | |
| 794.0 | 18 | | | | | 17.5 | | | | Driller noted difficult drilling from 17' to 22' |
| 793.0 | 19 | | | | | Brown poorly graded SAND with clay and gravel; mostly coarse to fine sand, little clayey fines with occasional clay seams, little coarse to fine gravel, moist | | | | |
| 792.0 | 20 | S-8 | 1.0 | 39-16-17 N=33 | | Grades wet at 20' | | | | S-8, S-9, S-10: Poor recovery; possible coarse gravel / COBBLE |
| 791.0 | 21 | | | | | | | | | |
| 790.0 | 22 | S-9 | 0.6 | 13-21-10 N=31 | | | | | | |
| 789.0 | 23 | | | | | | | | | |
| 788.0 | 24 | | | | SP-SC | | | | | |
| 787.0 | 25 | S-10 | 0.9 | 7-6-5 N=11 | | | | | | Environmental water sample at 25' |
| 786.0 | 26 | | | | | | | | | |
| 785.0 | 27 | S-11 | 1.5 | 14-12-13 N=25 | | | | | | Charged augers with water at 26.0' |
| 784.0 | 28 | | | | | | | | | |
| 783.0 | 29 | | | | | 29.0 | | | | *End water level may be influenced by charging augers |
| 782.0 | 30 | S-12 | 1.5 | 5-5-7 N=12 | | Gray lean CLAY; mostly clayey fines, trace fine sand, moist | 2.5 | | | |
| 781.0 | 31 | | | | CL | | | | | |
| 780.0 | 32 | S-13 | 1.5 | 4-6-8 N=14 | | 32.0 | 2.75 | | | |
| 779.0 | 33 | | | | | Gray SILT; mostly silty fines, trace fine sand, wet with occasional clay seams | | | | |
| 778.0 | 34 | | | | | | | | | |
| 777.0 | 35 | S-14 | 1.5 | 4-6-9 N=15 | ML | | | 23.6 | | S-14: LBW = 99.1% |
| 776.0 | 36 | | | | | | | | | |
| 775.0 | 37 | S-15 | 1.5 | 4-6-6 N=12 | | | | | | |
| 774.0 | 38 | | | | | Grades with occasional sand seams 38.0 | | | | |
| 773.0 | 39 | | | | | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 772.0 | 40 | S-16 | 1.5 | 4-8-15 N=23 | SM | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| | LOG OF BORING | Project No.: 241082<br>Boring No.: SB-11<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 771.0 | 41 | | | | | | | | | |
| 770.0 | 42 | S-17 | 1.5 | 5-2-18<br>N=20 | SM | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 769.0 | 43 | | | | | | | | | |
| 768.0 | 44 | | | | | | | | | |
| 767.0 | 45 | S-18 | 1.5 | 5-11-15<br>N=26 | | 45.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector.<br>Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-12
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285099.4 E=13289477.2 (MI South ift)
Elevation: 798.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 7.1 ft.

Date Begin: 03/12/2024 Date End: 03/12/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 10.0 |
| Sampler | SPT | 2" | End | 5.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 797.4 | 1 | | | | | 3" HMA, 5" Concrete 0.7 | | | | Fill: 0' to 5.5' |
| 796.4 | 2 | S-1 | 1.3 | 6-5-3 N=8 | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, moist, Fill | | | | S-2, S-3, S-4, S-8, S-9: Poor recovery; possible coarse gravel / COBBLE |
| 795.4 | 3 | | | | | | | | | |
| 794.4 | 4 | | | | | Grades with few coarse to fine gravel | | | | |
| 793.4 | 5 | S-2 | 0.1 | 3-2-1 N=3 | | 5.5 | | | | Environmental composite soil sample from 0.5' to 10' |
| 792.4 | 6 | | | | | | | | | |
| 791.4 | 7 | S-3 | 0.4 | 5-6-2 N=8 | | Brown poorly graded SAND; mostly coarse to fine sand, trace silty fines, moist with frequent lenses of fibrous peat | | | | Environmental water sample at 11' |
| 790.4 | 8 | | | | | | | | | |
| 789.4 | 9 | | | | | | | | | |
| 788.4 | 10 | S-4 | 0.3 | 3-2-3 N=5 | SP/PT | Grades with little gravel and occasional clay lenses | | | | |
| 787.4 | 11 | | | | | Grades wet at 10' | | | | |
| 786.4 | 12 | S-5 | 1.5 | 2-2-2 N=4 | | 13.0 | | 48.5 | | S-5: 7.7% Organics |
| 785.4 | 13 | | | | | | | | | |
| 784.4 | 14 | | | | | Light brown poorly graded SAND; mostly coarse to fine sand, trace silty fines, wet | | | | |
| 783.4 | 15 | S-6 | 1.5 | 3-2-3 N=5 | | | | | | |
| 782.4 | 16 | | | | | | | | | |
| 781.4 | 17 | S-7 | 1.5 | 6-2-3 N=5 | | | | | | Charged augers with water at 16.0' |
| 780.4 | 18 | | | | | | | | | *End water level may be influenced by charging augers |
| 779.4 | 19 | | | | | | | | | |
| 778.4 | 20 | S-8 | 0.8 | 3-3-3 N=6 | | | | | | |
| 777.4 | 21 | | | | | | | | | |
| 776.4 | 22 | S-9 | 1.2 | 3-2-2 N=4 | SP | | | | | |
| 775.4 | 23 | | | | | | | | | |
| 774.4 | 24 | | | | | | | | | |
| 773.4 | 25 | S-10 | 1.5 | 2-2-4 N=6 | | Grades without silty fines | | | | |
| 772.4 | 26 | | | | | | | | | |
| 771.4 | 27 | S-11 | 1.3 | 4-4-5 N=9 | | | | | | |
| 770.4 | 28 | | | | | | | | | |
| 769.4 | 29 | | | | | | | | | |
| 768.4 | 30 | S-12 | 1.5 | 3-4-5 N=9 | | 30.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241691
**Boring No.:** SB-101
**Sheet:** 1 of 1

Project: Ann Arbor High Level Trunkline Sewer Improvements
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: KE Field Eng.: JV Rev. By: IM
Coordinates: N=285084.5 E=13289743.2 (MI South ift)
Elevation: 800.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with bentonite grout, patched pavement with cold patch.

Date Begin: 10/24/2024 Date End: 10/24/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 8 |
| Sampler | SPT | 2" | End | NA |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 799.4 | 1 | S-1 | 1.1 | 38-6-4 N=10 | | 4" HMA<br>8" Gravel Base (1.0) | | | | Fill: 0.0' to 2.5' |
| 798.4 | 2 | | | | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, few silty fines, few coarse to fine gravel, moist, Fill (2.5) | | | | Environmental composite soil sample from 1.0' to 30.0' |
| 797.4 | 3 | | | | | | | | | |
| 796.4 | 4 | S-2 | 0.9 | 3-3-3 N=6 | SC | Brown clayed SAND with gravel; mostly coarse to fine sand, little clayey fines, few coarse to fine gravel, moist | | | | S-2: Poor recovery; possible coarse gravel / COBBLE |
| 795.4 | 5 | | | | | | | | | |
| 794.4 | 6 | | | | | | | | | |
| 793.4 | 7 | S-3 | 1.1 | 3-6-5 N=11 | | | | | | |
| 792.4 | 8 | | | | | (8.0) | | | | |
| 791.4 | 9 | S-4 | 1.3 | 6-8-8 N=16 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, some coarse to fine gravel, few silty fines, wet (10.5) | | | | |
| 790.4 | 10 | | | | | | | | | |
| 789.4 | 11 | | | | SP | Gray poorly graded SAND with gravel; mostly coarse to fine sand, little fine gravel, trace silty fines, wet | | | | |
| 788.4 | 12 | S-5 | 1.5 | 5-6-8 N=14 | | | | | | |
| 787.4 | 13 | | | | | | | | | |
| 786.4 | 14 | S-6 | 1.5 | 3-4-11 N=15 | | | | | | Environmental water sample at 13.5' via temporary screen set from 8.5' to 13.5' |
| 785.4 | 15 | | | | | | | | | |
| 784.4 | 16 | | | | | (16.0) | | | | |
| 783.4 | 17 | S-7 | 1.5 | 4-10-8 N=18 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, wet | | | | |
| 782.4 | 18 | | | | | | | | | Augers charged with water at 16.8' |
| 781.4 | 19 | | | | | (18.9) | | | | |
| 780.4 | 20 | S-8 | 1.5 | 4-4-5 N=9 | CL | Gray lean CLAY; mostly clayey fines, moist | 2.5 | | | |
| 779.4 | 21 | | | | | | | | | |
| 778.4 | 22 | S-9 | 1.2 | 6-8-10 N=18 | | | 2.5 | | | |
| 777.4 | 23 | | | | | | | | | |
| 776.4 | 24 | S-10 | 1.5 | 6-9-12 N=21 | | | 2.5 | | 1.1* | *S-10: 1.1 ppm H2S |
| 775.4 | 25 | | | | | | | | | |
| 774.4 | 26 | | | | | | | | | |
| 773.4 | 27 | S-11 | 1.5 | 5-7-11 N=18 | | | 3.5 | | | |
| 772.4 | 28 | | | | | | | | | |
| 771.4 | 29 | S-12 | 1.5 | 7-7-10 N=17 | | | 4.0 | | | |
| 770.4 | 30 | | | | | (30.0) | | | | |
| | | | | | | End of Boring | | | | VOC content correlated from combustible gas detector. Detection below threshold except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241691
**Boring No.:** SB-102
**Sheet:** 1 of 2

Project: Ann Arbor High Level Trunkline Sewer Improvements
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: KE Field Eng.: BG Rev. By: IM
Coordinates: N=285074 E=13290014.1 (MI South ift)
Elevation: 817.3 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Installed flush-mount monitoring well MW-102

Date Begin: 10/25/2024 Date End: 10/25/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21 |
| Sampler | SPT | 2" | End | NA |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 816.3 | 1 | S-1 | 1.5 | 3-3-8 N=11 | | 3 1/2" HMA, 4" Concrete 0.6 | | | | Fill: 0.0' to 5.5' |
| 815.3 | 2 | | | | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, some coarse to fine gravel, few silty fines, moist, Fill | | | | Environmental composite soil sample from 1.0' to 50.0' |
| 814.3 | 3 | | | | | | | | | |
| 813.3 | 4 | S-2 | 1.5 | 7-15-15 N=30 | | 5.5 | | | | |
| 812.3 | 5 | | | | | | | | | |
| 811.3 | 6 | | | | | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, moist | | | | |
| 810.3 | 7 | S-3 | 1.5 | 15-14-16 N=30 | | | | | | |
| 809.3 | 8 | | | | | | | | | |
| 808.3 | 9 | S-4 | 1.0 | 9-13-16 N=29 | | | | | | S-4, S-5, S-6, S-7: Poor recovery; possible coarse gravel / COBBLE |
| 807.3 | 10 | | | | | | | | | |
| 806.3 | 11 | | | | SP-SM | | | | | |
| 805.3 | 12 | S-5 | 0.0 | 50/3" | | Grades with coarse gravel and frequent COBBLE | | | | S-5: Sampler refusal; possible coarse gravel / COBBLE |
| 804.3 | 13 | | | | | | | | | |
| 803.3 | 14 | S-6 | 1.2 | 17-18-17 N=35 | | | | | | |
| 802.3 | 15 | | | | | 15.5 | | | | |
| 801.3 | 16 | | | | | Brown poorly graded GRAVEL with silt and sand; mostly coarse to fine gravel, some coarse to fine sand, few silty fines, moist with occasional COBBLE | | | | |
| 800.3 | 17 | S-7 | 0.8 | 10-25-25 N=50 | | | | | | |
| 799.3 | 18 | | | | | | | | | |
| 798.3 | 19 | S-8 | 1.5 | 25-25-20 N=45 | | | | | | |
| 797.3 | 20 | | | | | | | | | |
| 796.3 | 21 | | | | GP-GM | | | | | |
| 795.3 | 22 | S-9 | 1.5 | 7-17-11 N=28 | | Grades wet at 21.0' | | | | |
| 794.3 | 23 | | | | | | | | | |
| 793.3 | 24 | S-10 | 1.5 | 35-23-16 N=39 | | | | | | |
| 792.3 | 25 | | | | | | | | | |
| 791.3 | 26 | | | | | 26.0 | | | | |
| 790.3 | 27 | S-11 | 1.5 | 15-14-20 N=34 | | Brown poorly graded SAND with silt and gravel; mostly fine sand, some coarse to fine gravel, few silty fines, wet | | | | Charged augers with water at 26.0' |
| 789.3 | 28 | | | | | | | | | |
| 788.3 | 29 | S-12 | 0.8 | 3-8-15 N=23 | | | | | | S-12, S-13: Poor recovery: possible coarse gravel / COBBLE |
| 787.3 | 30 | | | | SP-SM | | | | | |
| 786.3 | 31 | | | | | | | | | |
| 785.3 | 32 | S-13 | 0.8 | 14-22-23 N=45 | | | | | | S-13: LBW=6.0% |
| 784.3 | 33 | | | | | | | | | |
| 783.3 | 34 | | | | | 34.0 | | | | |
| 782.3 | 35 | S-14 | 1.5 | 23-17-15 N=32 | | Gray SILT with sand; mostly silty fines, little fine sand, wet | | | | |
| 781.3 | 36 | | | | | | | | | |
| 780.3 | 37 | S-15 | 1.5 | 11-11-15 N=26 | ML | | | | | S-15: LBW=78.2% |
| 779.3 | 38 | | | | | | | | | |
| 778.3 | 39 | | | | | | | | | |
| 777.3 | 40 | S-16 | 1.5 | 7-11-16 N=27 | | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| MTC | LOG OF BORING | Project No.: 241691<br>Boring No.: SB-102<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 776.3 | 41 | | | | | Gray SILT with sand; mostly silty fines, little fine sand, wet | | | | |
| 775.3 | 42 | S-17 | 1.5 | 7-7-12 N=19 | | | | | | |
| 774.3 | 43 | | | | | | | | | |
| 773.3 | 44 | | | | | | | | | |
| 772.3 | 45 | S-18 | 1.5 | 3-3-7 N=10 | ML | | | | | |
| 771.3 | 46 | | | | | | | | | |
| 770.3 | 47 | S-19 | 1.5 | 3-7-8 N=15 | | | | | | |
| 769.3 | 48 | | | | | | | | | |
| 768.3 | 49 | | | | | | | | | |
| 767.3 | 50 | S-20 | 1.5 | 4-5-8 N=13 | | 50.0 | | | | |
| | | | | | | End of Boring | | | | VOC content correlated from combustible gas detector. Detection below threshold except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241691
**Boring No.:** SB-103
**Sheet:** 1 of 1

Project: Ann Arbor High Level Trunkline Sewer Improvements
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: KE Field Eng.: JV Rev. By: IM
Coordinates: N=286122.3 E=13289992.4 (MI South ift)
Elevation: 792.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Installed flush-mount monitoring well MW-103.

Date Begin: 12/02/2024 Date End: 12/03/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 15.5 |
| Sampler | SPT | 2" | End | NA |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

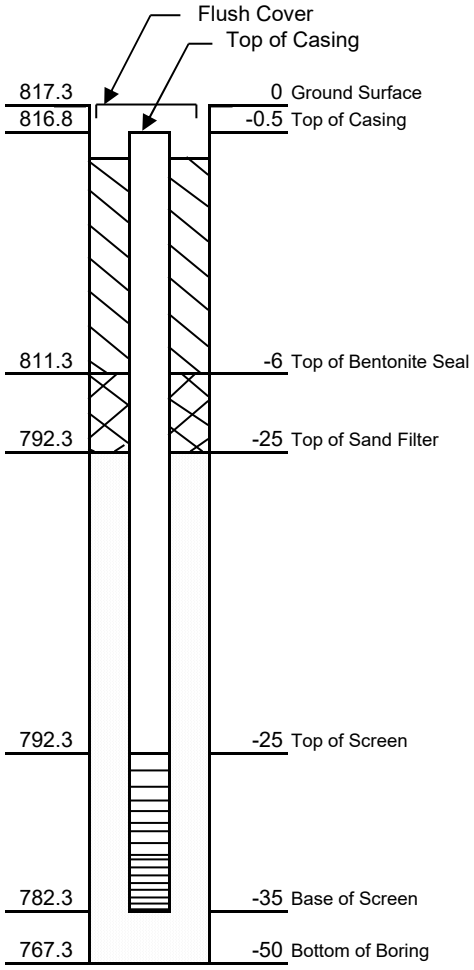
| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 791.9 | 1 | S-1 | 1.3 | 11-13-15 N=28 | | 7" HMA, 7" Gravel Base (1.2) | | | | Fill: 0' to 6.5' |
| 790.9 | 2 | | | | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, few silty fines, few coarse to fine gravel, moist, Fill | | | | Environmental composite sample from 1.2' to 30.0' |
| 789.9 | 3 | | | | | | | | | |
| 788.9 | 4 | S-2 | 1.2 | 4-4-4 N=8 | | | | | | S-2, S-4, S-6: Poor recovery; possible coarse gravel / COBBLE |
| 787.9 | 5 | | | | | | | | | |
| 786.9 | 6 | | | | | (6.5) | | | | |
| 785.9 | 7 | S-3 | 1.3 | 3-4-3 N=7 | CL | Brown lean CLAY; mostly clayey fines, few coarse to fine gravel, few coarse to fine sand, moist (8.0) | 4.5+ | | | |
| 784.9 | 8 | | | | | | | | | |
| 783.9 | 9 | S-4 | 1.2 | 2-3-5 N=8 | SP-SM | Brown poorly graded SAND with silt; mostly coarse to fine sand, few coarse to fine gravel, few silty fines, moist (9.7) | 4.5+ | | | |
| 782.9 | 10 | | | | | | | | | |
| 781.9 | 11 | | | | CL | Gray lean CLAY; mostly clayey fines, few coarse to fine gravel, moist with occasional silt lenses (13.0) | 4.0 | | | |
| 780.9 | 12 | S-5 | 1.5 | 8-15-11 N=26 | | Grades with occasional sand lenses at 11.0' | | | | |
| 779.9 | 13 | | | | | | | | | |
| 778.9 | 14 | S-6 | 0.7 | 4-3-2 N=5 | SP-SC | Gray poorly graded SAND with clay and gravel; mostly fine sand, little coarse to fine gravel, few clayey fines, moist (15.5) | | | | |
| 777.9 | 15 | | | | | Grades wet at 15.5' | | | | |
| 776.9 | 16 | | | | | | | | | |
| 775.9 | 17 | S-7 | 1.5 | 9-15-24 N=39 | SC | Gray clayey SAND; mostly fine sand, some clayey fines, trace coarse to fine gravel, wet (18.0) | | | | S-7: LBW=40.6% |
| 774.9 | 18 | | | | | | | | | |
| 773.9 | 19 | S-8 | 1.5 | 13-24-28 N=52 | SP-SC | Gray poorly graded SAND with clay; mostly fine sand, few fine gravel, few clayey fines, wet (20.5) | 4.5+ | | | |
| 772.9 | 20 | | | | | | | | | |
| 771.9 | 21 | | | | CL | Gray lean CLAY with sand; mostly clayey fines, little coarse to fine sand, few coarse to fine gravel, moist | | | | Charged augers with water at 20.0' |
| 770.9 | 22 | S-9 | 1.5 | 23-25-33 N=58 | | | 4.5+ | | | |
| 769.9 | 23 | | | | | | | | | |
| 768.9 | 24 | S-10 | 1.5 | 33-50-31 N=81 | | | 4.5+ | | | |
| 767.9 | 25 | | | | | | | | | |
| 766.9 | 26 | | | | | | | | | |
| 765.9 | 27 | S-11 | 1.5 | 12-36-40 N=76 | | | 4.5+ | | | |
| 764.9 | 28 | | | | | | | | | |
| 763.9 | 29 | S-12 | 1.5 | 15-31-35 N=66 | | | 4.5+ | | | |
| 762.9 | 30 | | | | | (30.0) | | | | |
| | | | | | | End of Boring | | | | VOC content correlated from combustible gas detector. Detection below threshold except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

Materials Testing Consultants
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# TEMPORARY MONITORING WELL INSTALLATION RECORD

Project Name: Ann Arbor High Level Trunkline Sewer Improvements | Project No.: 241691
MW No.: 102 | Location: | Installation Date: 10/25/24
Client: OHM Advisors | Crew Chief/Inspector: KE / BG




| | | | | | |
|---|---|---|---|---|---|
| Stainless Steel | | Type | 316 or 314 | |
| Casing type SCH 40 PVC | X | | Casing Dia. | 2" |
| (Riser Type) SCH 80 PVC | | | No. 5 ft Lengths Used | 1 |
| Galvanized | | | No. 10 ft Lengths Used | 2 |
| Black Steel | | | Other Lengths | |

| | | | | |
|---|---|---|---|---|
| | Stainless Steel | | Well Screen Length | 10' |
| Screen Type | SCH 40 PVC | X | Well Screen Dia. | 2" |
| | SCH 80 PVC | | No. 5 ft Lengths Used | |
| | Galvanized | | No. 10 ft Lengths Used | 1 |
| | Black Steel | | Other Lengths | |

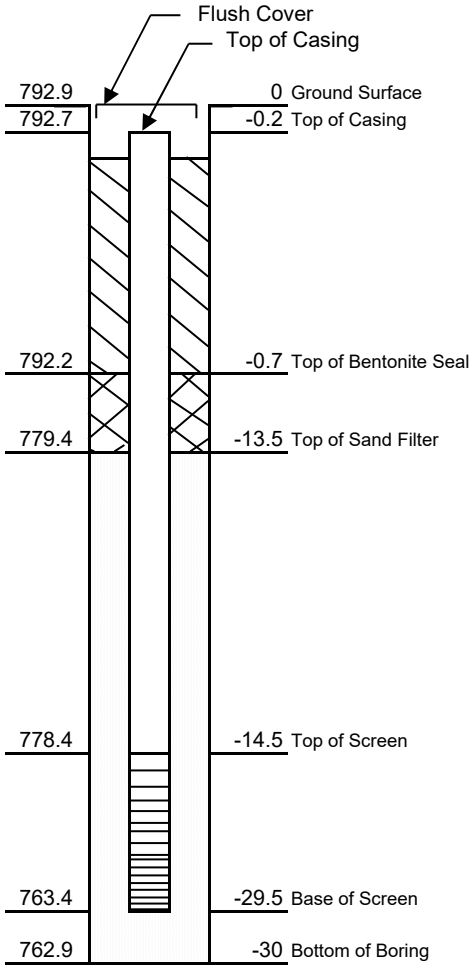
| Date | Water Level | Elevation |
|---|---|---|
| 10/25/2024 | 21 | 796.3 |
| 12/5/2024 | 21.5 | 795.8 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Remarks: Pulled auger and verified borehole cave-in from 50 ft to 35 ft.

Materials Testing Consultants
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# TEMPORARY MONITORING WELL INSTALLATION RECORD

Project Name: Ann Arbor High Level Trunkline Sewer Improvements
Project No.: 241691
MW No.: 103 Location:
Installation Date: 12/03/24
Client: OHM Advisors
Crew Chief/Inspector: KE / JV



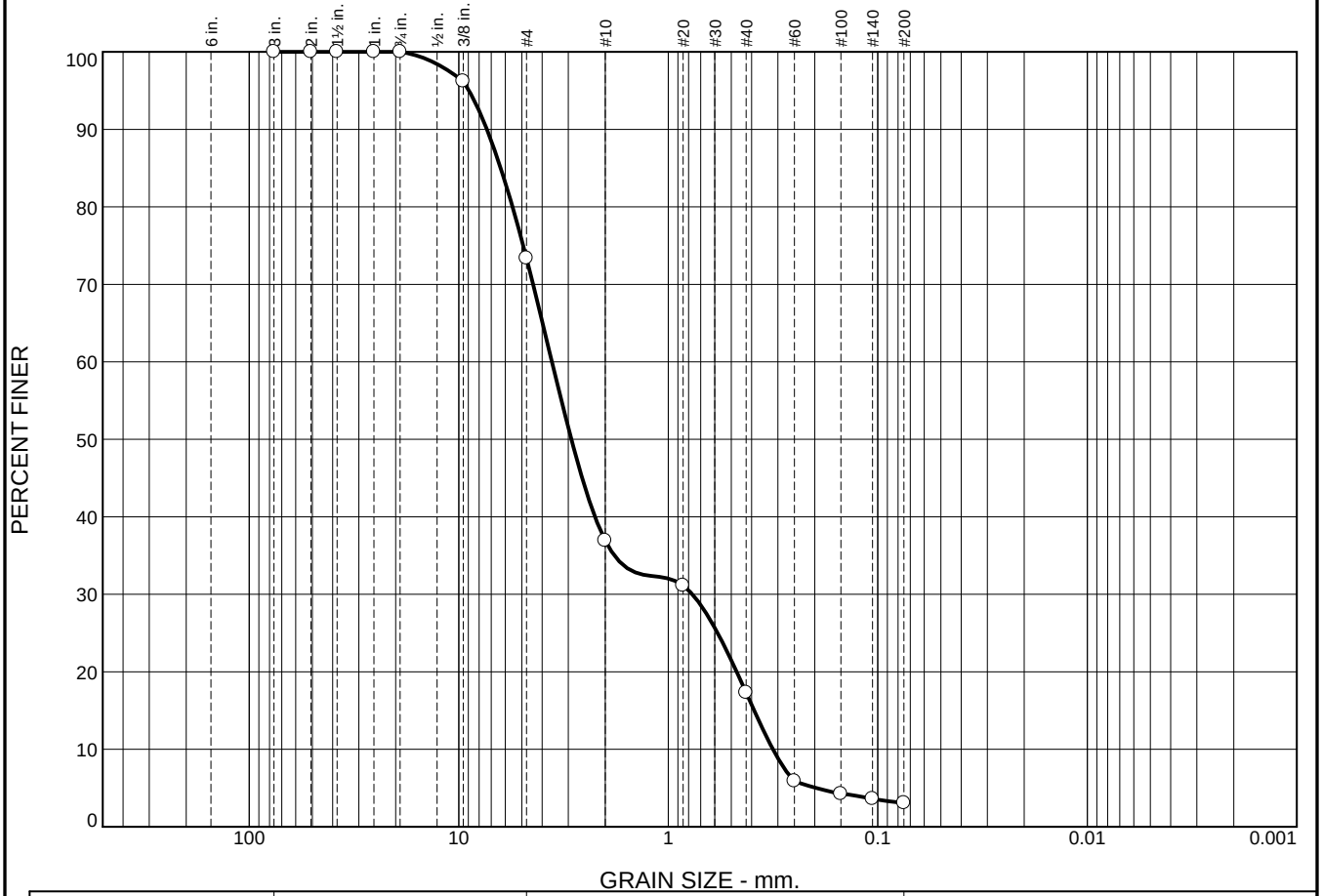

| | | | |
|---|---|---|---|
| Stainless Steel | | Type | 316 or 314 |
| Casing type SCH 40 PVC | X | | Casing Dia. 2" |
| (Riser Type) SCH 80 PVC | | | No. 5 ft Lengths Used 1 |
| Galvanized | | | No. 10 ft Lengths Used 1 |
| Black Steel | | | Other Lengths |

| | | | | |
|---|---|---|---|---|
| | Stainless Steel | | Well Screen Length | 15' |
| Screen Type | SCH 40 PVC | X | Well Screen Dia. | 2" |
| | SCH 80 PVC | | No. 5 ft Lengths Used | 1 |
| | Galvanized | | No. 10 ft Lengths Used | 1 |
| | Black Steel | | Other Lengths | |

| Date | Water Level | Elevation |
|---|---|---|
| 12/2/2024 | 15.5 | 777.4 |
| 12/5/2024 | 12.4 | 780.5 |

Remarks:

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 26.6 | 36.5 | 19.6 | 14.2 | 3.1 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 6.3084 | 3.5921 | 2.9019 | 0.7671 | 0.3889 | 0.3166 | 0.52 | 11.34 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Gravel | SP | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-101 **Sample Number:** S-5

**Date:** ○ 12/06/2024

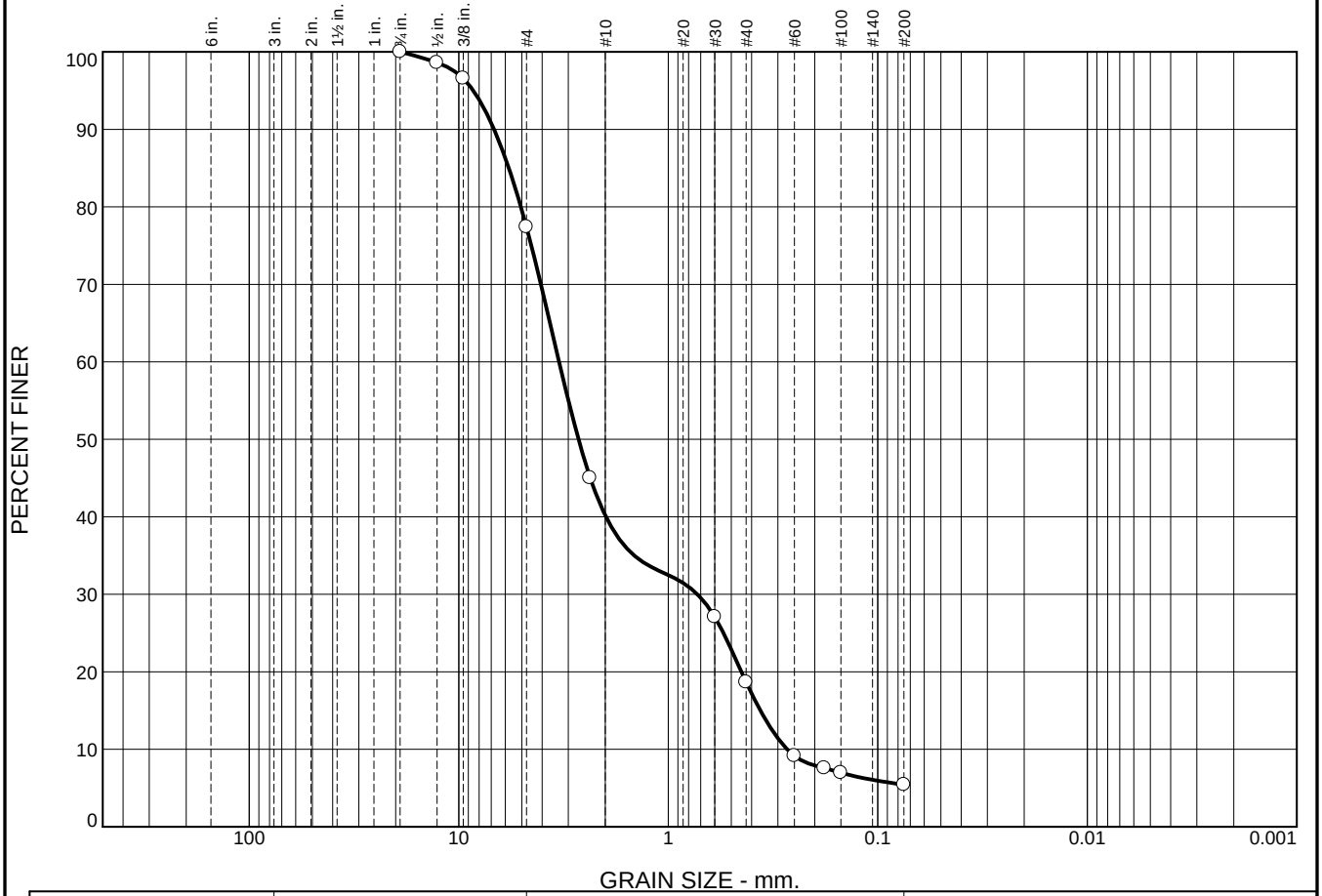
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 22.6 | 37.2 | 21.5 | 13.3 | 5.4 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 5.7684 | 3.3205 | 2.6824 | 0.7261 | 0.3632 | 0.2709 | 0.59 | 12.26 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Gravel | SP | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** B-101 **Sample Number:** S-6

**Date:** ○ 11/22/2024

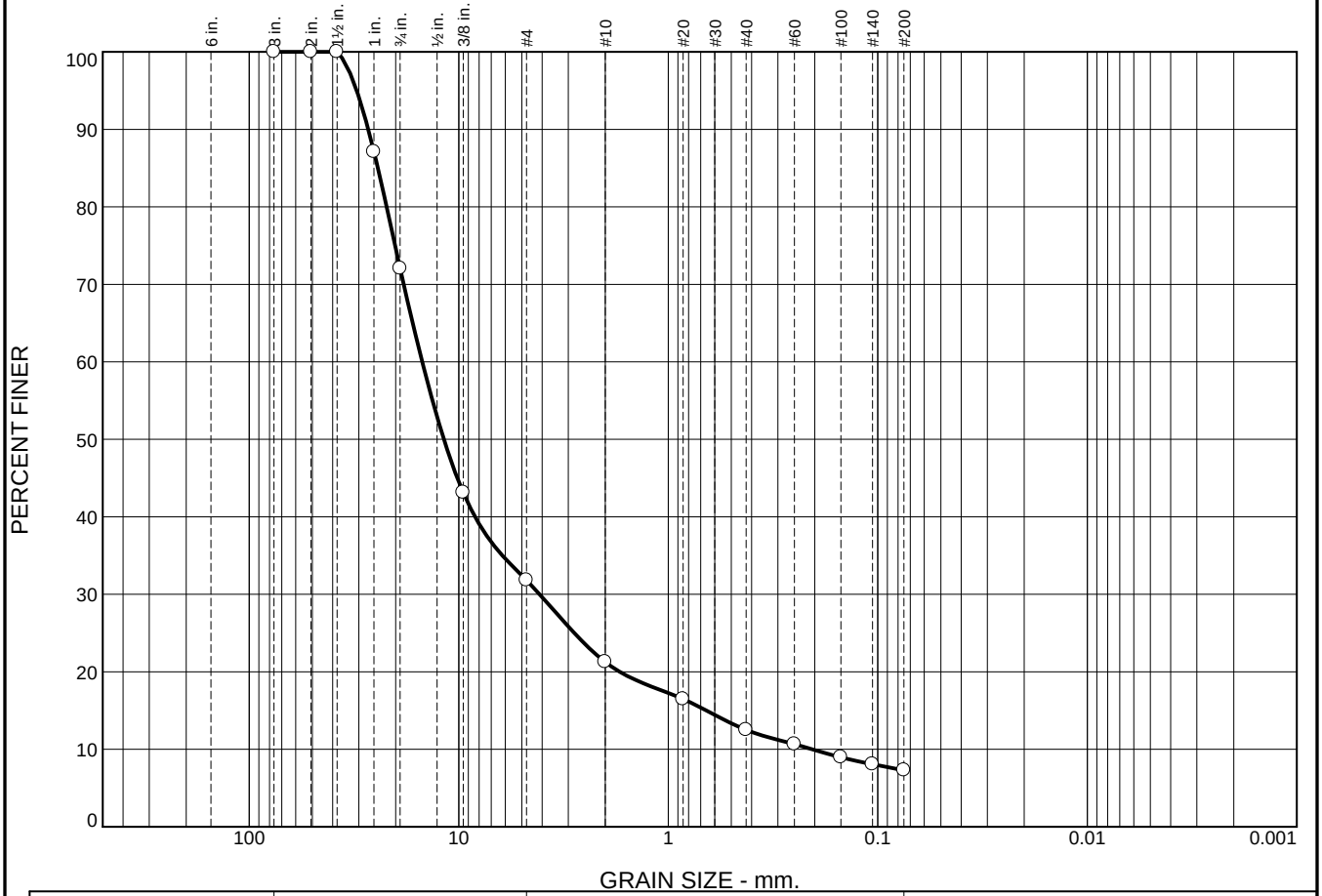
**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Remarks:**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 27.9 | 40.3 | 10.5 | 8.8 | 5.2 | 7.3 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 24.3285 | 14.9455 | 11.7718 | 4.1130 | 0.6576 | 0.2052 | 5.52 | 72.82 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Gravel with Silt | GP-GM | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-102 **Sample Number:** S-10

**Date:** ○ 12/17/2024

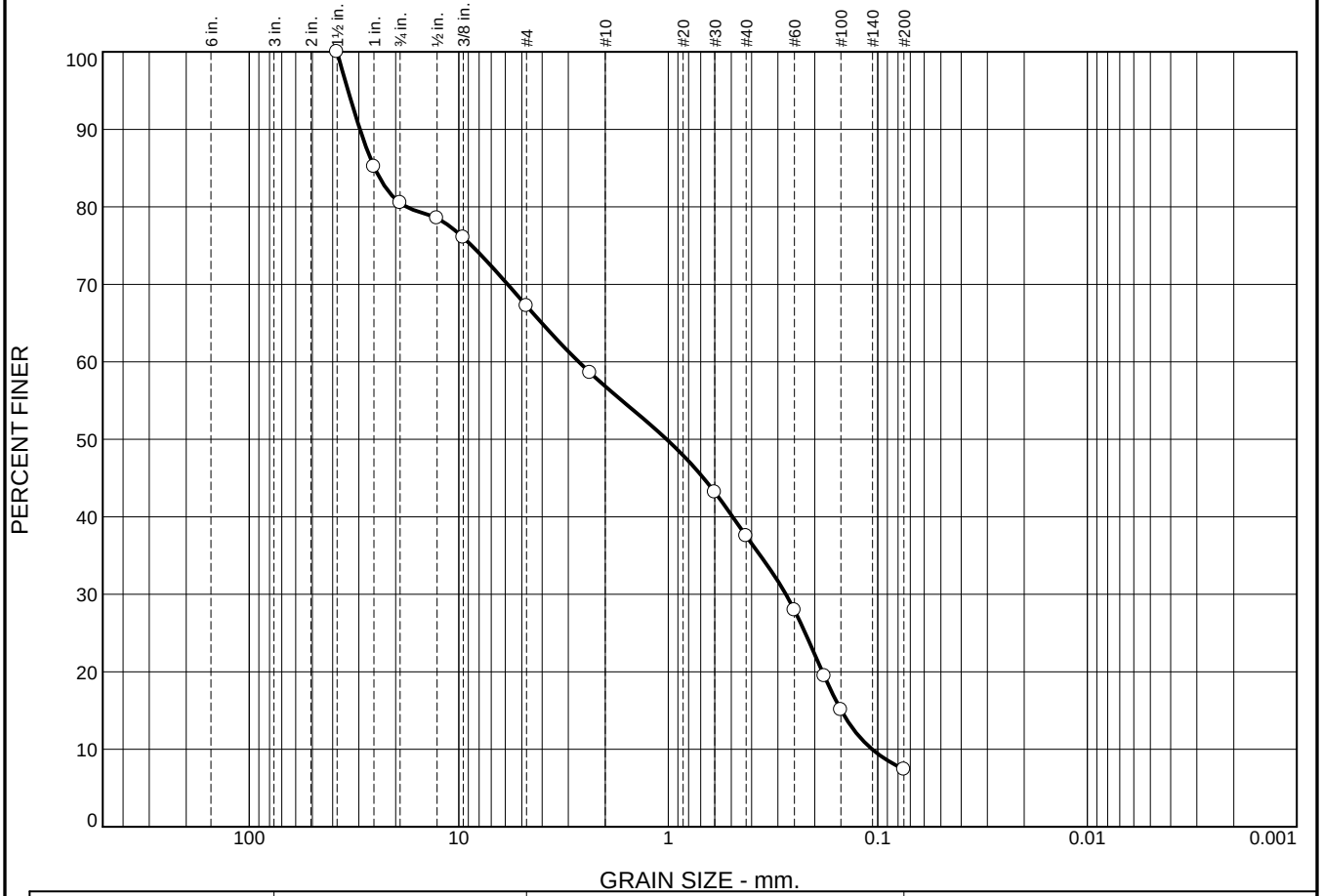
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 19.5 | 13.3 | 10.4 | 19.3 | 30.1 | 7.4 | |
| | | | | | | | | |
| | | | | | | | | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 25.2138 | 2.6765 | 1.0179 | 0.2747 | 0.1494 | 0.1064 | 0.26 | 25.15 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Silt and Gravel | SP-SM | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** B-102 **Sample Number:** S-12

**Date:** ○ 11/22/2024

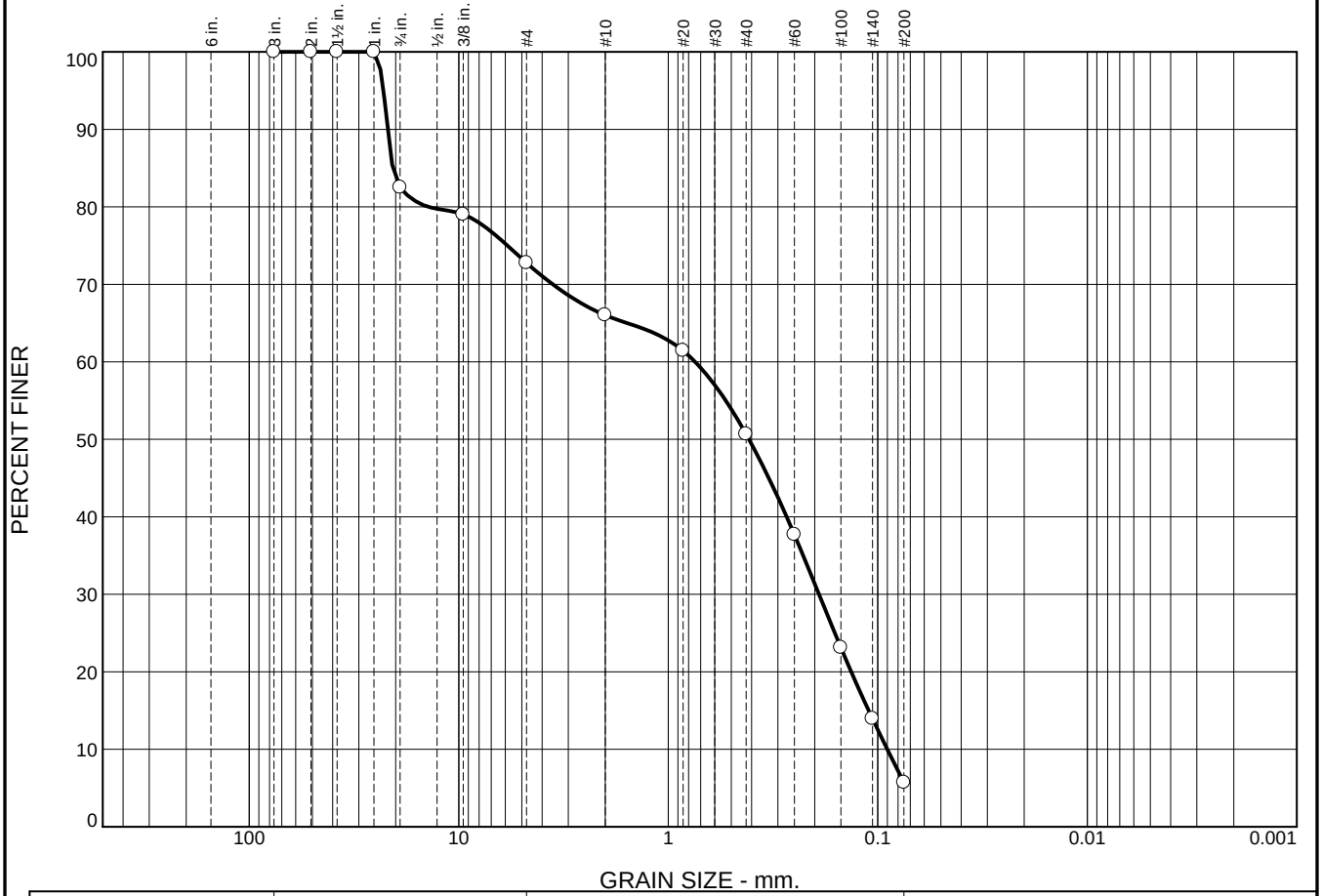
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 17.5 | 9.7 | 6.8 | 15.3 | 45.0 | 5.7 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 20.6533 | 0.7442 | 0.4120 | 0.1908 | 0.1105 | 0.0901 | 0.54 | 8.26 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Clay and Gravel | SP-SC | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-103 **Sample Number:** S-6

**Date:** ○ 12/17/2024

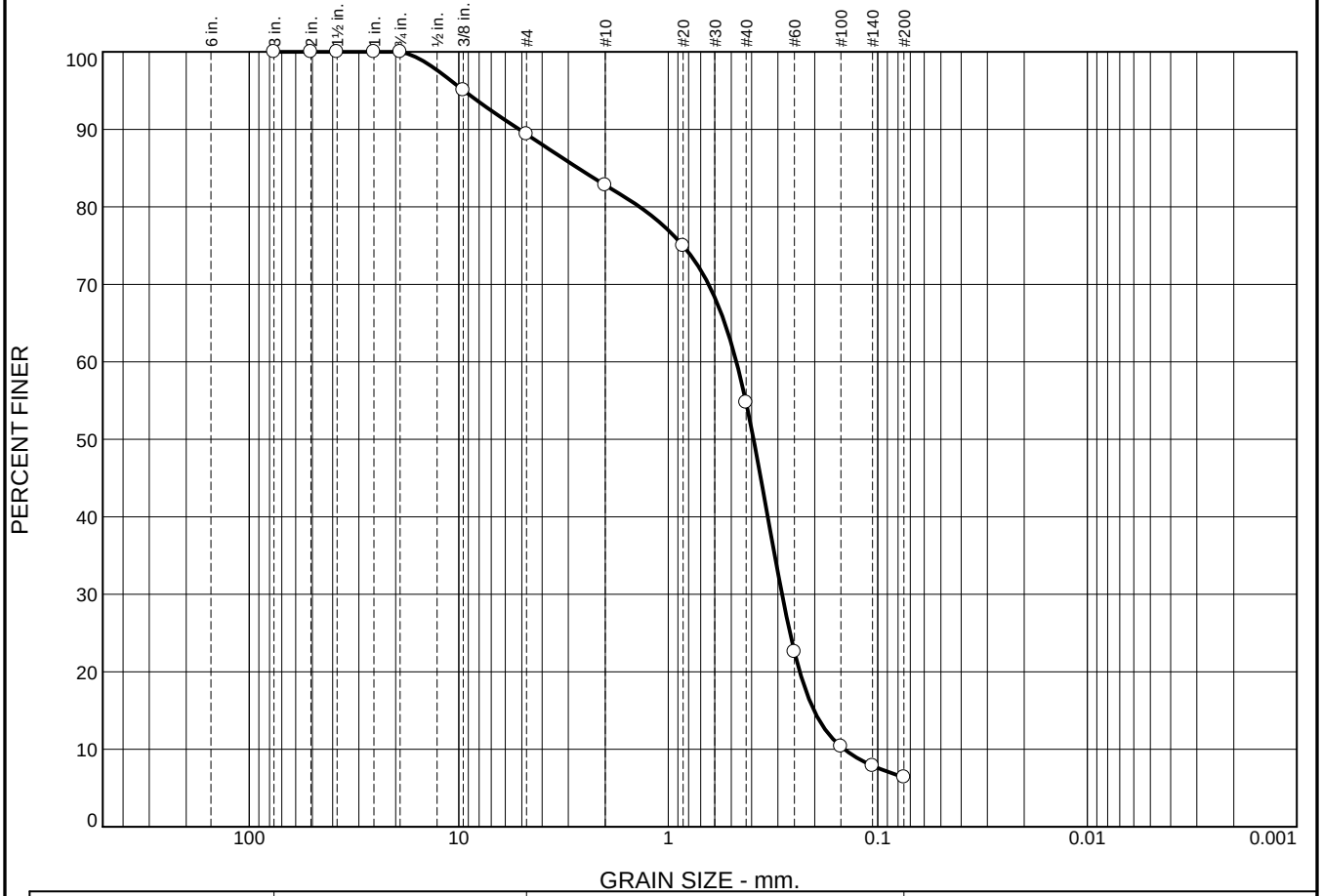
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 10.6 | 6.6 | 28.0 | 48.4 | 6.4 | |
| | | | | | | | | |
| | | | | | | | | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 2.6927 | 0.4729 | 0.3914 | 0.2866 | 0.2014 | 0.1442 | 1.20 | 3.28 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Clay | SP-SC | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-103 **Sample Number:** S-8

**Date:** ○ 12/17/2024

**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

Brighton Analytical L.L.C. TM

2105 Pless Drive Brighton, Michigan 48114 Phone (810)229-7575 Fax (810)229-8650 E-mail labs@brightonanalytical.com

July 08, 2025

Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

Subject: Ann Arbor Sewer Trunk - Water Sampling
241691

Dear : Mr. Rousseau

Thank you for making Brighton Analytical, L.L.C. your laboratory of choice. Attached are the results for the samples submitted on 07/02/2025 for the above mentioned project. NELAP/TNI Accredited Analysis and EGLE Drinking Water Certified Analysis will be identified in their respective reporting formats. Hard copies can be supplied at your request for a fee of $20.00 per copy. Quality Control summaries can also be provided upon request.

The invoice for this project will be emailed separately. If you have any questions concerning the data or invoice, please don't hesitate to contact our office. We welcome your comments and suggestions to improve our quality systems. Please reference Brighton Analytical, L.L.C. Project ID 108307 when calling or emailing. We thank you for this opportunity to partner with you on this project and hope to work with you again in the future.

Sincerely,
Brighton Analytical, L.L.C.

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 07/02/2025
Submit Date: 07/02/2025
Report Date: 07/08/2025

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **108307**
BA Sample ID: **CY01138**
Project Name: **Ann Arbor Sewer Trunk - Water Sampling**
Project Number: **241691**
Sample ID: **SB-103**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **1,4-Dioxane(SIM)** | | | | | | |
| 1,4-Dioxane (SIM) | **Not detected** | ug/L | 1 | EPA 1624(SIM) | BY | 07/07/2025 |

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

**No duplication of this report is allowed, except in its entirety.**

Released by 

Date 7/8/2025

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 07/02/2025
Submit Date: 07/02/2025
Report Date: 07/08/2025

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **108307**
BA Sample ID: **CY01139**
Project Name: **Ann Arbor Sewer Trunk - Water Sampling**
Project Number: **241691**
Sample ID: **SB-102**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **1,4-Dioxane(SIM)** | | | | | | |
| 1,4-Dioxane (SIM) | **Not detected** | ug/L | 1 | EPA 1624(SIM) | BY | 07/07/2025 |

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

**No duplication of this report is allowed, except in its entirety.**

Released by 

Date 7/8/2025

# Brighton Analytical, L.L.C™

2105 Pless Drive
Brighton, MI 48114
Phone: 810-229-7575 Fax: 810-229-8650
email:bai-brighton@sbcglobal.net

BA PROJECT #: 108307

**ABBREVIATIONS FOR SAMPLE MATRIX**

S = Solid
L = Liquid
DW = Drinking H,0
WW = Wastewater
O = Oil
P = Wipe
A = Air (Tedlar Bag)
F = Filter
T = Tube
GW = Groundwater
SW = Surface Water
M - Misc.

**Analysis Requested/Method**

| | |
|---|---|
| COMPANY NAME | Materials testing Consultants |
| PROJECT NAME (48 SPACES MAXIMUM) | Ann Arbor Sewer trunk - water sampling |
| PROJECT NUMBER (25 SPACES MAXIMUM) | 241691 |
| Sample collected by | Mitchell Eagle |

If RUSH approved by: _____

REQUESTED TURNAROUND: (X BOX WITH TAT NEEDED)
Default TAT Standard: 7 - 10 Business days
RUSH: 1 Business day (verify with lab) @3x Surcharge
RUSH: 2 Business days @2x Surcharge (Non TCLP)
RUSH: 3 Business days @1.5x Surcharge (TCLP @ 2X)

- [X] STD
- [ ] 1 DAY
- [ ] 2 DAY
- [ ] 3 DAY

**Container Type & Quantity**

| Brighton ID # | Sample Description (35 Characters Limit) | Sampling Date | Sampling Time | VOA'S (PRES) Y N | HDPE UNPRESERVED | HDPE $HNO_3$ | HDPE $H_2SO_4$ | HDPE NAOH | AMBER GLASS (UNPRESERVED) | AMBER GLASS (PRESERVED) | GLASS, NO PRESERVATIVE | STERILIZED BACTERIA | METALS FILTERED: (F)ield OR (L)ab | MEOH Preserved: (F)ield or (L)ab Preserved | Sample Matrix | 1,4 Dioxane |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1) 1138 | SB-103 | 7/2/25 | 10:40 | 2 | | | | | | | | | | | GW | X |
| 2) 1139 | SB-102 | 7/2/25 | 12:20 | 2 | | | | | | | | | | | GW | X |
| 3) | | | | | | | | | | | | | | | | |
| 4) | | | | | | | | | | | | | | | | |
| 5) | | | | | | | | | | | | | | | | |
| 6) | | | | | | | | | | | | | | | | |
| 7) | | | | | | | | | | | | | | | | |
| 8) | | | | | | | | | | | | | | | | |
| 9) | | | | | | | | | | | | | | | | |
| 10) | | | | | | | | | | | | | | | | |

**Special Instructions:**

PAGE: ___ OF ___

**COMPANY INFO:**

693 Plymouth Ave
NE Grand Rapids
MI 49505

Attn: Guy Rousseau
PHONE:
SEND:
EMAIL: GRousseau@mtc-test.com

**For Laboratory Use Only:**

Sample received within holding time? yes ☒ no ☐
Temperature of samples °C: ICE
pH verified in login? yes ☐ no ☒
Headspace/bubbles in VOA'S? yes ☐ no ☒ n/a ☐
Sample containers and COC match? yes ☒ no ☐

P.O. NUMBER:

BILLING ADDRESS (IF REQUIRED)

**For Laboratory Use Only: Field pH/Temp/Time/Initials**

**Drinking Water Only:**

Send to LCHD? yes ☐ no ☐
Chlorinated Water Supply? yes ☐ no ☐

MCL Failure yes ☐ no ☐
Client Notified (date/time/initials): _____

***Please fill out the Chain of Custody completely and review. Incorrect or incomplete information will result in a "hold" on all analyses. All hold samples = $10.***

| Trans. # | RELINQUISHED BY: | RECEIVED BY: | DATE: | TIME: | Trans. # | RELINQUISHED BY: | RECEIVED BY: | DATE/TIME: |
|---|---|---|---|---|---|---|---|---|
| 1 | | | 7/2/25 | 2:40 | 3 | | | |
| 2 | | | | | 4 | | | |

Brighton Analytical L.L.C.

# METHODS REGULATED BY NELAC AND OR STATE OF MICHIGAN

EPA 120.1-1982
EPA 150.1-1982
EPA 160.2-1979
EPA 160.3-1979
EPA 1631E-2002
EPA 200.7-1994
EPA 200.8 REV 5.4-1994
EPA 245.1-1994
EPA 245.2-1974
EPA 300.0R2.1-1993
EPA 310.1-1978
EPA 335.1-1974
EPA 335.4-1993
EPA 350.1 REV.2-1993
EPA 351.2 REV.2-1993
EPA 365.2-1971
EPA 405.1-1974
EPA 410.4 REV.2-1993
EPA 415.1-1974
EPA 420.1-1978
EPA 524.4-2013
EPA 608.3-2016
EPA 615-1993
EPA 624-1984
EPA 624.1-2016
EPA 625-1984
EPA 625.1-2016
SM 2540C-1997
SM 2540D-1997
SM 4500 H+B-1996
SM 4500 PE-1997
SM 5210B-1997
SM 5310B-1996
SM 9223B-1997
SW846 6010B-1996
SW846 6020A-2007
SW846 7471-1994
SW846 8081B-2007
SW846 8082A-2000
SW846 8151A-1996
SW846 8260C-2006
SW846 8270D-2007
SW846 9040B-1994

**Appendix F** Report of Geotechnical Investigation (RGI) prepared by G2 Consulting Group for the Fairfield Inn & Suites project

CONSULTING GROUP

Report of Geotechnical Investigation

# Proposed Fairfield Inn & Suites
# 300-308 W. Huron Street and 111 N. First Street
# Ann Arbor, Washtenaw County, Michigan
# 48103

Latitude 42.28172˚ N
Longitude 83.75113˚ W

Prepared for:

Hawkeye Hotels
2706 James Street
Coralville, Iowa 52241

G2 Project No. 193679
March 2, 2020

g2consultinggroup.com

| | | | | |
|---|---|---|---|---|
| **Headquarters** | 1866 Woodslee St | Troy, MI 48083 | P 248.680.0400 | F 248.680.9745 |
| **Ann Arbor** | 1350 Eisenhower Pl | Ann Arbor, MI 48108 | P 734.390.9330 | F 734.390.9331 |
| **Chicagoland** | 1186 Heather Dr | Lake Zurich, IL 60047 | P 847.353.8740 | F 847.353.8742 |

CONSULTING GROUP

March 2, 2020

Mr. Samir Patel
Sr. Manager, Development
Hawkeye Hotels
2706 James Street
Coralville, Iowa 52241

RE: Report of Geotechnical Investigation
Proposed Fairfield Inn & Suites
300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan 48103
G2 Project No. 193679

Dear Mr. Patel:

We have completed the geotechnical investigation for the proposed Fairfield Inn & Suites to be constructed at the aforementioned address. This report presents the results of our observations and analyses and our recommendations for earthwork operations, foundation design, and construction considerations as they relate to the geotechnical conditions on site.

We appreciate the opportunity to be of service to Hawkeye Hotels and look forward to discussing the recommendations presented. In the meantime, if you have any questions regarding the report or any other matter pertaining to this project, please call us.

Sincerely,

**G2 Consulting Group, LLC**

Jeffrey D. Crow, P.E.
Project Engineer

Jason B. Stoops, P.E.
Associate / Project Manager

JDC/JBS/jbs

## EXECUTIVE SUMMARY

The proposed project will include the construction of a new slab-on-grade structure with a finish floor elevation (FFE) within 1 to 2 feet of existing grade. Three (3) existing structures and a shed are present within the footprint of the proposed structure and will be demolished along with the associated pavements to allow construction of the new development. We understand an underground stormwater management structure will be constructed in conjunction with this project and situated toward the northwest portion of the site.

Soil borings could not be performed within the southwest portion of the proposed structure footprint due to site access conflicts. A supplemental investigation is recommended after site demolition occurs to verify the depth of suitable native bearing soils in this area. Similarly, soil borings could not be performed within the interior of the existing buildings. We recommend an experienced engineer or soils technician be on site during foundation demolition to confirm the soils within the footprint of the existing buildings are consistent with the borings that were performed.

Approximately 4 inches of clayey sand topsoil are present at the ground surface of boring B-1. Approximately 4 to 5 inches of Portland cement concrete underlain by 7 to 8 inches of aggregate base are present at the ground surface of borings B-2 through B-4. However, no aggregate base is present below the concrete at B-3. Granular fill soils, consisting of very loose to loose clayey sand, silty sand and gravelly sand with construction debris and trace organic matter underlie the topsoil and pavements at borings B-1 through B-4, and extend to depths ranging between 3 to 3-1/2 feet below the ground surface. Native granular soils, consisting of silty sand, sand, gravelly sand, gravel and sand, and sandy gravel, underlie the fill soils within B-1 through B-4 and extend to depths ranging between 23 to 28 feet. The native granular soils within the upper 6 feet of borings B-1, B-3 and B-4 are very loose to medium compact. The deeper granular soils, including below a depth of 3-1/2 feet within boring B-2, are medium compact to very compact in relative density. In general, alternating strata of very stiff to hard silty clay and loose to very compact clayey sand, silt and silty sand underlie the native granular soils and extend to the explored depths.

The existing fill soils are not suitable for reuse as engineered fill due to the presence of organic matter and construction debris. In general, we anticipate the underlying native granular soils will be suitable for reuse as engineered fill. The vibratory setting on any vibratory rollers should be turned off within 25 feet of any existing structures when performing proof-compacting evaluations or placing engineered fill over native soils.

We recommend the proposed structure be supported on conventional spread and continuous footing foundations extending through the existing fill and native very loose to loose granular soils to bear within the underlying native medium compact to very compact granular soils. Foundations in the vicinity of borings B-1, B-3 and B-4 would need to extend to an approximate depth of 6 feet below existing grade (approximately Elevations 805 to 808 feet) to reach the recommended bearing soils. Foundations bearing on the native medium compact to very compact granular soils, as recommended, may be designed based on a net allowable soil bearing pressure of 8,000 psf. Alternatively, if the existing fill soils and native very loose to loose granular soils are undercut from within the zone of foundation influence and replaced with engineered fill, a net allowable bearing pressure of 4,000 psf may be used in design of foundations bearing on engineered fill in these areas.

The existing fill soils are marginally suitable for support of floor slabs. Provided some floor slab settlement is acceptable, the existing fill soils may be left in place for support of floor slabs. However, if floor slab settlement cannot be tolerated, the existing fill needs to be completely removed and replaced with engineered fill.

Do not consider this summary separate from the entire text of this report, with all the conclusions and qualifications mentioned herein. Details of our analyses and recommendations are discussed in the following sections and in the Appendix of this report.

## PROJECT DESCRIPTION

The proposed project will include the construction of a new slab-on-grade structure with a finish floor elevation (FFE) within 1 to 2 feet of existing grade. We understand maximum foundation loads for this structure will be 600 kips at columns and 5 kips per linear foot (klf) along walls. Three (3) existing commercial or residential structures and a shed are present within the footprint of the proposed structure and will be demolished along with the associated pavements to allow construction of the new development. We understand an underground stormwater management structure site will be constructed in conjunction with this project and situated toward the northwest portion of the site.

## SCOPE OF SERVICES

The field operations, laboratory testing, and engineering report preparation were performed under the direction and supervision of a licensed professional engineer. Our services were performed according to generally accepted standards and procedures in the practice of geotechnical engineering. Our scope of services for this project is as follows:

1. We drilled a total of four (4) soil borings within the property. Soil borings B-1 through B-4 were performed within the footprint of the proposed structure and extended to depths between 45 and 70 feet each.
2. We performed laboratory testing on representative samples obtained from the soil borings. Laboratory testing included visual engineering classification, natural moisture content, grain-size distribution, dry density, and unconfined compressive strength determinations.
3. We prepared this engineering report. This report includes recommendations regarding the soil bearing capacity, estimated settlement, suitability for stormwater infiltration, and construction considerations related to the proposed development.

## FIELD OPERATIONS

Nederveld, in conjunction with G2 Consulting Group, LLC, selected the number, depth, and location of the soil borings. The soil boring locations were determined in the field by use of GPS assisted mobile technology prior to drilling operations. The approximate soil boring locations are shown on the Soil Boring Location Plan, Plate No. 1. Elevations at the soil boring locations were estimated from information presented within the topographic and boundary survey dated December 3, 2019.

The soil borings were drilled using a truck-mounted rotary drilling rig. Continuous flight 3-1/4 inch inside diameter, hollow-stem augers were used to advance the 45-foot boreholes (B-1 and B-2) to the explored depths. Continuous flight, 4-inch diameter, solid-stem augers were used to advance the 70-foot boreholes (B-3 and B-4) to a depth of 35 feet at which time steel casing was installed and the remainder of the soil borings were drilled using wash-rotary drilling methods. In each soil boring, soil samples were obtained at intervals of 2-1/2 feet within the upper 10 feet and at 5-foot intervals thereafter. The samples were obtained by the Standard Penetration Test method ASTM D 1586, which involves driving a 2-inch diameter split-spoon sampler into the soil with a 140-pound weight falling 30 inches. The sampler is driven three successive 6-inch increments with the number of blows for each increment recorded. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). Blow counts for each 6-inch increment and the resulting N-value are presented on the individual soil boring logs.

Soil samples were placed in sealed containers in the field and brought to the laboratory for testing and classification. During drilling operations, the drilling crew maintained logs of encountered subsurface conditions, including changes in stratigraphy and observed groundwater levels of the soil borings to be used in conjunction with our analysis of the subsurface conditions. The final boring logs are based on the field logs and laboratory soil classification and test results. Upon completion of drilling operations, the boreholes were backfilled with auger cuttings (B-1 and B-2) or cementitious grout (B-3 and B-4) and topped with asphaltic cold patch (B-2 through B-4).

## LABORATORY TESTING

Representative soil samples were subjected to laboratory testing to determine soil parameters pertinent to foundation design, soil permeability, and site preparation. An experienced geotechnical engineer classified the soils in general conformance with the Unified Soil Classification System. Laboratory testing included determinations in accordance with the following standards:

- ASTM D2216 – Natural Moisture Content
- ASTM D422 – Sieve Analysis (No Hydrometer)
- ASTM D2166 – Unconfined Compressive Strength of Cohesive Soils

Additional unconfined compressive strengths were determined using a spring-loaded hand penetrometer. The hand penetrometer estimates the unconfined compressive strength to a maximum of 4-1/2 tons per square foot (tsf) by measuring the resistance of the soil sample to the penetration of a calibrated spring-loaded cylinder.

The results of the laboratory tests are indicated on the soil boring logs, Figure Nos. 1 through 4, at the depths the samples were obtained. The results of the sieve analyses are presented graphically on Figure No. 5. The ASTM D2166 unconfined compressive strength results are also presented graphically on Figure No. 6. We will hold the soil samples for 60 days from the date of this report, after which time they will be discarded. If you would like the samples, please let us know.

## SITE DESCRIPTION

The development is located along the north side of W. Huron Street just west of N. First Street in Ann Arbor, Michigan. Three (3) existing commercial or residential structures and a shed are present within the footprint of the proposed structure. The existing structures will be demolished along with the associated pavements and utilities to allow construction of the new development. Based on the aforementioned topographical survey, site grades within the footprint of the proposed structure gently slope downward to the west with approximate elevations ranging from 802 to 814 feet. Beyond the development limits, the surrounding properties are residential in nature.

## SITE SEISMIC COEFFICIENT AND LIQUEFACTION POTENTIAL

Washtenaw County in Michigan lies in the Central Stable Tectonic Region of the country, characterized by a relatively low expected magnitude of ground accelerations in the event of an earthquake event. The upper soils to a depth of 6 feet consist of very loose to loose granular soils. The native granular soils below a depth of 6 feet generally become medium compact to very compact to the explored depth. Alternating strata of very stiff to hard silty clay are also present below a depth of 23 feet. Groundwater was encountered at depths ranging between 20 and 24 feet below the ground surface, corresponding to approximate elevations between 787.5 feet and 790 feet.

Based on the 2015 International Building Code, our familiarity with soil conditions in the area, and our engineering judgement, structures may be designed for seismic loading conditions on the basis of the following seismic coefficients and classifications.

- Site Class D – Stiff Soil Profile
- Maximum Considered Earthquake Spectral Response Acceleration
  - at short periods (Ss) = 0.094g
  - at one second period ($S_1$) = 0.048g
- Maximum Considered Earthquake Spectral Response Acceleration (adjusted for site class)
  - at short periods ($S_{MS}$) = 0.113g
  - at one second period ($S_{M1}$) = 0.081g
- Five Percent Damped Design Spectral Response Acceleration
  - at short periods ($S_{DS}$) = 0.075g
  - at one second period ($S_{D1}$) = 0.054g

The development of shear strains tending to cause liquefaction of soils is governed by the character of the ground motion (i.e. acceleration and frequency), soil type, groundwater level, and in-situ stress conditions. Granular soils below the water table are more likely to liquefy than granular soils above the water table. In the event of an earthquake episode producing accelerations of up to 0.113g, there is a low potential for localized liquefaction to occur within the granular soils above the water table beneath the site. Given that the site is also in an area with a low probability for seismic activity, we believe the risk of liquefaction occurring at this site is very low.

## SUBSURFACE CONDITIONS

Approximately 4 inches of clayey sand topsoil are present at the ground surface of boring B-1. Approximately 4 to 5 inches of Portland cement concrete underlain by 7 to 8 inches of aggregate base are present at the ground surface of borings B-2 through B-4. However, no aggregate base is present below the concrete at B-3. Granular fill soils, consisting of clayey sand, silty sand and gravelly sand with construction debris and trace organic matter, underlie the topsoil and pavements at borings B-1 through B-4, and extend to depths ranging between 3 to 3-1/2 feet below the ground surface. Native granular soils, consisting of silty sand, sand, gravelly sand, gravel and sand, and sandy gravel, underlie the fill soils within B-1 through B-4 and extend to depths ranging between 23 to 28 feet. In general, alternating strata of silty clay, clayey sand, silt and silty sand underlie the native granular soils and extend to the explored depths.

The granular fill is very loose to loose in relative density with Standard Penetration Test (SPT) N-values ranging from 4 to 5 blows per foot (bpf) and approximate organic matter contents ranging from 2 to 6 percent.

The native granular soils within the upper 6 feet of borings B-1, B-3 and B-4 are very loose to medium compact with SPT N-values ranging between 4 and 12 bpf. The deeper granular soils, including below a depth of 3-1/2 feet within boring B-2, become medium compact to very compact with SPT N-values between 13 bpf and 50 blows per 3 inches of penetration. However, the native silt within B-4 between the depths of 28 and 32 feet is loose with a SPT N-value of 9 bpf. The native silty clay is very stiff to hard in consistency with natural moisture contents ranging from 20 to 26 percent, dry densities ranging from 105 to 118 pounds per cubic foot, and unconfined compressive strengths ranging from 4,500 to 9,000 pounds per square foot (psf).

Groundwater was observed within borings B-1 through B-4 at depths ranging between 20 and 24 feet below the ground surface, corresponding to approximate elevations between 787.5 feet and 790 feet. Upon completion of drilling operations of borings B-1 and B-2, the boreholes caved-in after auger removal at depths ranging between 21-1/2 and 23 feet. Wash-rotary drilling operations were used to advance borings B-3 and B-4 beyond a depth of 35 feet to the explored depths. Direct groundwater observations could not be made upon completion of drilling operations at these locations due to the use of drilling fluid. Fluctuations in perched and long-term groundwater levels should be anticipated due to seasonal variations and following periods of prolonged precipitation.

The Soil Boring Location Plan, Plate No. 1, Soil Boring Logs, Figure Nos. 1 through 4, grain-size distribution, Figure No. 5, and Unconfined Compressive Strength Test Results, Figure No. 6, and are presented in the Appendix. The soil profiles described above are generalized descriptions of the conditions encountered at the boring locations. General Notes Terminology defining the nomenclature used on the boring logs and elsewhere in this report is presented on Figure No. 7.

## EARTHWORK

### Site and Subgrade Preparation

Soil borings could not be performed within the southwest portion of the proposed structure footprint due to site access conflicts. A supplemental investigation is recommended after demolition of the

existing structures to verify the depth of suitable native bearing soils in this area. We recommend one (1) additional soil boring extending to a depth of 30 feet below grade. Similarly, soil borings could not be performed within the interior of the existing buildings. We recommend an experienced engineer or soils technician be on site during foundation demolition to confirm the soils within the footprint of the existing buildings are consistent with the borings that were performed.

Earthwork operations are expected to consist of demolition of the existing buildings and associated foundations, removing any existing pavement, debris, vegetation, and associated root structures within the location of the proposed structure and pavement areas, removing and backfilling any existing utilities or existing basements in the proposed structure footprint and elsewhere as required, grading the site, subgrade preparation for support of floor slabs and pavements, and excavating, forming, and backfilling of foundations and utilities. We recommend all earthwork operations be performed in accordance with comprehensive specifications and be properly monitored in the field by qualified geotechnical engineers and technicians.

At the start of earthwork operations, any site concrete, topsoil, vegetation, and associated root structures within the footprint of the proposed structure footprint must be completely removed. Any existing utilities and associated backfill located within the structure zone of influence should be completely removed and backfilled with engineered fill. Where utilities lie outside the proposed structure zone of influence, utilities to be abandoned can be backfilled with grout and left in place. The zone of foundation influence may be defined as the prism of soil beneath the building foundation and below a 1H:2V inclined plane extending downward and laterally beyond the foundation edges.

The exposed granular soils should be thoroughly proof-compacted with a heavy vibratory roller and visually evaluated for instability and/or unsuitable soil conditions. We recommend a minimum of 10 roller passes in two perpendicular directions be performed during proof rolling operations. The vibratory setting should be turned off within 25 feet of any existing structures. Any unstable areas noted should be improved by additional compaction or removed and replaced with engineered fill.

**Engineered Fill Soils and Placement**

We recommend static-rolling any engineered fill (vibratory setting turned off) and shallower lift thicknesses be utilized when backfilling within 25 feet of any existing structures. Frozen material should not be used as fill, nor should fill be placed on a frozen subgrade.

The existing fill soils are not suitable for reuse as engineered fill due to the presence of organic matter and construction debris. This material may be used in landscape areas or within berms in landscape areas. In general, we anticipate the underlying native granular soils will be suitable for reuse as engineered fill.

Engineered fill placed within the site should consist of an approved, environmentally clean material. Engineered fill should be free of organic matter, frozen soil, clods, or other harmful substances. The fill should be placed in uniform horizontal layers, not more than 9 inches in loose thickness. The engineered fill should be compacted to achieve a density of at least 95 percent of the maximum dry density, as determined by the Modified Proctor compaction test (ASTM D 1557).

Any imported or on-site granular engineered fill used within the site may be compacted within 2 percent above or below optimum moisture content. We recommend using granular engineered fill within confined areas such as utility trenches and adjacent to foundation walls and catch basins. Granular engineered fill is generally more easily compacted than cohesive soils within these confined areas. Additionally, the proper placement and compaction of backfill within these areas is imperative to provide adequate support for overlying floor slabs.

## TEMPORARY SLOPE AND EARTH RETENTION RECOMMENDATIONS

Where excavations extend deeper than 5 feet and sufficient space is available, we recommend maximum slopes of 2H:1V within the very loose to loose granular soils and 1-1/2H:1V within the medium compact to very compact granular soils. All excavations should be safely sheeted, shored, sloped, or braced in accordance with MIOSHA requirements. If material is stored or equipment is operated near an excavation, lower angle slopes or stronger shoring must be used to resist the extra pressure due to the superimposed loads.

In consideration of the proximity of the adjacent structures and utilities, we anticipate temporary earth retention systems may be required to facilitate the excavation of any underground structures such as indoor pool, elevator pit, or stormwater management structures. Provided some lateral ground movement may be tolerated, temporary earth retention may consist of steel sheet pile or soldier pile and lagging. We anticipate the noise and vibrations induced from driving steel sheet pile will likely not be acceptable. If soldier pile and lagging is used, we anticipate the vibrations induced from pile driving will likely not be acceptable for existing foundations; therefore, we recommending pre-drilling each soldier pile. The pre-drilled hole should be backfilled with grout at or below the adjacent building foundations. We recommend a barrier, such as geotextile fabric, should be placed between the granular engineered fill and the lagging to minimize particle migration.

The earth retention structures, if required, should be designed by a qualified licensed professional engineer in consideration of the presented site and soil conditions and construction sequence. G2 would be pleased to provide a proposal to perform this work, if requested.

## BELOW GRADE WALL RECOMMENDATIONS

Below-grade walls, where required, should be designed to withstand lateral earth pressures due to backfilled soils. Below-grade walls considered to be fixed at the top should be designed on the basis of at-rest lateral earth pressures corresponding to an equivalent fluid pressure of 55 pounds per square foot per foot of depth for drained backfill soil conditions. Free-standing walls, allowed to move at their top, may be designed using an active earth pressure of 35 pounds per square foot per foot of depth for drained backfill conditions.

We recommend below grade walls be backfilled with free-draining granular soils. Lateral earth pressures are significantly influenced by the type and intensity of backfill compaction. We recommend only relatively small compaction equipment be used to compact backfill placed against below grade walls.

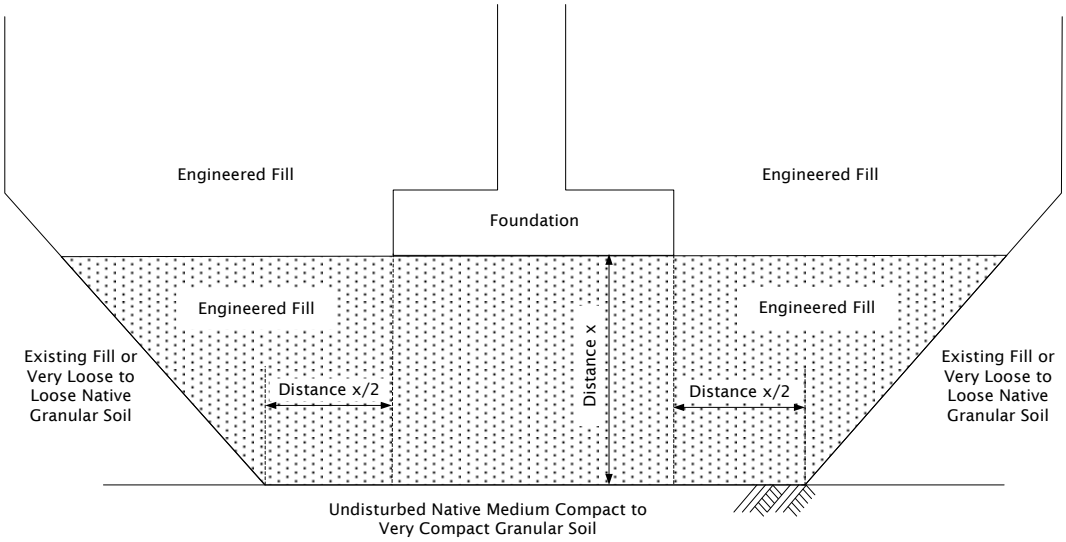
We recommend a perimeter drain system be placed at the foundation level along both sides of the foundations (interior and exterior). The perforated or slotted drain pipe should be protected with coarse aggregate, such as MDOT 6A limestone. The drain pipe and aggregate should be wrapped with a non-woven filter fabric to prevent the migration of surrounding soil fines into the aggregate and drain pipe. The drainage system should outlet to a sump system below the structure elevation. We recommend the sump system have a battery back-up in case of power failure to prevent the risk of groundwater intrusion or damage to structure due to hydrostatic pressure.

## FOUNDATION RECOMMENDATIONS

As noted previously, soil borings could not be performed within the southwest portion of the proposed structure footprint due to site access conflicts. The capacities presented below assume the soil conditions in this area are similar to the soil conditions observed in borings B-1 through B-4.

To provide uniformly proper support of foundations, we recommend the proposed structure be supported on conventional spread and continuous footing foundations extending through the existing fill and native very loose to loose granular soils to bear within the underlying native medium compact to

very compact granular soils. Foundations in the vicinity of borings B-1, B-3 and B-4 are would need to extend to an approximate depth of 6 feet below existing grade (Ele. 805 to 808 feet) to reach the recommended bearing soils. Foundations bearing on the native medium compact to very compact granular soils, as recommended, may be designed based on a net allowable soil bearing pressure of 8,000 psf. Alternatively, if the existing fill soils and native very loose to loose granular soils are undercut from within the zone of foundation influence and replaced with engineered fill, a net allowable bearing pressure of 4,000 psf may be used in design of foundations bearing on engineered fill in these areas. This option is illustrated below:




Exterior footings should bear at a minimum depth of 3-1/2 feet below finished grade for protection against frost heave. Interior foundations can bear at shallower depths provided engineered fill is present and foundations are protected from frost during construction. However, we anticipate most strip and spread footings will bear deeper than 3-1/2 feet below finished grades due to the presence of fill soils observed at shallower depths. We recommend a G2 engineer be on site during construction to observe the excavations, measure the bearing depths, and verify the adequacy of the native bearing soils.

Continuous wall or strip footing foundations should be at least 18 inches in width and isolated spread footing foundations should be at least 36 inches in their least dimension. To achieve a change in the level of a strip footing, the foundation should be gradually stepped at a grade no steeper than two units horizontal to one unit vertical (2H:1V).

Any foundations installed immediately adjacent to an existing building should bear at the same elevations as the adjacent building foundations. In no case should excavations extend below the foundation level of adjacent buildings unless underpinning or temporary earth support is planned. If required to construct foundations at different levels, the foundations should be designed and constructed so the least lateral distance between the foundations is equivalent to or more than the difference in their bearing levels. If native material is not encountered at the base of the existing foundations, G2 should be notified to review our recommendations. A qualified field technician should be on site during construction to observe the excavations, measure the bearing depths, and verify the adequacy of the bearing soils.

If the recommendations outlined in this report are adhered to, total and differential settlements for the completed structure should be within 1 inch and 1/2 inch, respectively. We expect settlements of these magnitudes are within tolerable limits for the type of structure proposed. We recommend all foundations be suitable reinforced to minimize the effects of differential settlements associated with local variations in subsoil conditions.

## FLOOR SLAB RECOMMENDATIONS

The fill soils present within the footprint of the proposed addition contain trace amounts of organic matter and appear not to have been placed in an engineered manner. Provided some floor slab settlement is acceptable, the existing fill soils may be left in place for support of floor slabs following satisfactory completion of the proof compaction operations as described within the Earthwork section of this report. However, if floor slab settlement cannot be tolerated, the existing fill must be completely removed and replaced with engineered fill. A subgrade modulus (k) of up to 90 pounds per cubic inch (pci) may be used in the design of floor slabs supported on the existing fill soils. A subgrade modulus (k) of up to 150 pounds per cubic inch (pci) may be used in the design of floor slabs supported on engineered fill.

We recommend that at least 4 inches of pea gravel or clean coarse gravel be placed between the subgrade and the bottom of the floor slab for use as a capillary break to reduce moisture transmission through the concrete floors and to reduce the potential for concrete curling. If moisture sensitive floor coverings are planned, or if greater protection against vapor transmission is desired, a vapor barrier, consisting of at least 10-mil plastic sheeting, may be placed over the capillary break layer beneath floor slabs. We recommend all concrete floor slabs be suitably reinforced and separated from the foundation system to allow for independent movement.

## INFILTRATION RECOMMENDATIONS

We understand that the proposed development will include a stormwater management area such as underground structures for stormwater detention. Information regarding the size and location of the stormwater management area was not available at the time of this report; however, we understand the structure will be situated toward the northwest portion of the site (near the vicinity of boring B-3). We anticipate the stormwater management structure will have an approximate invert elevation of 5 feet below existing grade. The native granular soils at the anticipated location and depth for the underground structure are generally suitable for stormwater infiltration.

For estimation purposes, it may be assumed that the native gravel and sand and sandy gravel encountered below a depth of 3-1/2 feet within borings B-2 through B-4 will have an approximate hydraulic conductivity of $9x10^{-4}$ cm/s, corresponding to 1.25 in/hr. The clayey sand encountered between 3 and 6 feet within B-1 was observed to have an appreciable number of fines; therefore, the estimated hydraulic conductivity should be limited to $2.5x10^{-5}$ cm/s in this area, corresponding to less than 0.1 in/hr. We recommend that these values be confirmed with in-situ infiltration tests once site demolition has occurred.

## CONSTRUCTION CONSIDERATIONS

We anticipate that caving and/or sloughing of the granular soils will occur and as such, the contractor should be prepared to over excavate and form foundations, as necessary, within the existing granular fill, native granular soils, or engineered fill. The sides of the spread and/or strip footing foundations should be constructed straight and vertical to reduce the risk of frozen soil adhering to the concrete and raising the foundations. If the foundations are trenched within the upper fill soils, we recommend excavations and concrete placement be performed the same day.

In general, we do not anticipate significant accumulations of groundwater within construction excavations at the depths anticipated for this project. We anticipate any surface run off should be controllable with normal pumping from properly constructed sumps.

## GENERAL COMMENTS

We have formulated the evaluations and recommendations presented in this report relative to site preparation and foundations on the basis of data provided to us relating to the project location, type of structure, and surface grade for the proposed site. If changes occur in the design, location, or concept

of the project, conclusions and recommendations contained in this report are not valid unless G2 Consulting Group, LLC reviews the changes. G2 Consulting Group, LLC will then confirm the recommendations presented herein or make changes in writing.

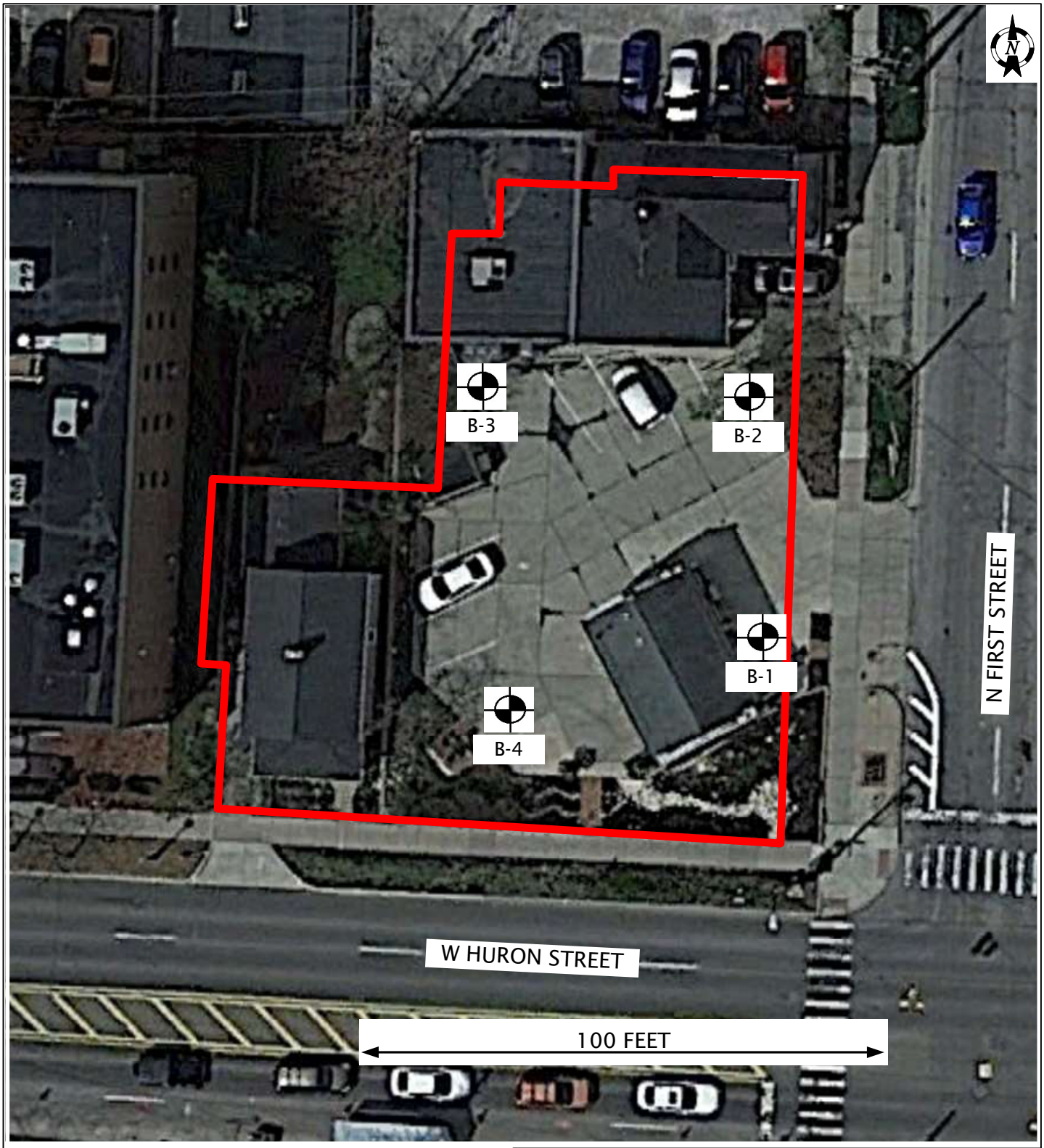
The scope of the present investigation was limited to evaluation of subsurface conditions for the support of proposed structure and other related aspects of the development. No chemical, environmental, or hydrogeological testing or analyses were included in the scope of this investigation.

We base the analyses and recommendations submitted in this report upon the data from the soil borings performed at the approximate locations shown on the Soil Boring Location Plan, Plate No. 1. This report does not reflect variations that may occur between the actual boring locations and the actual structure locations. The nature and extent of any such variations may not become clear until the time of construction.

If significant variations then become evident, it may be necessary for us to re-evaluate our report recommendations. We recommend a qualified geotechnical engineering firm observe all geotechnical related work, including subgrade preparation and engineered fill placement. The consulting firm will perform the appropriate testing to confirm the geotechnical conditions given in the report are found during construction.

## APPENDIX


| | |
|---|---|
| Soil Boring Location Plan | Plate No. 1 |
| Soil Boring Logs | Figure Nos. 1 through 4 |
| Grain-size Analysis | Figure No. 5 |
| Unconfined Compressive Strength Test Results | Figure No. 6 |
| General Notes Terminology | Figure No. 7 |




LEGEND

Soil borings performed by BRAX Drilling, LLC on February 6, 2020

Approximate Building Footprint

# Soil Boring Location Plan

Proposed Fairfield Inn & Suites
300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

2G CONSULTING GROUP

| | |
|---|---|
| Project No. 193679 | |
| Drawn by: JDC | |
| Date: 2-20-2020 | Plate No. 1 |
| Scale: NTS | |

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 193679

Latitude: 42.28172° Longitude: -83.75113°

# Soil Boring No. B-1

CONSULTING GROUP

## SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: 814.0 ft ±

| ELEV. (ft) | DEPTH (ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | 0.3 Topsoil: Dark Brown Clayey Sand (4 inches) | | | | | | |
| | Fill: Very Loose Dark Brown Clayey Sand with trace gravel and organic matter (Organic Matter Content = 2.4%) | S-1 | 4<br>2<br>2 | 4 | | | |
| | 3.0 | | | | | | |
| 809.0 | Medium Compact Brown Clayey Sand with trace gravel 5 | S-2 | 4<br>5<br>7 | 12 | | | |
| | 6.0 | S-3 | 10<br>17<br>20 | 37 | | | |
| 804.0 | 10 | S-4 | 13<br>24<br>29 | 53 | | | |
| | Compact to Very Compact Brown Sand with trace silt and gravel | | | | | | |
| 799.0 | 15 | S-5 | 31<br>50/4" | --- | | | |
| | 17.0 | | | | | | |
| 794.0 | 20 | S-6 | 14<br>18<br>20 | 38 | | | |
| | Compact Brown Sandy Gravel with trace silt | | | | | | |
| 789.0 | 25 | S-7 | 29<br>30<br>19 | 49 | | | |

Total Depth: 45 ft
Drilling Date: February 12, 2020
Inspector:
Contractor: BRAX Drilling
Driller: A. Rau

Drilling Method:
3-1/4 inch inside diameter hollow stem auger

Water Level Observation:
24 feet during operations
Wet at cave-in depth of 22 feet

Notes:
Borehole collapsed at 22 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 1a

SOIL / PAVEMENT BORING 193679.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 3/2/20

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 193679

Latitude: 42.28172° Longitude: -83.75113°

# Soil Boring No. B-1

CONSULTING GROUP

| SUBSURFACE PROFILE | | | | SOIL SAMPLE DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ELEV. ( ft) | PRO-FILE | GROUND SURFACE ELEVATION: 814.0 ft ± | DEPTH ( ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
| | | Compact Brown Sandy Gravel with trace silt *(continued)* | | | | | | | |
| | | 28.0 | | | | | | | |
| 784.0 | | | 30 | S-8 | 9<br>11<br>13 | 24 | 23.7 | | |
| | | Medium Compact Gray Silt with trace clay and sand | | | | | | | |
| 779.0 | | | 35 | S-9 | 8<br>11<br>14 | 25 | 24.8 | | |
| | | 38.0 | | | | | | | |
| 774.0 | | | 40 | S-10 | 8<br>12<br>15 | 27 | 25.1 | 105 | 8500* |
| | | Hard Gray Silty Clay with trace sand and gravel, occasional silt seams | | | | | | | |
| 769.0 | | 45.0 | 45 | S-11 | 10<br>14<br>17 | 31 | 21.9 | | 9000* |
| | | End of Boring @ 45 ft | | | | | | | |
| 764.0 | | | 50 | | | | | | |

Total Depth: 45 ft
Drilling Date: February 12, 2020
Inspector:
Contractor: BRAX Drilling
Driller: A. Rau

Drilling Method:
3-1/4 inch inside diameter hollow stem auger

Water Level Observation:
24 feet during operations
Wet at cave-in depth of 22 feet

Notes:
Borehole collapsed at 22 ft after auger removal
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Auger cuttings

Figure No. 1b

SOIL / PAVEMENT BORING 193679.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 3/2/20

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 193679

Latitude: 42.28184° Longitude: -83.75114°

# Soil Boring No. B-2

CONSULTING GROUP

## SUBSURFACE PROFILE

## SOIL SAMPLE DATA

| ELEV. (ft) | PRO-FILE | GROUND SURFACE ELEVATION: 813.0 ft ± | DEPTH (ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
|---|---|---|---|---|---|---|---|---|---|
| | | Portland Cement Concrete (5 inches) 0.4 | | | | | | | |
| | | Natural Aggregate Base: Brown Sand and Gravel with trace silt (7 inches) 1.0 | | | | | | | |
| | | Fill: Brown Silty Sand with trace clay, gravel, and bituminous concrete debris | | S-1 | 3<br>11<br>1 | 12 | | | |
| | | 3.5 | | | | | | | |
| 808.0 | | | 5 | S-2 | 3<br>25<br>17 | 42 | | | |
| | | | | S-3 | 18<br>15<br>19 | 34 | | | |
| 803.0 | | | 10 | S-4 | 38<br>38<br>31 | 69 | | | |
| | | Compact to Very Compact Brown Gravel and Sand with trace silt | | | | | | | |
| 798.0 | | | 15 | S-5 | 29<br>34<br>50 | 84 | | | |
| 793.0 | | ▽ | 20 | S-6 | 19<br>37<br>43 | 80 | | | |
| | | ▼ 23.0 | | | | | | | |
| | | Very Stiff Gray Sitly Clay with trace sand and gravel | | | | | | | |
| 788.0 | | | 25 | S-7 | 6<br>7<br>8 | 15 | 22.1 | 108 | 4500 |

Total Depth: 45 ft
Drilling Date: February 6, 2020
Inspector:
Contractor: BRAX Drilling
Driller: A. Rau

Drilling Method:
3-1/4 inch inside diameter hollow stem auger

Water Level Observation:
20 feet during operations
Wet at cave-in depth of 23 feet

Notes:
Borehole collapsed at 23 ft after auger removal

Excavation Backfilling Procedure:
Auger cuttings and capped with cold patch

Figure No. 2a

SOIL / PAVEMENT BORING 193679.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 3/2/20

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 193679

Latitude: 42.28184° Longitude: -83.75114°

# Soil Boring No. B-2

CONSULTING GROUP

| SUBSURFACE PROFILE | | | | SOIL SAMPLE DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ELEV. ( ft) | PRO-FILE | GROUND SURFACE ELEVATION: 813.0 ft ± | DEPTH ( ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
| | | Very Stiff Gray Sitly Clay with trace sand and gravel *(continued)* | | | | | | | |
| | | 28.0 | | | | | | | |
| 783.0 | | Medium Compact Gray Silt with trace clay and sand | 30 | S-8 | 7<br>9<br>12 | 21 | 21.9 | | |
| | | 33.0 | | | | | | | |
| 778.0 | | Medium Compact Gray Clayey Sand with trace silt and gravel | 35 | S-9 | 4<br>6<br>7 | 13 | 21.1 | | |
| 773.0 | | | 40 | S-10 | 4<br>8<br>11 | 19 | 21.9 | | |
| | | 43.0 | | | | | | | |
| 768.0 | | Very Compact Gray Silt with trace clay and sand | 45 | S-11 | 7<br>8<br>44 | 52 | 21.1 | | |
| | | 45.0 | | | | | | | |
| | | End of Boring @ 45 ft | | | | | | | |
| 763.0 | | | 50 | | | | | | |

Total Depth: 45 ft
Drilling Date: February 6, 2020
Inspector:
Contractor: BRAX Drilling
Driller: A. Rau

Drilling Method:
3-1/4 inch inside diameter hollow stem auger

Water Level Observation:
20 feet during operations
Wet at cave-in depth of 23 feet

Notes:
Borehole collapsed at 23 ft after auger removal

Excavation Backfilling Procedure:
Auger cuttings and capped with cold patch

Figure No. 2b

SOIL / PAVEMENT BORING 193679.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 3/2/20

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 193679

Latitude: 42.28185° Longitude: -83.75132°

# Soil Boring No. B-3

CONSULTING GROUP

## SUBSURFACE PROFILE

## SOIL SAMPLE DATA

| ELEV. ( ft) | PRO-FILE | GROUND SURFACE ELEVATION: 811.0 ft ± | DEPTH ( ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
|---|---|---|---|---|---|---|---|---|---|
| | | Portland Cement Concrete (4 inches) 0.3 | | | | | | | |
| | | Fill: Loose Dark Brown Clayey Sand with trace silt, gravel, and organic matter (Organic Matter Content = 5.8%) | | S-1 | 3<br>3<br>2 | 5 | | | |
| | | 3.5 | | | | | | | |
| 806.0 | | Very Loose Brown Silty Sand with trace gravel | 5 | S-2 | 3<br>2<br>2 | 4 | | | |
| | | 6.0 | | | | | | | |
| | | Medium Compact Brown Gravel and Sand with little clay | | S-3 | 13<br>13<br>16 | 29 | | | |
| | | 8.0 | | | | | | | |
| 801.0 | | | 10 | S-4 | 12<br>19<br>18 | 37 | | | |
| 796.0 | | Compact to Very Compact Brown Sandy Gravel with trace silt | 15 | S-5 | 12<br>17<br>20 | 37 | | | |
| 791.0 | | | 20 | S-6 | 20<br>25<br>33 | 58 | | | |
| | | 23.0 | | | | | | | |
| 786.0 | | Medium Compact Brown Sandy Gravel with trace silt | 25 | S-7 | 8<br>12<br>13 | 25 | | | |

Total Depth: 70 ft
Drilling Date: February 11, 2020
Inspector:
Contractor: BRAX Drilling
Driller: A. Rau

Drilling Method:
3-1/4 inch inside diameter hollow stem auger to 35 feet, 3-7/8 inch wash rotary thereafter

Water Level Observation:
23-1/2 feet during operations; not measuered upon completion due to drilling method

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Cement Grout and capped with cold patch

Figure No. 3a

SOIL / PAVEMENT BORING 193679.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 3/2/20

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 193679

Latitude: 42.28185° Longitude: -83.75132°

# Soil Boring No. B-3

CONSULTING GROUP

| SUBSURFACE PROFILE | | | | SOIL SAMPLE DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ELEV. ( ft) | PRO-FILE | GROUND SURFACE ELEVATION: 811.0 ft ± | DEPTH ( ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
| | | Medium Compact Brown Sandy Gravel with trace silt *(continued)* | | | | | | | |
| | | 28.0 | | | | | | | |
| 781.0 | | Very Stiff Gray Silty Clay with trace sand and gravel | 30 | S-8 | 6<br>10<br>14 | 24 | 20.4 | 109 | 7000* |
| | | 33.0 | | | | | | | |
| 776.0 | | | 35 | S-9 | 9<br>11<br>9 | 20 | 22.6 | | |
| 771.0 | | | 40 | S-10 | 8<br>11<br>14 | 25 | 22.9 | | |
| 766.0 | | Medium Compact to Compact Gray Silt with trace clay and sand | 45 | S-11 | 9<br>17<br>18 | 35 | 22.5 | | |
| 761.0 | | | 50 | S-12 | 10<br>15<br>21 | 36 | 23.5 | | |

Total Depth: 70 ft
Drilling Date: February 11, 2020
Inspector:
Contractor: BRAX Drilling
Driller: A. Rau

Drilling Method:
3-1/4 inch inside diameter hollow stem auger to 35 feet, 3-7/8 inch wash rotary thereafter

Water Level Observation:
23-1/2 feet during operations; not measured upon completion due to drilling method

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Cement Grout and capped with cold patch

Figure No. 3b

SOIL / PAVEMENT BORING 193679.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 3/2/20

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 193679

Latitude: 42.28185° Longitude: -83.75132°

# Soil Boring No. B-3

CONSULTING GROUP

| SUBSURFACE PROFILE | | | | SOIL SAMPLE DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ELEV. ( ft) | PRO-FILE | GROUND SURFACE ELEVATION: 811.0 ft ± | DEPTH ( ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
| 756.0 | | Medium Compact to Compact Gray Silt with trace clay and sand *(continued)* | 55 | S-13 | 9<br>16<br>19 | 35 | 20.3 | | |
| 751.0 | | 58.0<br>Hard Gray Silty Clay with trace sand and gravel | 60 | S-14 | 15<br>38<br>50/5" | --- | 20.6 | 118 | 9000* |
| 746.0 | | 63.0<br>Very Compact Gray Silt with trace clay and sand | 65 | S-15 | 17<br>34<br>39 | 73 | 45.6 | | |
| 741.0 | | 68.0<br>Hard Gray Silty Clay with trace sand and gravel<br>70.0 | 70 | S-16 | 18<br>27<br>31 | 58 | 23.5 | 117 | 9000* |
| 736.0 | | End of Boring @ 70 ft | 75 | | | | | | |

Total Depth: 70 ft
Drilling Date: February 11, 2020
Inspector:
Contractor: BRAX Drilling
Driller: A. Rau

Drilling Method:
3-1/4 inch inside diameter hollow stem auger to 35 feet, 3-7/8 inch wash rotary thereafter

Water Level Observation:
23-1/2 feet during operations; not measured upon completion due to drilling method

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Cement Grout and capped with cold patch

Figure No. 3c

SOIL / PAVEMENT BORING 193679.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 3/2/20

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 193679

Latitude: 42.28169° Longitude: -83.75130°

# Soil Boring No. B-4

G2 CONSULTING GROUP

## SUBSURFACE PROFILE

GROUND SURFACE ELEVATION: 812.0 ft ±

- 0.3: Portland Cement Concrete (4 inches)
- 1.0: Natural Aggregate Base: Brown Sand and Gravel with trace silt (8 inches)
- Fill: Brown Gravelly Sand with trace silt and bituminous concrete debris
- 3.5: Loose Brown Gravelly Sand with little clay
- 6.0: Medium Compact Brown Sandy Gravel with trace silt
- 8.0: Compact to Very Compact Brown Sandy Gravel with trace silt

## SOIL SAMPLE DATA

| ELEV. (ft) | DEPTH (ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
|---|---|---|---|---|---|---|---|
| | | S-1 | 8<br>30<br>26 | 56 | | | |
| 807.0 | 5 | S-2 | 5<br>4<br>4 | 8 | | | |
| | | S-3 | 8<br>11<br>17 | 28 | | | |
| 802.0 | 10 | S-4 | 9<br>16<br>21 | 37 | | | |
| 797.0 | 15 | S-5 | 19<br>31<br>43 | 74 | | | |
| 792.0 | 20 | S-6 | 31<br>51/5" | --- | | | |
| 787.0 | 25 | S-7 | 24<br>50/4" | --- | | | |

Total Depth: 70 ft
Drilling Date: February 10, 2020
Inspector:
Contractor: BRAX Drilling
Driller: A. Rau

Drilling Method:
3-1/4 inch inside diameter hollow stem auger to 35 feet, 3-7/8 inch wash rotary thereafter

Water Level Observation:
23-1/2 feet during operations; not measured upon completion due to drilling method

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Cement Grout and capped with cold patch

Figure No. 4a

SOIL / PAVEMENT BORING 193679.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 3/2/20

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 193679

Latitude: 42.28169° Longitude: -83.75130°

# Soil Boring No. B-4

G2 CONSULTING GROUP

| SUBSURFACE PROFILE | | | | SOIL SAMPLE DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ELEV. ( ft) | PRO-FILE | GROUND SURFACE ELEVATION: 812.0 ft ± | DEPTH ( ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
| | | Compact to Very Compact Brown Sandy Gravel with trace silt *(continued)* | | | | | | | |
| | | 28.0 | | | | | | | |
| 782.0 | | Loose Gray Silt with trace clay and sand | 30 | S-8 | 5<br>3<br>6 | 9 | 23.8 | | |
| | | 32.0 | | | | | | | |
| 777.0 | | Medium Compact Gray Silty Sand with trace clay and gravel | 35 | S-9 | 5<br>13<br>14 | 27 | 30.1 | | |
| | | 38.0 | | | | | | | |
| 772.0 | | | 40 | S-10 | 8<br>17<br>20 | 37 | 22.5 | | |
| 767.0 | | Compact Gray Silt with trace clay and sand | 45 | S-11 | 10<br>14<br>20 | 34 | 23.4 | | |
| | | 48.0 | | | | | | | |
| 762.0 | | Hard Gray Silty Clay with trace sand and gravel | 50 | S-12 | 10<br>12<br>17 | 29 | 22.1 | | 9000* |

Total Depth: 70 ft
Drilling Date: February 10, 2020
Inspector:
Contractor: BRAX Drilling
Driller: A. Rau

Drilling Method:
3-1/4 inch inside diameter hollow stem auger to 35 feet, 3-7/8 inch wash rotary thereafter

Water Level Observation:
23-1/2 feet during operations; not measured upon completion due to drilling method

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Cement Grout and capped with cold patch

Figure No. 4b

SOIL / PAVEMENT BORING 193679.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 3/2/20

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No. 193679

Latitude: 42.28169° Longitude: -83.75130°

# Soil Boring No. B-4

CONSULTING GROUP

| SUBSURFACE PROFILE | | | | SOIL SAMPLE DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ELEV. ( ft) | PRO-FILE | GROUND SURFACE ELEVATION: 812.0 ft ± | DEPTH ( ft) | SAMPLE TYPE-NO. | BLOWS/ 6-INCHES | STD. PEN. RESISTANCE (N) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | UNCONF. COMP. STR. (PSF) |
| | | Hard Gray Silty Clay with trace sand and gravel *(continued)* | | | | | | | |
| | | 53.0 | | | | | | | |
| 757.0 | | | 55 | S-13 | 12<br>14<br>22 | 36 | 22.3 | | |
| | | Compact to Very Compact Gray Silt with trace clay and sand | | | | | | | |
| 752.0 | | | 60 | S-14 | 90<br>50/3" | --- | 26.9 | | |
| | | 63.0 | | | | | | | |
| 747.0 | | | 65 | S-15 | 22<br>23<br>34 | 57 | 22.9 | 111 | 9000* |
| | | Hard Gray Silty Clay with trace sand and gravel | | | | | | | |
| 742.0 | | 70.0 | 70 | S-16 | 21<br>25<br>29 | 54 | 70.9 | 80 | 9000* |
| | | End of Boring @ 70 ft | | | | | | | |
| 737.0 | | | 75 | | | | | | |

Total Depth: 70 ft
Drilling Date: February 10, 2020
Inspector:
Contractor: BRAX Drilling
Driller: A. Rau

Drilling Method:
3-1/4 inch inside diameter hollow stem auger to 35 feet, 3-7/8 inch wash rotary thereafter

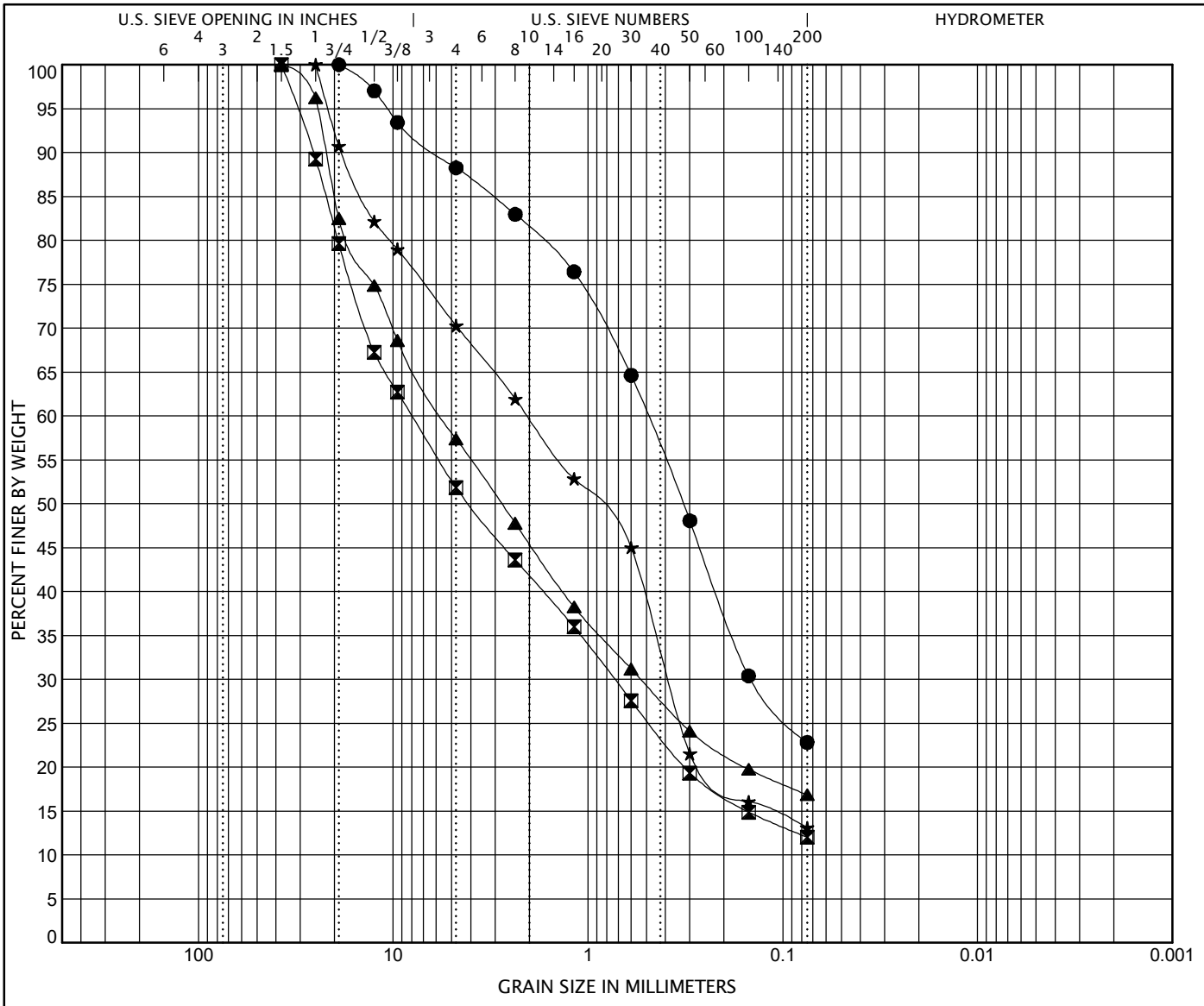
Water Level Observation:
23-1/2 feet during operations; not measured upon completion due to drilling method

Notes:
* Calibrated Hand Penetrometer

Excavation Backfilling Procedure:
Cement Grout and capped with cold patch

Figure No. 4c

SOIL / PAVEMENT BORING 193679.GPJ 20150116 G2 CONSULTING DATA TEMPLATE.GDT 3/2/20




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| Specimen ID | | | Description | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | B-1 | S-2 | Brown Clayey Sand with trace gravel | | | | | |
| ⊠ | B-2 | S-3 | Brown Gravel and Sand with trace silt | | | | 1.4 | 172.7 |
| ▲ | B-3 | S-3 | Brown Gravel and Sand with little clay | | | | | |
| ★ | B-4 | S-2 | Brown Gravelly Sand with little clay | | | | | |
| | | | | | | | | |

| Specimen ID | | | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | B-1 | S-2 | 19 | 0.495 | 0.145 | | 11.8 | 65.4 | 22.8 | |
| ⊠ | B-2 | S-3 | 37.5 | 8.009 | 0.73 | | 48.2 | 39.8 | 12.0 | |
| ▲ | B-3 | S-3 | 37.5 | 5.592 | 0.535 | | 42.6 | 40.5 | 16.9 | |
| ★ | B-4 | S-2 | 25 | 2.037 | 0.385 | | 29.7 | 57.2 | 13.1 | |
| | | | | | | | | | | |

CONSULTING GROUP

# GRAIN SIZE DISTRIBUTION

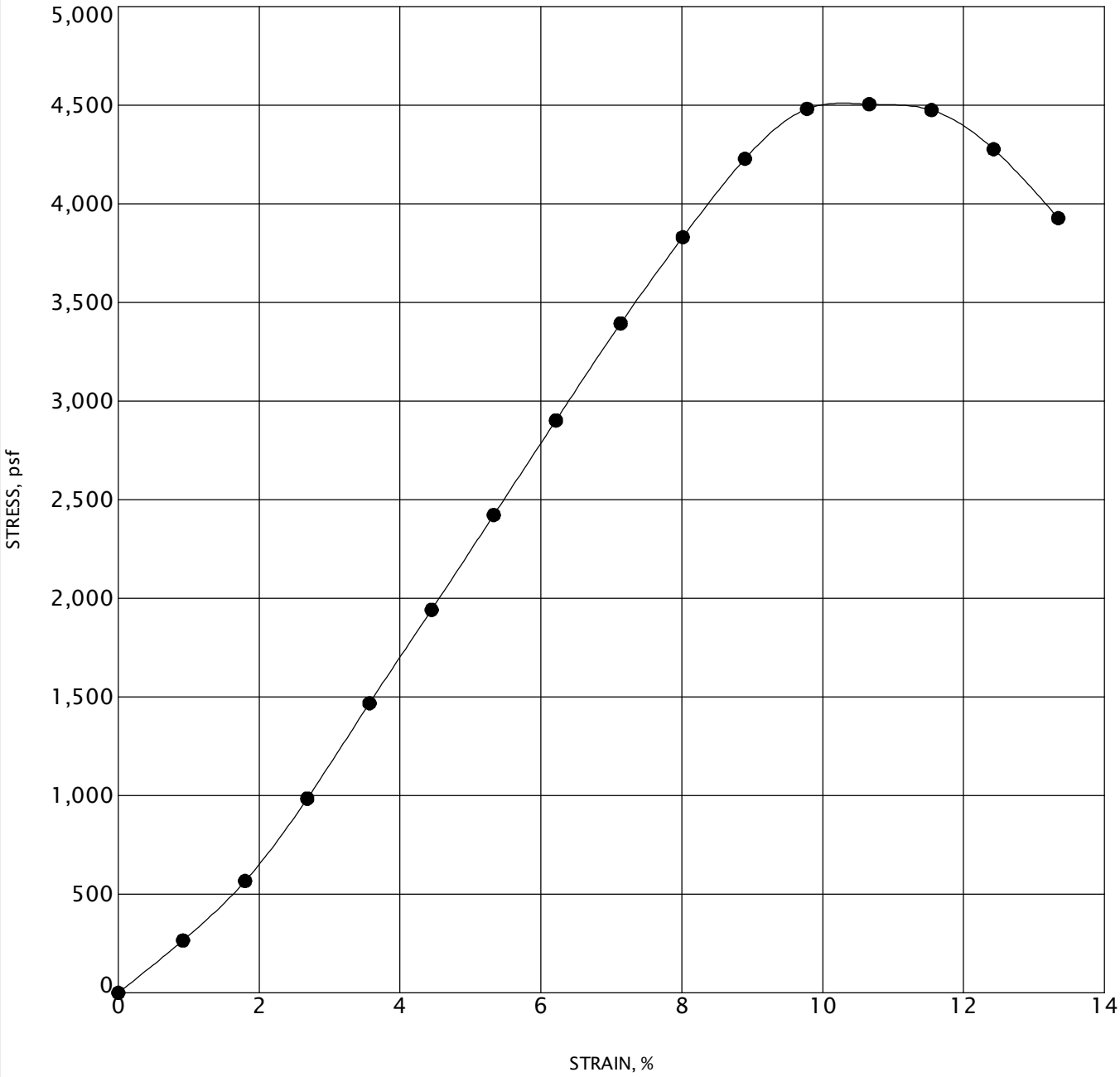
Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No.: 193679

Figure No. 5

US_GRAIN_SIZE 193679.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 2/26/20




| | Specimen | | Classification | MC% | $\gamma_d$ | UC |
|---|---|---|---|---|---|---|
| ● | B-2 | S-7 | Gray Silty Clay | 22 | 108 | 4500 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

CONSULTING GROUP

## UNCONFINED COMPRESSIVE STRENGTH TEST

Project Name: Proposed Fairfield Inn & Suites

Project Location: 300-308 W. Huron Street and 111 N. First Street
Ann Arbor, Washtenaw County, Michigan

G2 Project No.: 193679

Figure No. 6

US_UNCONFINED 193679.GPJ 20140820 G2 CONSULTING DATA TEMPLATE.GDT 2/26/20

# GENERAL NOTES TERMINOLOGY

Unless otherwise noted, all terms herein refer to the Standard Definitions presented in ASTM 653.

**PARTICLE SIZE**

| | | |
|---|---|---|
| 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 | | - 0.005mm to 0.074mm |
| Clay | | - Less than 0.005mm |

**CLASSIFICATION**

The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:

| Second Major Constituent (percent by weight) | Minor Constituent (percent by weight) |
|---|---|
| Trace - 1 to 12% | Trace - 1 to 12% |
| Adjective - 12 to 35% | Little - 12 to 23% |
| And - over 35% | Some - 23 to 33% |

**COHESIVE SOILS**

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier, i.e. sandy clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils, i.e. silty clay, trace sand, little gravel.

| Consistency | Unconfined Compressive Strength (psf) | Approximate Range of (N) |
|---|---|---|
| Very Soft | Below 500 | 0 - 2 |
| Soft | 500 - 1,000 | 3 - 4 |
| Medium | 1,000 - 2,000 | 5 - 8 |
| Stiff | 2,000 - 4,000 | 9 - 15 |
| Very Stiff | 4,000 - 8,000 | 16 - 30 |
| Hard | 8,000 - 16,000 | 31 - 50 |
| Very Hard | Over 16,000 | Over 50 |

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

**COHESIONLESS SOILS**

| Density Classification | Relative Density % | Approximate Range of (N) |
|---|---|---|
| Very Loose | 0 - 15 | 0 - 4 |
| Loose | 16 - 35 | 5 - 10 |
| Medium Compact | 36 - 65 | 11 - 30 |
| Compact | 66 - 85 | 31 - 50 |
| Very Compact | 86 - 100 | Over 50 |

Relative Density of cohesionless soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

**SAMPLE DESIGNATIONS**

AS - Auger Sample – Cuttings directly from auger flight
BS - Bottle or Bag Samples
S - Split Spoon Sample - ASTM D 1586
LS - Liner Sample with liner insert 3 inches in length
ST - Shelby Tube sample - 3 inch diameter unless otherwise noted
PS - Piston Sample - 3 inch diameter unless otherwise noted
RC - Rock Core - NX core unless otherwise noted

STANDARD PENETRATION TEST (ASTM D 1586) - A 2.0 inch outside-diameter, 1-3/8 inch inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).

**With every community, we redefine what's possible.**

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

TETRA TECH

# Documentation of Due Care Compliance

## High-Level Trunkline Capacity Improvements Project
## W. Washington Street and First Street
## Ann Arbor, MI 48103

**August 15, 2025**

**PRESENTED TO**

**OHM Advisors**
355 S. Zeeb, Suite A
Ann Arbor, MI 48103

**PRESENTED BY**

**Tetra Tech, Inc.**
1136 Oak Valley Drive, Suite 100
Ann Arbor, Michigan 48108
(734) 213-4069

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Table 2 – Groundwater Analytical Results (Metals)

## APPENDICES

Appendix A Supplemental Data Package, Miller-Chapin Sanitary Relief Sewer, Ann Arbor, Michigan, prepared by Materials Testing Consultants, dated January 10, 2025

Appendix B July 2025 Brighton Analytical Lab Report for 1,4-Dioxane Samples

Appendix C United States Department of Agriculture Web Soil Survey Map

# 1.0 INTRODUCTION

On behalf of the City of Ann Arbor, Tetra Tech has prepared this Documentation of Due Care Compliance (DDCC) for the City of Ann Arbor's High-Level Trunkline Capacity Improvements project. The project includes installation of approximately 1,500-feet of sanitary sewer to meet capacity requirements for the new University of Michigan dormitories currently under construction or design. The project extends along W. Washington Street and First Street in downtown Ann Arbor, Michigan (**Figure 1**). The project's sewer alignment will occur within the road and road right-of-way of these streets. Parcel numbers are not included for the adjacent parcels.

There are no underground storage tanks within the project area and therefore the Project is not regulated under Part 213 of NREPA.

This DDCC documents the current and historical use of the project area, historical and current concentrations detected in excess of applicable criteria in soil, a pathway analysis including response and mitigation measures, and demonstration of compliance in accordance with Part 20107a of NREPA (EGLE 2025).

## 1.1 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

The following environmental investigations have been completed for the Property and are discussed in greater detail below.

- Supplemental Data Package, Miller-Chapin Sanitary Relief Sewer, Ann Arbor, Michigan, dated January 10, 2025, completed by Materials Testing Consultants (MTC) (MTC 2025)
- July 2025 Brighton Analytical Lab Report for 1,4-Dioxane Samples

### 1.1.1 Supplemental Data Package (January 2025)

In 2024, MTC completed a drilling investigation along the proposed sewer alignment route (**Appendix A**). Nine soil borings were advanced in support of the project; six in March 2024 (SB-1, SB-8, SB-9, SB-10, SB-11, and SB-12), two in October 2024 (SB-101, SB-102) and one in December 2024 (SB-103). The locations of the soil borings are included in Figure 1 of the Supplemental Data Package (**Appendix A**). Soil samples from each boring were submitted for analysis of volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PNAs), and Michigan 10 metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver and zinc). Additionally, temporary monitoring wells were installed, and groundwater samples were

collected from four soil borings (SB-1, SB-11, SB-12 and SB-101) and two monitoring wells (MW-102 and MW-103). Groundwater samples were submitted for analysis of VOCs, PNAs and Michigan 10 metals.

The results of the soil sampling indicated that VOCs and PNAs concentrations were not detected above the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Part 201 Generic Cleanup Criteria and Screening Levels for Nonresidential Soil, (Part 201 Criteria), dated October 12, 2023, under Natural Resources Environmental Protection Act 1994 Public Act 451, as amended (NREPA). All ten metals were detected in the soil.

Tetra Tech has summarized the metal detections for soil in Table 1, evaluating the exceedances by calculating the groundwater to surface water interface protection (GSIP) criteria by using default values for hardness. In addition, the concentration data were evaluated with state default background concentration. Select metals (arsenic, mercury and selenium) were detected in the soil exceed Part 201 Criteria. Other metals were detected above the Part 201 Criteria but below the Statewide Default Background Levels (SDBLs), such as silver.

The results of the groundwater sampling indicated PNAS were non-detect. VOCs were either not detected or were detected at concentrations that were not above EGLE Part 201 Criteria, with the exception of tetrachloroethylene (PCE). Tetra Tech has summarized the metal detections for groundwater in **Table 2**, evaluating the exceedances by calculating the groundwater to surface water interface (GSI) criteria by using default values for hardness. VOCs and PNAs concentrations are not included in **Table 2**. The results of the groundwater sampling indicated that select metals (arsenic, copper, lead, mercury, silver and zinc) and PCE in the groundwater exceed Part 201 Generic Cleanup Criteria and Screening Levels for Residential and Nonresidential Groundwater, (Part 201 Criteria), dated October 12, 2023, under NREPA. The laboratory analytical reports for all metals, VOCs and PNA parameters analyzed are included as an attachment of the Supplemental Data Package (**Appendix A**).

As a result, this project area is a facility as defined by EGLE:

> *Facility means any area, place, or property where a hazardous substance in excess of the concentrations which satisfy the requirements of section 20120a(1)(a) or (17) or the cleanup criteria for unrestricted residential use under Part 213 has been released, deposited, disposed of otherwise comes to be located.*

The laboratory analytical reports are included as an attachment to the Supplemental Data Package (**Appendix A**). The exceedances are discussed in greater detail in Section 6.0.

#### 1.1.2. 1,4-Dioxane Sample Results (July2025)

On July 2, 2025, MTC collected groundwater samples from SB-102 (MW-102) and SB-103 (MW-103). The samples were submitted to Brighton Analytical for 1,4-dioxane analysis using method 1624 (SIM). Both samples were non-detect for 1,4-dioxane (**Appendix B**). In addition, the leading edge of the Gelman plume is located west of the area, as depicted on the most recent plume map located on the Washtenaw County Health Department's website:

https://www.washtenaw.org/3441/Maps

# 2.0 DETAILED PROPERTY INFORMATION

The following sections include the property description, features and current property use.

## 2.1 PROPERTY DESCRIPTION

The High-Level Trunkline Capacity Improvements project area is located in Ann Arbor, Washtenaw County, Michigan (**Figure 1**). The project area extends along two roads; W. Washington Street and First Street. The project begins near 415 W. Washington, east of Third Street and extends to S. First Street. From here the project continues north along S. and N. First Street, ending north of Miller Avenue. An overhead railroad track crosses the project area on W. Washington Street. Adjacent properties include commercial structures and parking lots.

The property is located within the Gelman 1,4-Dioxane Prohibition Zone (PZ), which is currently under consideration for federal National Priorities Listing as a Superfund site. The PZ restricts groundwater use for drinking water purposes, due to contamination from the Gelman Sciences site. This area was established as an institutional control to prevent human exposure to the 1,4-dioxane contamination present in the groundwater in this area.

No underground storage tanks (USTs) or abandoned containers are known to exist within the project area. The current use of the project area does not require any containers that would have hazardous substances. There are no aboveground storage tanks (ASTs) present within the project area.

## 2.2 PROPERTY FEATURES

The property is zoned as planned unit development (PUD), downtown core (D1) and downtown interface (D2). The surrounding areas have similar zoning and are serviced by the City of Ann

Arbor municipal water and sewer. The project area is within road surfaces and potentially sidewalk, brick paved or grassy areas.

### 2.3 CURRENT PROPERTY USE

The project area is located along W. Washington Street and N. First Street in Ann Arbor, Michigan. The project's sewer alignment will occur within the road and road right-of-way of these streets. The project area is currently used as public roads, primarily covered with asphalt in the downtown area. Adjacent properties included commercial structures, residential structures and parking lots.

There are no surface soil erosion issues or dispersion of particulates or volatile hazardous substances from the surface soils at the property.

## 3.0 IDENTIFICATION OF COMPLETE EXPOSURE PATHWAYS

| COMPLETE PATHWAY | PERTINENT PROPERTY CONDITIONS | EXPLANATION, IF NOT COMPLETE |
|---|---|---|
| Drinking water pathway is not complete | Groundwater is not being used in the project area. No drinking water or irrigation wells are present. | Drinking water wells are not permissible in the City of Ann Arbor, and connection to municipal water supply is required. |
| Direct contact pathway is not complete | Workers can encounter soil during the project. | There are no exceedances of direct contact Part 201 Criteria detected. |
| Soil particulate inhalation pathway is not complete | Soil will be exposed during construction that a person could inhale from vehicle traffic or wind. | There are no exceedances of particulate inhalation Part 201 Criteria detected. |
| Soil volatilization to ambient air pathway is not complete | Soils will be exposed during construction and a person could inhale ambient air that contains vapors from volatile substances if present in soil. | There are no exceedances of soil volatilization to ambient air Part 201 Criteria. |
| Volatilization to indoor air pathway is not complete | There are no indoor structures that a person could be exposed to volatilized indoor air | There are no exceedances of volatilization to indoor air pathway Part 201 Criteria. |

The GSI and GSIP data are evaluated in this document also. While not a human exposure risk, the exceedance of GSI in groundwater and GSIP in soil are important. The Allen Creek Drain, which is within the project area is the venting location for groundwater to a surface water feature. The comparison to available data for the evaluation of the pathways is included in Section 8.0.

# 4.0 HISTORICAL PROPERTY USE

The project area has been in what is downtown Ann Arbor and has been developed for some time. Adjacent properties have historically included industrial and commercial properties, residential structures and parking lots. Historical Sanborn Maps reviewed identify that the area surrounding the proposed project area has been developed since at least the 1880s. Historically, this area has primarily included industrial and commercial properties along W. Washington and First Street. These include a cooper manufacturing facility, coal and timber storage, electric company, church, wholesale groceries, farm equipment and building supplies, machine shop, garage, battery shop and a milling company.

## 4.1 HISTORICAL HAZARDOUS SUBSTANCE USE

The property is located within the Gelman 1,4-Dioxane PZ, however this area has not been impacted to date based on area data collected for this project and EGLE's Gelman Site of 1,4-Dioxane Contamination Interactive Web Map 1,4-dioxane plume boundary. In addition, there are three significant plumes of TCE in the area. One is from the Argus Buildings, originating on Third Street and W. Williams Street, moving west toward First Street. The second is from the former Eaton Corporation, originating from Liberty and S. First Street and is located partially along S. First Street. The third plume is at 415 W. Washington Street, primarily at the southern end of the property, which may be a result of one of the other plumes or former site activities. This plume is migrating north.

# 5.0 PROPERTY GEOLOGY/HYDROGEOLOGY/TOPOGRAPHY

The site is generally at an elevation of 790 to 817 feet above mean sea level (amsl) according to the Supplemental Data Package (**Appendix A**). The high points are located along N. First Street between W. Huron and W. Washington Street east of S. First Street. The Huron River is located approximately 0.5-mile northeast of the northern extent of the project area (intersection of Miller Avenue and N First Street). Allen Creek Drain flows through the project area in a north-south direction on the west side of the railroad tracks on W. Washington Street and continues north adjacent to the project area. Allen Creek Drain flows north to the Huron River. It is assumed the general direction of groundwater flow in the project area is toward the Allen Creek Drain.

The United States Department of Agriculture Web Soil Survey map (**Appendix C**) identifies the soils in the project area as Matherton sandy loam, 0 to 4 percent slopes, Fox sandy loam, Huron Lobe, 6 to 12 percent slopes and Fox sandy loam till plain, 2 to 6 percent slopes.

The soil borings completed on the site in 2024 were completed to a depth of 25 to 50 feet below ground surface (bgs). Groundwater was encountered at depths of 8 to 30 feet bgs. The soils encountered in these borings were predominately sand or clay with some areas of gravel and silt encountered. The 2024 soil boring logs are included in the Supplemental Data Package (**Appendix A**).

## 6.0 ASSESSMENT OF APPLICABILITY TO GENERIC CRITERIA

Surface soil impacts between 0.5 and 50 feet have been documented onsite (**Appendix A**). The applicability to Part 201 Criteria for the soil impacts are as follows:

- Mobilization as dust dispersed to ambient air: mobilization of impacted soil particulates to ambient air, by wind, is a potential migration pathway; however, concentrations of constituents have not been detected above Particulate Soil Inhalation Criteria.
- Volatile Soil Inhalation Criteria to Ambient Air: No parameters were detected above applicable criteria; this exposure pathway is not applicable.
- Soil Volatilization to Indoor Air Inhalation: No parameters were detected above applicable criteria. This exposure pathway is not applicable.
- Leaching to drinking water: arsenic is present at concentrations in soil that exceed Part 201 Criteria for drinking water protection. No drinking water or irrigation wells are present on the project area. Drinking water wells are not permitted to be installed in the City of Ann Arbor, instead connecting to the municipal water supply is required.
- GSIP: arsenic, mercury, and selenium were detected at concentrations that exceed Part 201 Criteria for GSIP. Silver is also detected at concentrations that exceed Part 201 Criteria for GSIP but below the SDBL. Groundwater is likely venting to surface water at the Allen Creek Drain.
- Direct Contact: no parameters were present at concentrations that exceed residential Part 201 Criteria for direct contact. This exposure pathway is complete because a person can encounter soil during the sewer alignment work, however there are no exceedances of direct contact in soil in the project area.

Groundwater was encountered in the project area between 8.5 and 30 feet (**Appendix A**). The applicability to Part 201 Criteria for the groundwater impacts are as follows:

- Drinking water: PCE, arsenic and lead are present at concentrations that exceed residential and nonresidential drinking water (RDW and NDW) criteria. While drinking water wells are prohibited in the PZ, site personnel can be exposed to the water during their activities for installation of the sewer alignment. Unintentional ingestion is possible without proper hygiene.
- Groundwater to surface water: Arsenic, copper, lead, mercury, silver and zinc are detected at concentrations that exceed GSI criteria. This exceedance is not a human exposure risk but an environmental one, given the proximity to Allen Creek Drain and the potential for groundwater to vent to the surface water.

# 7.0 IDENTIFICATION OF APPLICABLE CLEANUP CRITERIA AND/OR SSVIAC OR SBSLS AND/OR SSTLS

The site qualifies as a nonresidential Part 201 Criteria Site. The results from the Supplemental Data Package (**Appendix A**) and **Tables 1** and **2** are compared to nonresidential criteria for soil and residential and nonresidential criteria for groundwater.

# 8.0 CONTAMINANT INFORMATION

This section identifies the contaminants and concentrations present in soil.

## 8.1 SOIL

In 2024, MTC completed a drilling investigation along the proposed sewer alignment route (**Appendix A**). Nine borings were advanced in 2024. Laboratory analytical results indicate the following exceedances in soil:

- Arsenic exceeds residential and nonresidential drinking water protection criteria (RDWP and NDWP) and GSIP.
- Mercury and selenium exceed GSIP criteria.
- Silver exceeds GSIP criteria but is below SDBLs.
- Barium, lead and zinc exceed statewide SDBLs.

## 8.2 GROUNDWATER

Groundwater samples were collected from four soil borings (SB-1, SB-11, SB-12 and SB-101) and two monitoring wells (MW-102 and MW-103) in 2024. Groundwater samples were submitted for analysis of VOCs, PNAs and Michigan 10 metals. Two groundwater samples were collected from two monitoring wells (SB-102/MW-102 and SB-103/MW-103) on July 2, 2025 for analysis of 1,4-dioxane. Laboratory analytical results indicate the following exceedances in groundwater:

- PCE, arsenic and lead exceeds RDW and NDW.
- Arsenic, copper, lead, mercury, silver and zinc exceeds GSI.

PNAS were not detected in groundwater. Select VOC parameters were detected at concentrations above the method detection limit but below Part 201 Criteria. The laboratory analytical reports for all metals, VOCs and PNA parameters analyzed are included as an attachment of the Supplemental Data Package (**Appendix A**). The 1,4-dioxane samples collected on July 2, 2025 were both non-detect. The laboratory analytical reports for the 1,4-dioxane samples are included as **Appendix B**.

## 8.3 SOIL GAS

Soil gas is not applicable at the site.

# 9.0 COMPLETE EXPOSURE PATHWAYS & RESPONSE ACTIONS THAT WERE COMPLETED TO MITIGATE UNACCEPTABLE EXPOSURES

Concentrations and institutional controls have mitigated exposure to area residents; however, the specific sewer alignment exposes construction and utility workers to levels of arsenic and lead that are above the drinking water (DW) criteria. The following addresses corrective actions to reduce human exposure or mitigate unacceptable exposures for this group of workers.

## 9.1 DRINKING WATER PATHWAY

The property has exceedances of arsenic in soil and groundwater for the drinking water protection (DWP) and DW pathways. Additionally, PCE and lead exceed DW Part 201 Criteria. While these pathways are not complete because area water is supplied through the municipality, workers installing the sewer line can be exposed to both the soil and groundwater. Proper hygiene is required to ensure worker safety and reduce the potential for ingestion. Use of gloves is

encouraged, to reduce exposure to soil and groundwater. Washing hands prior to eating, drinking or bathroom breaks is required; ensuring entrainment into the ingestion track is minimized.

### 9.1 GROUNDWATER TO SURFACE WATER IMPACT PATHWAY

The property has exceedances of select metals (arsenic, mercury and selenium) in soil for GSIP Part 201 Criteria. Silver is also detected at concentrations that exceed Part 201 Criteria for GSIP but below the SDBL. The property also has exceedances of select metals (arsenic copper, lead, mercury, silver and zinc) in groundwater for GSI Part 201 Criteria. These are not human exposure pathways. However, because the Allen Creek Drain is nearby, groundwater will vent to the surface water feature. During the project, the removal of heavy metals in water will be completed to reduce the metals that may be pumped into the storm sewer or sanitary sewer.

## 10. DEMONSTRATION OF COMPLIANCE

This section demonstrates compliance with Section 7a obligations applicable to the Site based on current use.

### 10.1 EXACERBATION

Several locations have concentrations of arsenic and lead in excess of DWP in the groundwater. Additionally, arsenic, copper, lead, mercury, silver and zinc are detected in excess of GSI in the groundwater.

Arsenic, mercury and selenium are detected in excess of GSIP in the soil and arsenic is also detected in excess of NDWP and RDWP. Silver is also detected at concentrations that exceed Part 201 Criteria for GSIP but below the SDBL. While GSIP is not a pathway for human exposure; and the DW pathway is not complete, workers can still be exposed to risk.

Precautions must be taken to protect potential construction and utility workers, who may come in contact with metals that exceed applicable criteria, including the following:

- Inform all contractors and utility workers of the presence of parameters in excess of Part 201 Criteria for work involving contact with soils or groundwater, including the following: shallow excavation, surface grading, removal of existing material, and below grade utility installation and maintenance.
- Have contractors prepare a health and safety plan that addresses the potential health hazards and environmental concerns when handling or disturbing soils.

- Require workers engaged in subsurface work to have Hazard Communication (HazCom) training to explain the metals potential onsite and the prevention measures.
- Provide contractors with facilities to wash their hands and face prior to leaving the site, taking a break or eating lunch.
- Reinforce health and safety requirements through daily tailgates, health and safety plan review and continued hazard communication.
- Prohibit relocation of soils from this project area to any other location except a Type II landfill in accordance with Part 20120c of NREPA.
- Dewatering activities onsite may consider treatment onsite prior to discharge to a stormwater or permit to a sanitary sewer. Other options include containerizing and sampling for offsite disposal.

## 10.2 MITIGATE OR PREVENT UNACCEPTABLE EXPOSURES AND PREVENTION OF UNACCEPTABLE HUMAN EXPOSURE

Contaminant migration and exposure pathways have been evaluated. The DWP and GSIP pathways have been addressed in Section 10.1 to mitigate worker exposure.

### 10.2.1 Demonstration of Compliance with Due Care Rules Applicable to the Subject Property Based on Current Use

The property is in compliance with Section 20107a(1)(b):

- Rule 1009 Discarded or Abandoned Aboveground Containers. There are no discarded or abandoned containers on the property.
- Rule 1011 below ground containers. There are no below ground containers on the property and the site use does not require them.
- Rule 1015 Notice to department of discarded or abandoned containers. The site use does not require containers for hazardous waste storage on the property.
- Rule 1017 Notice to department and to affected adjacent property owners of contamination migrating beyond the boundaries, is not applicable.
- Rule 1019 Notice of fire or explosion hazard to the local fire department, mitigation or elimination within 7 day of notification to the department, is not applicable for current site use.
- Rule 1013(6) Notice to utility workers or other persons conducting activities at the property in an easement, under the terms of a utility franchise, or pursuant to severed subsurface mineral rights or severed subsurface formations.

### 10.3 REASONABLE PRECAUTIONS

There has not been a documented need for response activities to address the acts or omissions of third parties as described in Section 20107a(1)(c).

### 10.4 COMPLIANCE WITH LAND USE RESTRICTIONS AND INSTITUTIONAL CONTROLS

No deed restriction is required for the Property.

### 10.5 NOT IMPEDE THE EFFECTIVENESS OR INTEGRITY OF LAND OR RESOURCE USE RESTRICTIONS

There are no other response actions that are occurring or are necessary.

## 11.0 SIGNATURES

If you have additional questions, please do not hesitate to contact us.

Sincerely,

Alison Rauss
Senior Project Scientist

Patti McCall, CPG, PWS
Principal Hydrogeologist

# 12.0 REFERENCES


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# TABLES

**Table 1**
**Soil Analytical Results - Nonresidential Criteria**
High-Level Trunkline Capacity Improvements Project
Ann Arbor, Michigan

| | | | | | Soil Nonresidential Part 201 Generic Cleanup Criteria and Screening Levels; Part 213 Risk Based Screening Levels (RBSLs) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Groundwater Protection | | | Indoor Air | Ambient Air | | | | Contact | Csat |
| **Sample And Depth** | **CAS** | **Parameter** | **Result (ug/kg)** | **Statewide Default Background Levels** | **Residential Drinking Water Protection Criteria And RBSLs** | **Nonresidential Drinking Water Protection Criteria AND RBSLs** | **Groundwater Surface Water Interface Protection Criteria And RBSLs** | **Soil Volatilization to Indoor Air Inhalation Criteria And RBSLs** | **Infinite Source Volatile Soil Inhalation Criteria And RBSLs** | **Finite VSIC for 5 Meter Source Thickness** | **Finite VSIC for 2 Meter Source Thickness** | **Particulate Soil Inhalation Criteria And RBSLs** | **Nonresidential Direct Contact Criteria And RBSLs** | **Soil Saturation Concentration Screening Levels** |
| **SB-101 10/24/24** | 7440-38-2 | Arsenic | **7,600** | **5,800** | **4,600** | **4,600** | **4,600** | NLV | NLV | NLV | NLV | 910,000 | 37,000 | NA |
| | 7440-39-3 | Barium | 27,000 | 75,000 | 1,300,000 | 1,300,000 | 440,000 (G) | NLV | NLV | NLV | NLV | 150,000,000 | 130,000,000 | NA |
| | 7440-43-9 | Cadmium | 610 | 1,200 | 6,000 | 6,000 | 3,600 (G,X) | NLV | NLV | NLV | NLV | 2,200,000 | 2,100,000 | NA |
| | 7440-47-3 | Chromium | 7,300 | 18,000 | 1,000,000,000 (D) | 1,000,000,000 (D) | 2,900,000,000 (G,X) | NLV | NLV | NLV | NLV | 150,000,000 | 1,000,000,000 (D) | NA |
| | 7440-50-8 | Copper | 18,000 | 32,000 | 5,800,000 | 5,800,000 | 75,000 (G) | NLV | NLV | NLV | NLV | 59,000,000 | 73,000,000 | NA |
| | 7439-92-1 | Lead | 6,800 | 21,000 | 700,000 | 700,000 | 6,000,000 (G,X) | NLV | NLV | NLV | NLV | 44,000,000 | 900,000 (DD) | NA |
| | Varies | Mercury | ND | 130 | 1,700 | 1,700 | 50 (M); 1.2 | 89,000 | 62,000 | 62,000 | 62,000 | 8,800,000 | 580,000 | NA |
| | 7782-49-2 | Selenium | **690** | **410** | 4,000 | 4,000 | **400** | NLV | NLV | NLV | NLV | 59,000,000 | 9,600,000 | NA |
| | 7440-22-4 | Silver | **110** | 1,000 | 4,500 | 13,000 | **100 (M): 27** | NLV | NLV | NLV | NLV | 2,900,000 | 9,000,000 | NA |
| | 7440-66-6 | Zinc | **48,000** | **47,000** | 2,400,000 | 5,000,000 | 170,000 (G) | NLV | NLV | NLV | NLV | ID | 630,000,000 | NA |
| **SB-102 10/25/24** | 7440-38-2 | Arsenic | **7,600** | **5,800** | **4,600** | **4,600** | **4,600** | NLV | NLV | NLV | NLV | 910,000 | 37,000 | NA |
| | 7440-39-3 | Barium | 15,000 | 75,000 | 1,300,000 | 1,300,000 | 440,000 (G) | NLV | NLV | NLV | NLV | 150,000,000 | 130,000,000 | NA |
| | 7440-43-9 | Cadmium | 480 | 1,200 | 6,000 | 6,000 | 3,600 (G,X) | NLV | NLV | NLV | NLV | 2,200,000 | 2,100,000 | NA |
| | 7440-47-3 | Chromium | 6,100 | 18,000 | 1,000,000,000 (D) | 1,000,000,000 (D) | 2,900,000,000 (G,X) | NLV | NLV | NLV | NLV | 150,000,000 | 1,000,000,000 (D) | NA |
| | 7440-50-8 | Copper | 15,000 | 32,000 | 5,800,000 | 5,800,000 | 75,000 (G) | NLV | NLV | NLV | NLV | 59,000,000 | 73,000,000 | NA |
| | 7439-92-1 | Lead | 6,400 | 21,000 | 700,000 | 700,000 | 6,000,000 (G,X) | NLV | NLV | NLV | NLV | 44,000,000 | 900,000 (DD) | NA |
| | Varies | Mercury | ND | 130 | 1,700 | 1,700 | 50 (M); 1.2 | 89,000 | 62,000 | 62,000 | 62,000 | 8,800,000 | 580,000 | NA |
| | 7782-49-2 | Selenium | **810** | **410** | 4,000 | 4,000 | **400** | NLV | NLV | NLV | NLV | 59,000,000 | 9,600,000 | NA |
| | 7440-22-4 | Silver | ND | 1,000 | 4,500 | 13,000 | 100 (M): 27 | NLV | NLV | NLV | NLV | 2,900,000 | 9,000,000 | NA |
| | 7440-66-6 | Zinc | **47,000** | **47,000** | 2,400,000 | 5,000,000 | 170,000 (G) | NLV | NLV | NLV | NLV | ID | 630,000,000 | NA |
| **SB-103 12/2/24** | 7440-38-2 | Arsenic | **4,900** | 5,800 | **4,600** | **4,600** | **4,600** | NLV | NLV | NLV | NLV | 910,000 | 37,000 | NA |
| | 7440-39-3 | Barium | 32,000 | 75,000 | 1,300,000 | 1,300,000 | 440,000 (G) | NLV | NLV | NLV | NLV | 150,000,000 | 130,000,000 | NA |
| | 7440-43-9 | Cadmium | 180 | 1,200 | 6,000 | 6,000 | 3,600 (G,X) | NLV | NLV | NLV | NLV | 2,200,000 | 2,100,000 | NA |
| | 7440-47-3 | Chromium | 8,100 | 18,000 | 1,000,000,000 (D) | 1,000,000,000 (D) | 2,900,000,000 (G,X) | NLV | NLV | NLV | NLV | 150,000,000 | 1,000,000,000 (D) | NA |
| | 7440-50-8 | Copper | 10,000 | 32,000 | 5,800,000 | 5,800,000 | 75,000 (G) | NLV | NLV | NLV | NLV | 59,000,000 | 73,000,000 | NA |
| | 7439-92-1 | Lead | 8,500 | 21,000 | 700,000 | 700,000 | 6,000,000 (G,X) | NLV | NLV | NLV | NLV | 44,000,000 | 900,000 (DD) | NA |
| | Varies | Mercury | ND | 130 | 1,700 | 1,700 | 50 (M); 1.2 | 89,000 | 62,000 | 62,000 | 62,000 | 8,800,000 | 580,000 | NA |
| | 7782-49-2 | Selenium | **870** | **410** | 4,000 | 4,000 | **400** | NLV | NLV | NLV | NLV | 59,000,000 | 9,600,000 | NA |
| | 7440-22-4 | Silver | ND | 1,000 | 4,500 | 13,000 | 100 (M): 27 | NLV | NLV | NLV | NLV | 2,900,000 | 9,000,000 | NA |
| | 7440-66-6 | Zinc | 29,000 | 47,000 | 2,400,000 | 5,000,000 | 170,000 (G) | NLV | NLV | NLV | NLV | ID | 630,000,000 | NA |
| **SB-1 3/11/24** | 7440-38-2 | Arsenic | 4,200 | 5,800 | 4,600 | 4,600 | 4,600 | NLV | NLV | NLV | NLV | 910,000 | 37,000 | NA |
| | 7440-39-3 | Barium | **120,000** | **75,000** | 1,300,000 | 1,300,000 | 440,000 (G) | NLV | NLV | NLV | NLV | 150,000,000 | 130,000,000 | NA |
| | 7440-43-9 | Cadmium | 190 | 1,200 | 6,000 | 6,000 | 3,600 (G,X) | NLV | NLV | NLV | NLV | 2,200,000 | 2,100,000 | NA |
| | 7440-47-3 | Chromium | 5,600 | 18,000 | 1,000,000,000 (D) | 1,000,000,000 (D) | 2,900,000,000 (G,X) | NLV | NLV | NLV | NLV | 150,000,000 | 1,000,000,000 (D) | NA |
| | 7440-50-8 | Copper | 18,000 | 32,000 | 5,800,000 | 5,800,000 | 75,000 (G) | NLV | NLV | NLV | NLV | 59,000,000 | 73,000,000 | NA |
| | 7439-92-1 | Lead | **58,000** | **21,000** | 700,000 | 700,000 | 6,000,000 (G,X) | NLV | NLV | NLV | NLV | 44,000,000 | 900,000 (DD) | NA |
| | Varies | Mercury | **78** | 130 | 1,700 | 1,700 | **50 (M); 1.2** | 89,000 | 62,000 | 62,000 | 62,000 | 8,800,000 | 580,000 | NA |
| | 7782-49-2 | Selenium | ND | 410 | 4,000 | 4,000 | 400 | NLV | NLV | NLV | NLV | 59,000,000 | 9,600,000 | NA |
| | 7440-22-4 | Silver | ND | 1,000 | 4,500 | 13,000 | 100 (M): 27 | NLV | NLV | NLV | NLV | 2,900,000 | 9,000,000 | NA |
| | 7440-66-6 | Zinc | 41,000 | 47,000 | 2,400,000 | 5,000,000 | 170,000 (G) | NLV | NLV | NLV | NLV | ID | 630,000,000 | NA |
| **SB-8 3/6/24** | 7440-38-2 | Arsenic | 2,000 | 5,800 | 4,600 | 4,600 | 4,600 | NLV | NLV | NLV | NLV | 910,000 | 37,000 | NA |
| | 7440-39-3 | Barium | 42,000 | 75,000 | 1,300,000 | 1,300,000 | 440,000 (G) | NLV | NLV | NLV | NLV | 150,000,000 | 130,000,000 | NA |
| | 7440-43-9 | Cadmium | 120 | 1,200 | 6,000 | 6,000 | 3,600 (G,X) | NLV | NLV | NLV | NLV | 2,200,000 | 2,100,000 | NA |
| | 7440-47-3 | Chromium | 13,000 | 18,000 | 1,000,000,000 (D) | 1,000,000,000 (D) | 2,900,000,000 (G,X) | NLV | NLV | NLV | NLV | 150,000,000 | 1,000,000,000 (D) | NA |
| | 7440-50-8 | Copper | 13,000 | 32,000 | 5,800,000 | 5,800,000 | 75,000 (G) | NLV | NLV | NLV | NLV | 59,000,000 | 73,000,000 | NA |
| | 7439-92-1 | Lead | 6,000 | 21,000 | 700,000 | 700,000 | 6,000,000 (G,X) | NLV | NLV | NLV | NLV | 44,000,000 | 900,000 (DD) | NA |
| | Varies | Mercury | ND | 130 | 1,700 | 1,700 | 50 (M); 1.2 | 89,000 | 62,000 | 62,000 | 62,000 | 8,800,000 | 580,000 | NA |
| | 7782-49-2 | Selenium | 200 | 410 | 4,000 | 4,000 | 400 | NLV | NLV | NLV | NLV | 59,000,000 | 9,600,000 | NA |
| | 7440-22-4 | Silver | ND | 1,000 | 4,500 | 13,000 | 100 (M): 27 | NLV | NLV | NLV | NLV | 2,900,000 | 9,000,000 | NA |
| | 7440-66-6 | Zinc | 29,000 | 47,000 | 2,400,000 | 5,000,000 | 170,000 (G) | NLV | NLV | NLV | NLV | ID | 630,000,000 | NA |
| **SB-9 3/7/24** | 7440-38-2 | Arsenic | 2,200 | 5,800 | 4,600 | 4,600 | 4,600 | NLV | NLV | NLV | NLV | 910,000 | 37,000 | NA |
| | 7440-39-3 | Barium | 41,000 | 75,000 | 1,300,000 | 1,300,000 | 440,000 (G) | NLV | NLV | NLV | NLV | 150,000,000 | 130,000,000 | NA |
| | 7440-43-9 | Cadmium | 76 | 1,200 | 6,000 | 6,000 | 3,600 (G,X) | NLV | NLV | NLV | NLV | 2,200,000 | 2,100,000 | NA |
| | 7440-47-3 | Chromium | 14,000 | 18,000 | 1,000,000,000 (D) | 1,000,000,000 (D) | 2,900,000,000 (G,X) | NLV | NLV | NLV | NLV | 150,000,000 | 1,000,000,000 (D) | NA |
| | 7440-50-8 | Copper | 7,500 | 32,000 | 5,800,000 | 5,800,000 | 75,000 (G) | NLV | NLV | NLV | NLV | 59,000,000 | 73,000,000 | NA |
| | 7439-92-1 | Lead | 4,200 | 21,000 | 700,000 | 700,000 | 6,000,000 (G,X) | NLV | NLV | NLV | NLV | 44,000,000 | 900,000 (DD) | NA |
| | Varies | Mercury | ND | 130 | 1,700 | 1,700 | 50 (M); 1.2 | 89,000 | 62,000 | 62,000 | 62,000 | 8,800,000 | 580,000 | NA |
| | 7782-49-2 | Selenium | 280 | 410 | 4,000 | 4,000 | 400 | NLV | NLV | NLV | NLV | 59,000,000 | 9,600,000 | NA |
| | 7440-22-4 | Silver | ND | 1,000 | 4,500 | 13,000 | 100 (M): 27 | NLV | NLV | NLV | NLV | 2,900,000 | 9,000,000 | NA |
| | 7440-66-6 | Zinc | 19,000 | 47,000 | 2,400,000 | 5,000,000 | 170,000 (G) | NLV | NLV | NLV | NLV | ID | 630,000,000 | NA |

**Table 1**
**Soil Analytical Results - Nonresidential Criteria**
High-Level Trunkline Capacity Improvements Project
Ann Arbor, Michigan

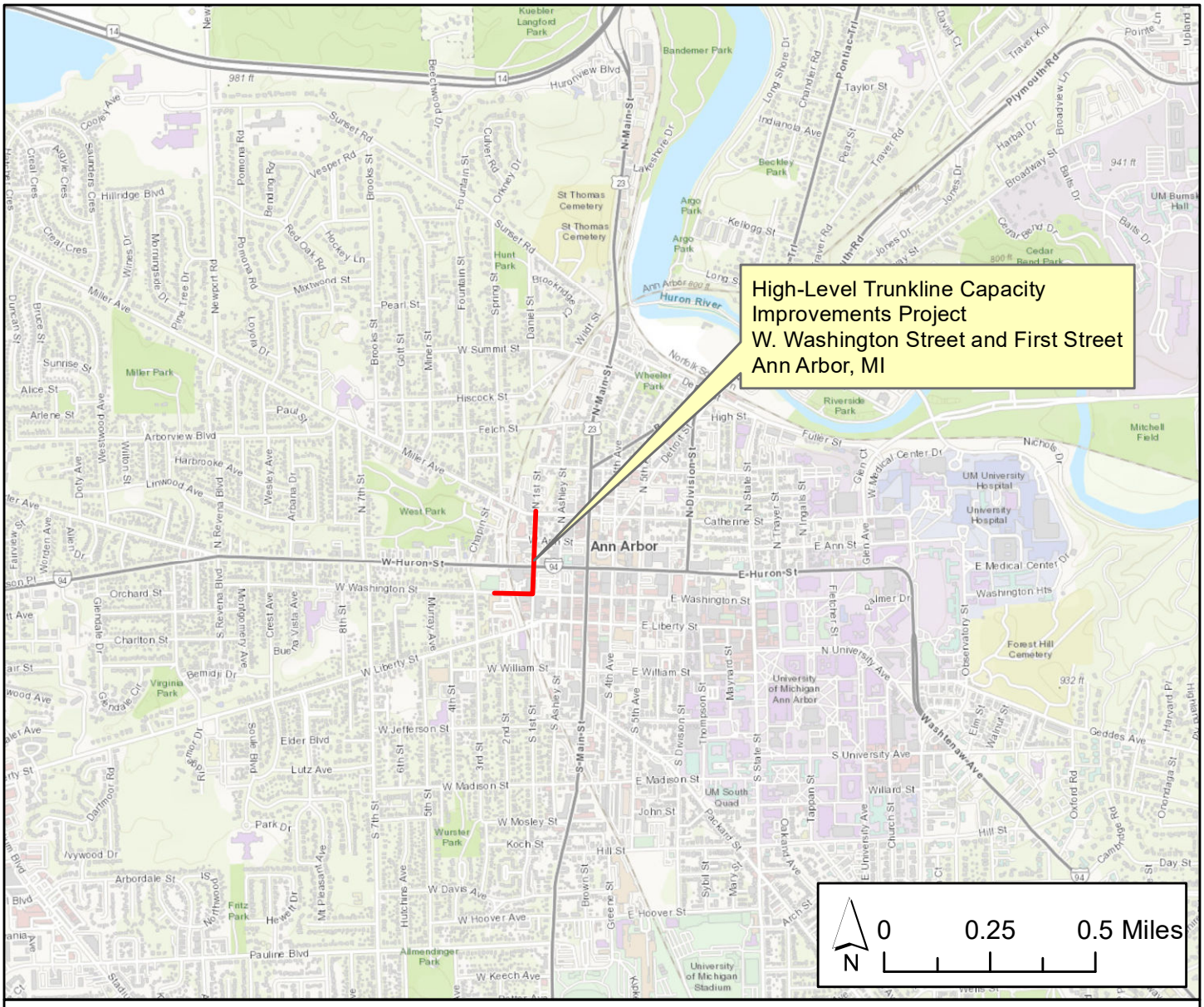
| | | | | | Soil Nonresidential Part 201 Generic Cleanup Criteria and Screening Levels; Part 213 Risk Based Screening Levels (RBSLs) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Groundwater Protection | | | Indoor Air | Ambient Air | | | | Contact | Csat |
| **Sample And Depth** | **CAS** | **Parameter** | **Result (ug/kg)** | **Statewide Default Background Levels** | **Residential Drinking Water Protection Criteria And RBSLs** | **Nonresidential Drinking Water Protection Criteria AND RBSLs** | **Groundwater Surface Water Interface Protection Criteria And RBSLs** | **Soil Volatilization to Indoor Air Inhalation Criteria And RBSLs** | **Infinite Source Volatile Soil Inhalation Criteria And RBSLs** | **Finite VSIC for 5 Meter Source Thickness** | **Finite VSIC for 2 Meter Source Thickness** | **Particulate Soil Inhalation Criteria And RBSLs** | **Nonresidential Direct Contact Criteria And RBSLs** | **Soil Saturation Concentration Screening Levels** |
| **SB-10 3/13/24** | 7440-38-2 | Arsenic | **12,000** | **5,800** | **4,600** | **4,600** | **4,600** | NLV | NLV | NLV | NLV | 910,000 | 37,000 | NA |
| | 7440-39-3 | Barium | 22,000 | 75,000 | 1,300,000 | 1,300,000 | 440,000 (G) | NLV | NLV | NLV | NLV | 150,000,000 | 130,000,000 | NA |
| | 7440-43-9 | Cadmium | 340 | 1,200 | 6,000 | 6,000 | 3,600 (G,X) | NLV | NLV | NLV | NLV | 2,200,000 | 2,100,000 | NA |
| | 7440-47-3 | Chromium | 14,000 | 18,000 | 1,000,000,000 (D) | 1,000,000,000 (D) | 2,900,000,000 (G,X) | NLV | NLV | NLV | NLV | 150,000,000 | 1,000,000,000 (D) | NA |
| | 7440-50-8 | Copper | 16,000 | 32,000 | 5,800,000 | 5,800,000 | 75,000 (G) | NLV | NLV | NLV | NLV | 59,000,000 | 73,000,000 | NA |
| | 7439-92-1 | Lead | 15,000 | 21,000 | 700,000 | 700,000 | 6,000,000 (G,X) | NLV | NLV | NLV | NLV | 44,000,000 | 900,000 (DD) | NA |
| | Varies | Mercury | ND | 130 | 1,700 | 1,700 | 50 (M); 1.2 | 89,000 | 62,000 | 62,000 | 62,000 | 8,800,000 | 580,000 | NA |
| | 7782-49-2 | Selenium | ND | 410 | 4,000 | 4,000 | 400 | NLV | NLV | NLV | NLV | 59,000,000 | 9,600,000 | NA |
| | 7440-22-4 | Silver | ND | 1,000 | 4,500 | 13,000 | 100 (M): 27 | NLV | NLV | NLV | NLV | 2,900,000 | 9,000,000 | NA |
| | 7440-66-6 | Zinc | 35,000 | 47,000 | 2,400,000 | 5,000,000 | 170,000 (G) | NLV | NLV | NLV | NLV | ID | 630,000,000 | NA |
| **SB-11 3/20/24** | 7440-38-2 | Arsenic | **7,300** | **5,800** | **4,600** | **4,600** | **4,600** | NLV | NLV | NLV | NLV | 910,000 | 37,000 | NA |
| | 7440-39-3 | Barium | 12,000 | 75,000 | 1,300,000 | 1,300,000 | 440,000 (G) | NLV | NLV | NLV | NLV | 150,000,000 | 130,000,000 | NA |
| | 7440-43-9 | Cadmium | 230 | 1,200 | 6,000 | 6,000 | 3,600 (G,X) | NLV | NLV | NLV | NLV | 2,200,000 | 2,100,000 | NA |
| | 7440-47-3 | Chromium | 6,700 | 18,000 | 1,000,000,000 (D) | 1,000,000,000 (D) | 2,900,000,000 (G,X) | NLV | NLV | NLV | NLV | 150,000,000 | 1,000,000,000 (D) | NA |
| | 7440-50-8 | Copper | 11,000 | 32,000 | 5,800,000 | 5,800,000 | 75,000 (G) | NLV | NLV | NLV | NLV | 59,000,000 | 73,000,000 | NA |
| | 7439-92-1 | Lead | 7,100 | 21,000 | 700,000 | 700,000 | 6,000,000 (G,X) | NLV | NLV | NLV | NLV | 44,000,000 | 900,000 (DD) | NA |
| | Varies | Mercury | ND | 130 | 1,700 | 1,700 | 50 (M); 1.2 | 89,000 | 62,000 | 62,000 | 62,000 | 8,800,000 | 580,000 | NA |
| | 7782-49-2 | Selenium | 220 | 410 | 4,000 | 4,000 | 400 | NLV | NLV | NLV | NLV | 59,000,000 | 9,600,000 | NA |
| | 7440-22-4 | Silver | ND | 1,000 | 4,500 | 13,000 | 100 (M): 27 | NLV | NLV | NLV | NLV | 2,900,000 | 9,000,000 | NA |
| | 7440-66-6 | Zinc | 30,000 | 47,000 | 2,400,000 | 5,000,000 | 170,000 (G) | NLV | NLV | NLV | NLV | ID | 630,000,000 | NA |
| **SB-12 3/12/24** | 7440-38-2 | Arsenic | **5,300** | 5,800 | **4,600** | **4,600** | **4,600** | NLV | NLV | NLV | NLV | 910,000 | 37,000 | NA |
| | 7440-39-3 | Barium | 73,000 | 75,000 | 1,300,000 | 1,300,000 | 440,000 (G) | NLV | NLV | NLV | NLV | 150,000,000 | 130,000,000 | NA |
| | 7440-43-9 | Cadmium | 220 | 1,200 | 6,000 | 6,000 | 3,600 (G,X) | NLV | NLV | NLV | NLV | 2,200,000 | 2,100,000 | NA |
| | 7440-47-3 | Chromium | 8,500 | 18,000 | 1,000,000,000 (D) | 1,000,000,000 (D) | 2,900,000,000 (G,X) | NLV | NLV | NLV | NLV | 150,000,000 | 1,000,000,000 (D) | NA |
| | 7440-50-8 | Copper | 17,000 | 32,000 | 5,800,000 | 5,800,000 | 75,000 (G) | NLV | NLV | NLV | NLV | 59,000,000 | 73,000,000 | NA |
| | 7439-92-1 | Lead | **53,000** | **21,000** | 700,000 | 700,000 | 6,000,000 (G,X) | NLV | NLV | NLV | NLV | 44,000,000 | 900,000 (DD) | NA |
| | Varies | Mercury | **140** | **130** | 1,700 | 1,700 | **50 (M); 1.2** | 89,000 | 62,000 | 62,000 | 62,000 | 8,800,000 | 580,000 | NA |
| | 7782-49-2 | Selenium | **420** | **410** | 4,000 | 4,000 | **400** | NLV | NLV | NLV | NLV | 59,000,000 | 9,600,000 | NA |
| | 7440-22-4 | Silver | **270** | 1,000 | 4,500 | 13,000 | **100 (M): 27** | NLV | NLV | NLV | NLV | 2,900,000 | 9,000,000 | NA |
| | 7440-66-6 | Zinc | **54,000** | **47,000** | 2,400,000 | 5,000,000 | 170,000 (G) | NLV | NLV | NLV | NLV | ID | 630,000,000 | NA |

Notes:
All criteria units are micrograms per kilogram (ug/kg).
Table reflects analytical data comparison to Soil Nonresidential Part 201 Generic Cleanup Criteria and Screening Levels; Part 213 Risk-Based Screening Levels (RSBLs), October 12, 2023.
All metal results are shown on this table.
Blue Shaded cells with bold font indicate Michigan Department of Environment, Great Lakes, and Energy (EGLE) Criteria that are exceeded.
Results that exceed Statewide Default Background Levels (SDBLs) are in bold.
If a detection exceeds criteria, but not SDBLs, the result is not highlighted.
Explanations of criteria shown in this table can be found in the EGLE Footnotes document.
Default hardness values were used to calculate values identified with EGLE Footnote G (hardness=150 mg CaCO3/L). G Values are rounded down to 2 significant digits.
Chromium values are compared to Chrome III criteria; there is no reason to believe, nor is there documented hexavalent chromium in the area.
ND = Not detected above laboratory reporting limit.

**Table 2**
**Groundwater Analytical Results**
High-Level Trunkline Capacity Improvements Project
Ann Arbor, Michigan

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |

# FIGURES


High-Level Trunkline Capacity Improvements Project
W. Washington Street and First Street
Ann Arbor, MI
Ann Arbor
W-Huron-St
E-Huron-St
N-Main-St
S-Main-St
N-Division-St
W Washington St
E Washington St
W Liberty St
E Liberty St
W William St
E William St
W Jefferson St
W Madison St
E Madison St
W Summit St
Hiscock St
Felch St
Miller Ave
Huron River
Miller Park
West Park
Wheeler Park
Riverside Park
Mitchell Field
Bandemer Park
Argo Park
Beckley Park
St Thomas Cemetery
Hunt Park
Wurster Park
Allmendinger Park
Fritz Park
Virginia Park
Elder Bld
Lutz Ave
Park Dr
Hill St
S University Ave
E University Ave
N University Ave
Washtenaw Ave
Geddes Ave
Willard St
Day St
Catherine St
E Ann St
High St
Fuller St
Packard St
Plymouth Rd
Broadway St
Taylor St
Kellogg St
Huronview Blvd
Hillridge Blvd
Sunset Rd
Vesper Rd
Pearl St
Arborview Blvd
Harbrooke Ave
Limwood Ave
Orchard St
Charlton St
Arlene St
Alice St
Sunrise St
Paul St
Hillridge Blvd
Mixtwood St
Red Oak Rd
Hockey Ln
Bending Rd
Pomona Rd
Newport Rd
Brooks St
Fountain St
Spring St
Daniel St
Brookridge Ct
Gott St
Miner St
Brooks St
Wilmot St
Doty Ave
Westwood Ave
Wesley Ave
Arbana Dr
N Revena Blvd
N 7th St
N 1st St
N Ashley St
N 5th St
N State St
N Ingalls St
N Traver St
Glen Ave
Glen Ct
W Medical Center Dr
E Medical Center Dr
Nichols Dr
UM University Hospital
University Hospital
Washington Hts
Forest Hill Cemetery
Observatory St
Palmer Dr
Fletcher St
Thompson St
Mayard St
S State St
S Division St
S 4th Ave
S 5th Ave
S Ashley St
S 1st St
2nd St
3rd St
4th St
5th St
6th St
S 7th St
8th St
Murray Ave
Crest Ave
Buena Vista Ave
S Revena Blvd
Meadowlake Dr
Bemidji Dr
Glendale Ct
Dartmoor Rd
Ivywood Dr
Arbordale St
Northwood
Mt Pleasant Ave
Hewett Dr
Hutchins Ave
W Davis Ave
W Hoover Ave
E Hoover St
Pauline Blvd
W Keech Ave
Brown St
Greene St
Sybil St
Mary St
Oakland Ave
Tappan St
Packard St
John St
UM South Quad
University of Michigan Ann Arbor
University of Michigan Stadium
Church St
Elm St
Walnut St
Harvard Pl
Oxford Rd
Cambridge Rd
Orlandage St
Harbal Dr
Broadview Ln
Jones Dr
Balfs Dr
Cedar Bend Dr
Cedar Bend Park
UM Burnett Hall
Pontiac Trl
Traver Rd
Indianola Ave
Pearl St
Chandler Rd
Long Shore Dr
Lakeshore Dr
Kuebler Langford Park
Breckwood Dr
Cooley Ave
Cleal Cres
Argyle Cres
Saunders Cres
Duncan St
Bruce St
Nottingham Dr
Deer Tree Dr
Wines Dr
Miller Ave
Fairview St
Worden Ave
Alpine Dr
Maple Ridge Ave
Virginia Park
Elder Bld
Solon Blvd
Rivermont Dr
Glendale Ct
Ivywood Dr
Arbordale St
Northwood
Fritz Park
Hewett Dr
Mt Pleasant Ave
Hutchins Ave
Allmendinger Park

# APPENDICES

# APPENDIX A – SUPPLEMENTAL DATA PACKAGE, MILLER-CHAPIN SANITARY RELIEF SEWER, ANN ARBOR MICHIGAN (JANUARY 10, 2025)

January 10, 2025
Project No. 241691

OHM Advisors
355 South Zeeb Road, Suite A
Ann Arbor, MI 48103

Attention: Chris Elenbaas, P.E.

Reference: Supplemental Data Package
Miller-Chapin Sanitary Relief Sewer
Ann Arbor, Michigan

Dear Mr. Elenbaas:

We have completed an additional geotechnical investigation and environmental testing services for the above-referenced project. This data package is a supplement to our preliminary geotechnical report no. 241082R dated April 9, 2024. This work has been performed as described in our proposal dated September 19, 2024. Presented herein are descriptions of our investigation methods, data and test results.

## INVESTIGATION METHODOLOGY

### Field Investigation

Subsurface conditions along the proposed 1st Street sewer alignment were investigated by 6 soil test borings in March 2024 and 3 additional soil borings in October and December 2024. Boring depths ranged from 25 ft to 50 ft below the existing ground surface. Boring locations are shown on the attached plan, Figure No. 1.

One of our engineers staked the approximate boring locations in the field. Boring elevations were approximated by GPS, except for Boring SB-11 which was estimated from the 2017 contour map available in the Washtenaw County GIS database. The elevations used in this report are given in feet and are based on NAVD88 datum with boring coordinates based on the Michigan State Plane South coordinate system. If more precise location and elevation data are desired, a registered professional land surveyor should be retained to locate the borings and determine their ground elevations.

The drilling was performed using conventional hollow-stem auger methods to advance the boreholes. The boreholes were backfilled to the original ground surface with compacted soil cuttings or sealed with cement-bentonite grout, where appropriate, and patched with asphalt cold patch after drilling completion. Temporary monitoring wells were installed in Borings SB-102 and SB-103 at the completion of drilling. Monitoring well installation records are attached.

Soil samples were recovered at regular intervals by means of the Standard Penetration Test (SPT), ASTM D1586. The SPT test involves the use of a 140-lb hammer with a 30-inch drop to drive a standard 2.0-inch O.D. split spoon sampler. The number of hammer blows required to drive the sampler 12 inches, after seating 6 inches, is termed the soil N-value and provides an indication of the soil's relative density and strength parameters at the sample location. SPT blow counts in 6-inch increments are recorded on the boring logs. The drill rig was equipped with an automatic hammer system which delivers a more consistent driving energy to the sampler compared to the rope and cathead system.

Recovered samples were sealed, labeled and transported to our laboratory. All soil samples will be discarded after sixty days unless a longer hold time is specifically requested.

The recovered soil samples were reviewed by an engineer and technically classified according to the methods of ASTM D2488 "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)". Estimates of the unconfined compressive strength of the cohesive samples were made using a calibrated penetrometer. A copy of the test boring logs along with a description of the terminology used on the logs and a chart of the ASTM D2488 group symbol names are provided in the Appendix.

Environmental Sampling and Testing

Each soil sample recovered from the test borings was screened with a Photoionization detector (PID) or flammable gas meter to evaluate the possible presence of Volatile Organic Compounds (VOCs). PID and gas meter results are noted on the attached boring logs.

Composite or grab soil samples were collected from each soil boring and analyzed for VOCs, Polynuclear Aromatic Hydrocarbons (PNAs), and Michigan 10 metals. We prepared Table 1 to compare analytical soil test results to generic Michigan Department of Environment Great Lakes and Energy (EGLE) criteria. The locations where soil samples exceeded EGLE criteria are shown on the attached plan, Figure No. 2.

Groundwater samples were collected from Borings SB-1, SB-11, SB-12 and SB-101 and from Monitoring wells MW-102 and MW-103. Groundwater samples were recovered using a peristaltic pump from the monitoring wells or from temporary screen points set within the boreholes. Groundwater samples were analyzed for VOCs, PNAs, and Michigan 10 metals.

We prepared Table 2 to compare analytical groundwater test results to generic EGLE criteria. The analytical test results and comparison table are provided in the Appendix. The locations where groundwater samples exceeded applicable EGLE criteria are shown on the attached plan, Figure No. 3.

Geotechnical Laboratory

Selected samples were subjected to various laboratory tests, including:

- ASTM D422 "Test Method for Particle-Size Analysis of Soils"
- ASTM D1140 "Test Methods for Determining the Amount of Material Finer than 75-μm (No. 200) Sieve in Soils by Washing"

The samples subjected to the grain-size testing were reclassified according to ASTM D2487 procedures "Standard Test Method for Classifications of Soils for Engineering Purposes". The ASTM D2487 and D2488 classifications are included on the boring logs.

Results of the laboratory tests have been summarized in a table and on the Particle Size Distribution Reports attached to this letter.

CLOSURE

We appreciate this opportunity to provide engineering services and express our interest in providing continuing services as the project progresses. Please contact our office should you have any questions or require further assistance.

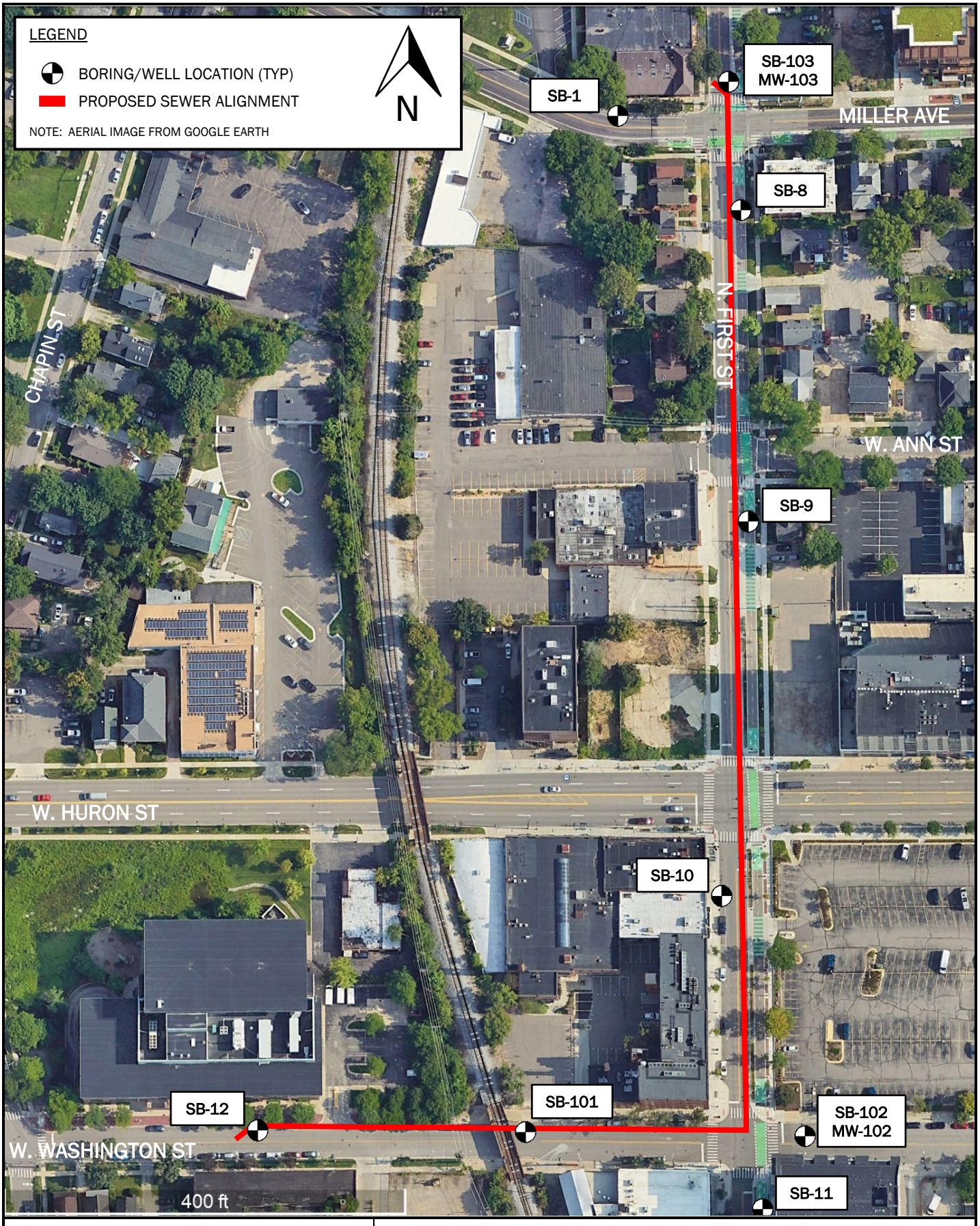
Sincerely,

MATERIALS TESTING CONSULTANTS, INC.

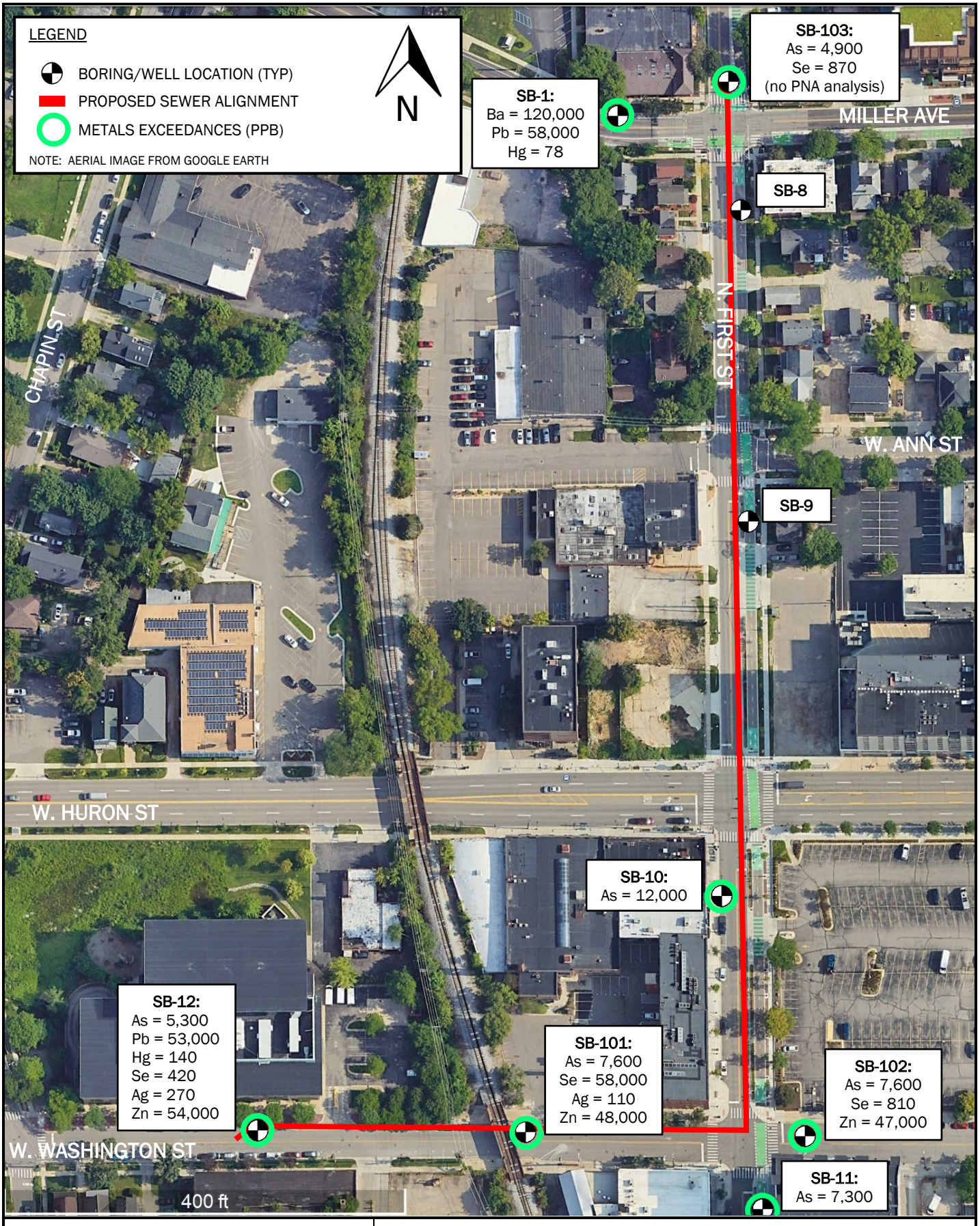
Isaac L. MacMillan, P.E.
Project Manager

Robert J. Warren, P.E.
Senior Project Manager

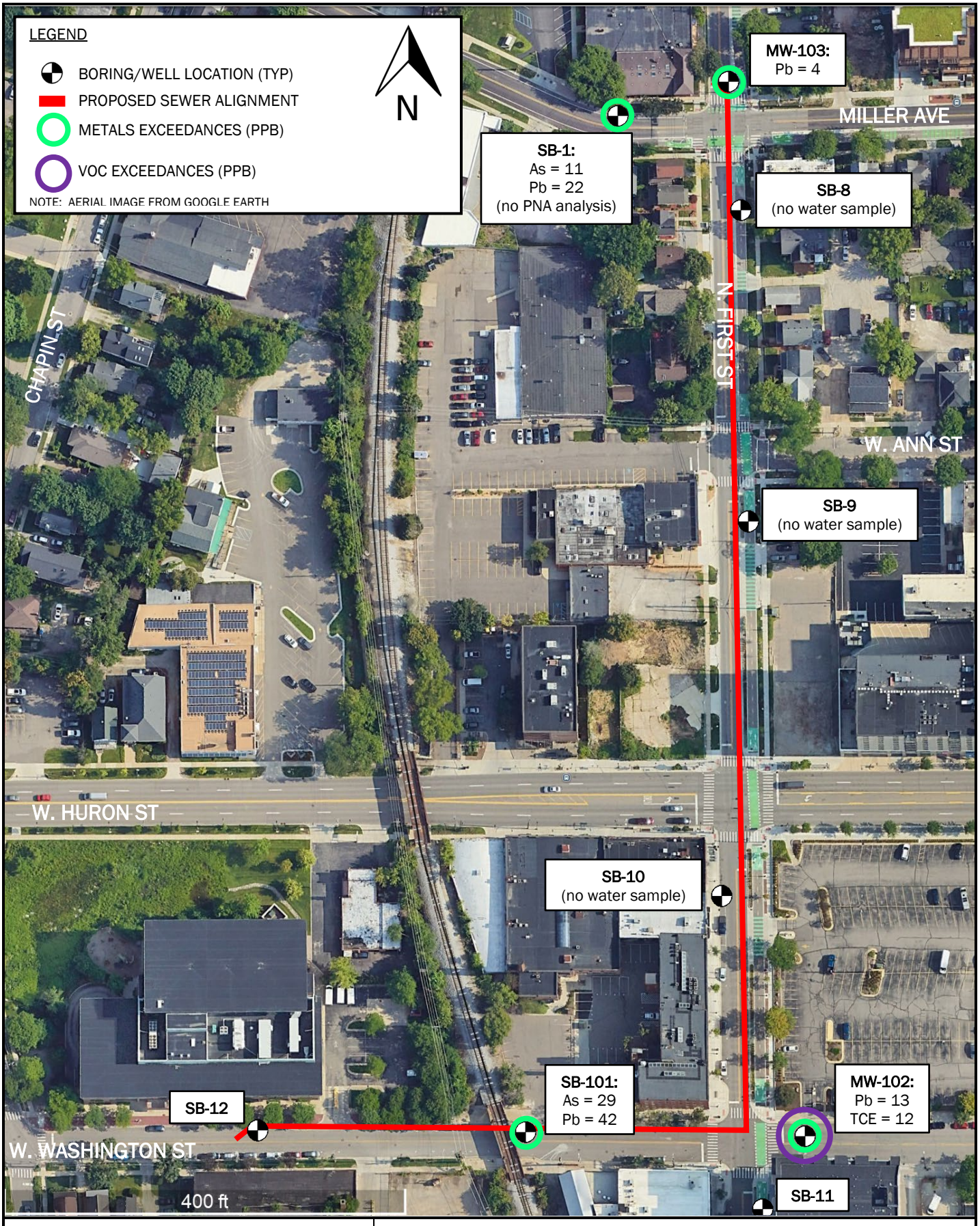
Attachments: Figure No. 1 – Boring Location Plan
Figure No. 2 – Soil Exceedances
Figure No. 3 – Groundwater Exceedances
Figure No. 4 – Generalized Subsurface Profile
Test Drilling and Sampling Procedures
Boring Log Terminology and Classification Outline
Boring Logs
Monitoring Well Installation Records
Particle Size Distribution Reports
Summary of Laboratory Test Data
Table 1 – Comparison of Soil Samples to EGLE Criteria
Table 2 – Comparison of Groundwater Samples to EGLE Criteria
Analytical Test Results



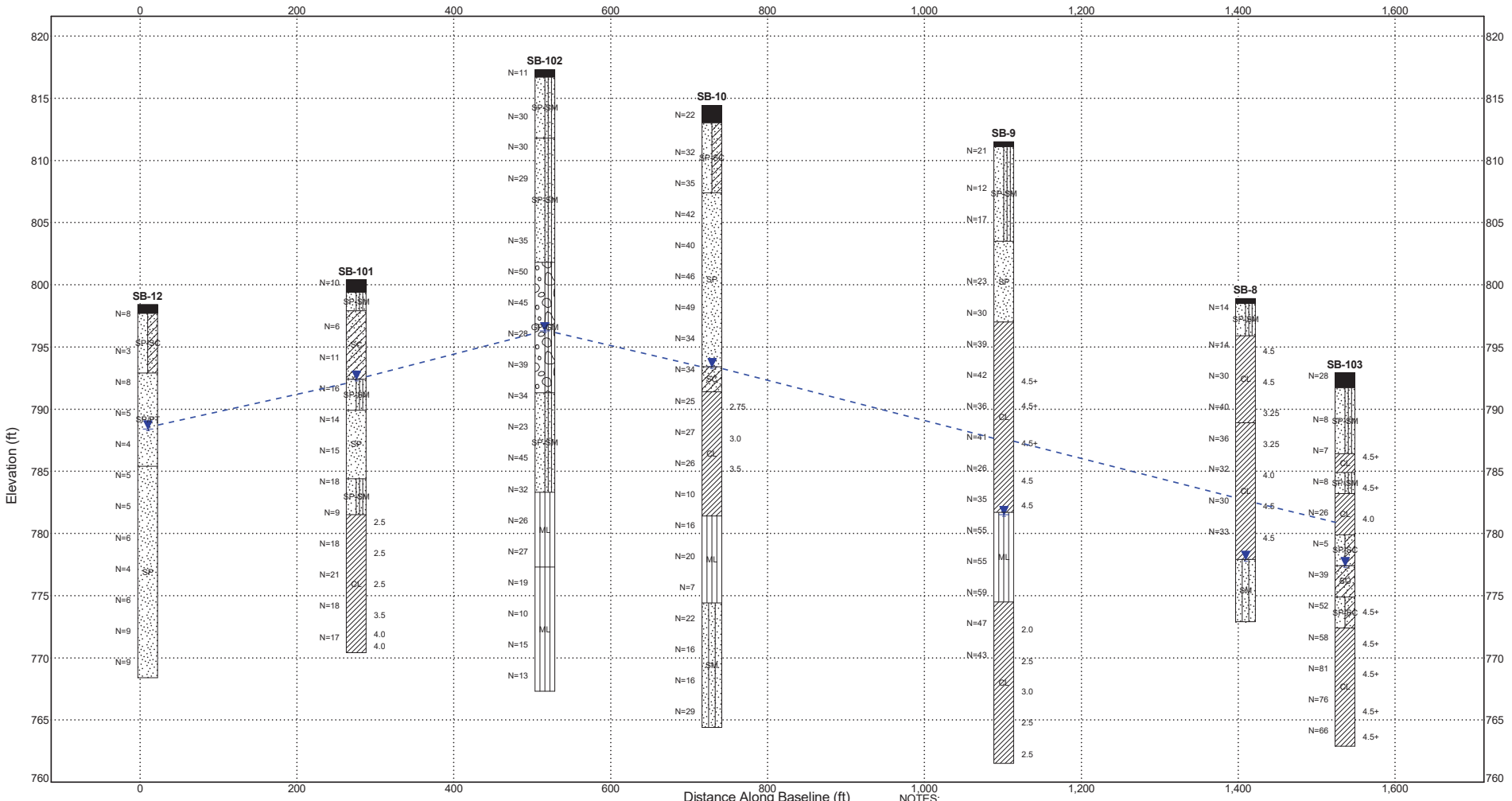

| | | | |
|---|---|---|---|
| TITLE: BORING LOCATION PLAN | | PROJECT: ANN ARBOR HIGH LEVEL TRUNKLINE SEWER IMPROVEMENTS | |
| SCALE: AS SHOWN | DATE: 1/10/2025 | PROJECT NO.: 241691 | MTC MATERIALS TESTING CONSULTANTS |
| FIG. NO.: 1 | DR. BY: IM | REV. BY: RW | |



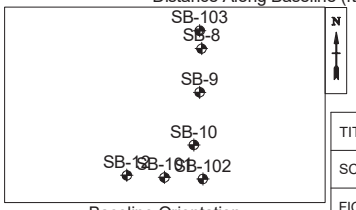

| | | | |
|---|---|---|---|
| TITLE: SOIL EXCEEDANCES | | PROJECT: ANN ARBOR HIGH LEVEL TRUNKLINE SEWER IMPROVEMENTS | |
| SCALE: AS SHOWN | DATE: 1/10/2025 | PROJECT NO.: 241691 | MTC MATERIALS TESTING CONSULTANTS |
| FIG. NO.: 2 | DR. BY: IM | REV. BY: RW | |




| | | | |
|---|---|---|---|
| TITLE: GROUNDWATER EXCEEDANCES | | PROJECT: ANN ARBOR HIGH LEVEL TRUNKLINE SEWER IMPROVEMENTS | |
| SCALE: AS SHOWN | DATE: 1/10/2025 | PROJECT NO.: 241691 | MTC MATERIALS TESTING CONSULTANTS |
| FIG. NO.: 3 | DR. BY: IM | REV. BY: RW | |




Asphalt
USCS Clayey Sand
USCS Silty Sand
Encountered Groundwater Level
Estimated Groundwater Surface
USCS Poorly-graded Sand with Clay
USCS Low Plasticity Clay
USCS Poorly-graded Sand with Silt
USCS Poorly-graded Sand
USCS Silt
USCS Poorly-graded Gravel with Silt




Baseline Orientation

NOTES:
1. SUBSURFACE CONDITONS ARE GENERALIZED. REFER TO BORING LOGS FOR SPECIFIC DESCRIPTIONS.
2. CONDITIONS BETWEEN BORINGS AND GROUNDWATER ELEVATIONS BETWEEN BORINGS MAY VARY.

| | | | |
|---|---|---|---|
| TITLE: GENERALIZED SUBSURFACE PROFILE | | | PROJECT: ANN ARBOR HIGH LEVEL TRUNKLINE SEWER IMPROVEMENTS |
| SCALE: NTS | DATE: 1/10/2025 | PROJECT NO.: 241691 | **Materials Testing Consultants, INC** |
| FIG. NO.: 4 | DR. BY: IM | REV. BY: RW | |

# TEST DRILLING AND SAMPLING PROCEDURES

Test Drilling Methods:

- [X] Hollow stem auger, ASTM D6151
- [ ] Mud rotary, ASTM D5783
- [ ] Casing advancer, ASTM D5872
- [ ] Rock coring, ASTM D2113
- [ ] Core/Hand Auger

*Note: Cone penetration test data can be used to interpret subsurface stratigraphy and can provide data on engineering properties of soils. The ASTM procedure does not include a procedure for determining soil classification from CPT testing. Soil classifications shown on CPT logs are based on published procedures and are not based on physical ASTM soil classification tests.*

Sampling Methods:

- [X] SPT, ASTM D1586, Auto hammer (140 lb., 30" drop, 2" OD split spoon sampler)
- [ ] Thin-walled tube sampler (Shelby), ASTM D1587
- [X] Grab Samples

*Note: The number of hammer blows required to drive the SPT sampler 12 inches, after seating 6 inches, is termed the soil N-value and provides an indication of the soil's relative density and strength parameters at the sample location. SPT blow counts in 6 inch increments are recorded on the boring logs.*

Drill Rig:

- [X] CME 55 (ATV)
- [ ] Acker Renegade (ATV)
- [X] CME 45 Truck
- [ ] Geoprobe 7822 (ATV)
- [ ] Geoprobe Rotary Sonic

Boreholes Backfilled With:

- [X] Excavated soil
- [X] Cement bentonite grout
- [X] Piezometer or Monitoring Well (see notes on logs)
- [X] Concrete or asphalt patch where appropriate

Sample Handling and Disposition:

- [X] Samples labeled, placed in jars, returned to MTC Laboratory
- [X] Discard after 60 days

# BORING LOG TERMINOLOGY AND ASTM D 2488 CLASSIFICATION OUTLINE

## TERMS DESCRIBING CONSISTENCY OR CONDITION

**COARSE-GRAINED** SOILS (major portions retained on No. 200 sieve): includes (1) clean gravel and sands and (2) silty or clayey gravels and sands. Condition is rated according to relative density as determined by laboratory tests or standard penetration resistance tests.

| Descriptive Terms | Relative Density | SPT Blow Count |
|---|---|---|
| Very loose | 0 to 15 % | < 5 |
| Loose | 15 to 35 % | 5 to 10 |
| Medium dense | 35 to 65 % | 10 to 30 |
| Dense | 65 to 85 % | 30 to 50 |
| Very dense | 85 to 100 % | > 50 |

Per ASTM D2487, the following conditions must be met based on laboratory testing to justify the label 'well graded' in a soil description.

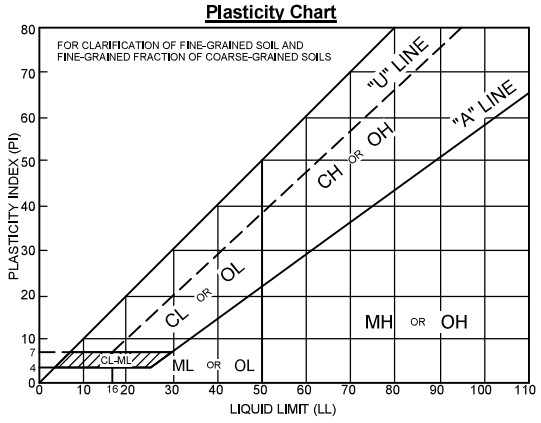
Gravel: $C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

Sand: $C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

**FINE-GRAINED** SOILS (major portions passing on No. 200 sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings, SPT blow count, or unconfined compression tests.

| Descriptive Terms | Unconfined Compressive Strength TSF | SPT Blow Count |
|---|---|---|
| Very soft | < 0.25 | < 2 |
| Soft | 0.25 to 0.5 | 2 to 4 |
| Medium stiff | 0.5 to 1.0 | 4 to 8 |
| Stiff | 1.0 to 2.0 | 8 to 15 |
| Very stiff | 2.0 to 4.0 | 15 to 30 |
| Hard | > 4.0 | > 30 |

### Plasticity Chart




| MAJOR DIVISIONS | | | | | TYPICAL NAMES |
|---|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE | GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE | CLEAN GRAVELS WITH LESS THAN 15% FINES | GW | | WELL-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | | GP | | POORLY-GRADED GRAVELS WITH OR WITHOUT SAND |
| | | GRAVELS WITH 15% OR MORE FINES | GM | | SILTY GRAVELS WITH OR WITHOUT SAND |
| | | | GC | | CLAYEY GRAVELS WITH OR WITHOUT SAND |
| | SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LESS THAN 15% FINES | SW | | WELL-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP | | POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL |
| | | | SP-SM | | POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL |
| | | SANDS WITH 15% OR MORE FINES | SM | | SILTY SANDS WITH OR WITHOUT GRAVEL |
| | | | SC | | CLAYEY SANDS WITH OR WITHOUT GRAVEL |
| FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | | INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CL | | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OL | | ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | | INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | CH | | INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| | | | OH | | ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL |
| HIGHLY ORGANIC SOILS | | | PT/OL | | PEAT AND OTHER HIGHLY ORGANIC SOILS |

## GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. "Grades with" or "Grades without" may be used to describe soil when characteristics vary within a stratum.
3. Preserved soil samples will be discarded after 60 days unless alternate arrangements have been made.

## GROUNDWATER OBSERVATIONS:

During - indicates water level encountered during the boring
End- indicates water level immediately after drilling
Date and Depth - Measurements at indicated date

SAMPLE TYPES AND NUMBERING

| | |
|---|---|
| S | SPT, split barrel sample, ASTM D1586 |
| U | Shelby tube sample, ASTM D1587 |
| R | Rock core run |
| *S | Other than 2" split barrel sample |
| L | SPT with liner, ASTM D1586 |
| A | Auger cuttings |
| G | Geoprobe liner |

MINOR COMPONENT QUANTIFYING TERMS

| | |
|---|---|
| Less than 5% | TRACE |
| 5 to 10% | FEW |
| 15 to 25% | LITTLE |
| 30 to 40% | SOME |
| 50 to 100% | MOSTLY |

GRAIN SIZE

| | |
|---|---|
| BOULDER | >12" |
| COBBLE | 12" to 3" |
| COARSE GRAVEL | 3" to 0.75" |
| FINE GRAVEL | 0.75" to No. 4 |
| COARSE SAND | No. 4 to No. 10 |
| MEDIUM SAND | No. 10 to No.40 |
| FINE SAND | No. 40 to No. 200 |

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-1
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=286096.8 E=13289879.1 (MI South ift)
Elevation: 790.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 15.0 ft.

Date Begin: 03/11/2024 Date End: 03/11/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 8.5 |
| Sampler | SPT | 2" | End | 11.5 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 25.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 789.5 | 1 | | | | | 6" HMA, 6" Gravel Base | | | | Fill: 0' to 13.0' |
| 788.5 | 2 | S-1 | 1.0 | 14-12-12 N=24 | | 1.0 Brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist, Fill | | | | S-1 to S-3: Poor recovery; possible coarse gravel / COBBLE |
| 787.5 | 3 | | | | | | | | | |
| 786.5 | 4 | | | | | | | | | Environmental composite soil sample from 0.5' to 10' |
| 785.5 | 5 | S-2 | 0.0 | 5-5-4 N=9 | | | | | | |
| 784.5 | 6 | | | | | | | | | |
| 783.5 | 7 | S-3 | 1.0 | 1-2-2 N=4 | SC | | | | | |
| 782.5 | 8 | | | | | | | | | |
| 781.5 | 9 | | | | | | | | | |
| 780.5 | 10 | S-4 | 1.3 | 1-1-1 N=2 | | Grades wet at 8.5' | | | | |
| 779.5 | 11 | | | | | | | | | |
| 778.5 | 12 | S-5 | 1.5 | 5-6-17 N=23 | | | | | | |
| 777.5 | 13 | | | | | 13.0 | | | | Driller noted difficult drilling from 12' to 19' |
| 776.5 | 14 | | | | | Brown poorly graded GRAVEL with silt and sand; mostly coarse to fine gravel, little coarse to fine sand, few silty fines, wet | | | | |
| 775.5 | 15 | S-6 | 1.3 | 5-17-6 N=23 | | | | | | Environmental water sample at 15' |
| 774.5 | 16 | | | | | | | | | |
| 773.5 | 17 | S-7 | 1.4 | 12-14-18 N=32 | GP-GM | | | | | |
| 772.5 | 18 | | | | | | | | | |
| 771.5 | 19 | | | | | | | | | |
| 770.5 | 20 | S-8 | 1.5 | 4-10-9 N=19 | | 19.5 | | | | |
| 769.5 | 21 | | | | | Gray SILT; mostly silty fines, trace fine sand, moist | | | | |
| 768.5 | 22 | S-9 | 1.5 | 9-13-17 N=30 | ML | | | | | |
| 767.5 | 23 | | | | | Grades with trace coarse to fine gravel and few coarse to fine sand | | | | |
| 766.5 | 24 | | | | | | | | | |
| 765.5 | 25 | S-10 | 1.5 | 9-17-20 N=37 | | 25.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-8
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285995.5 E=13290005.0 (MI South ift)
Elevation: 798.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 15.0 ft.

Date Begin: 03/03/2024 Date End: 03/03/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21.0 |
| Sampler | SPT | 2" | End | 13.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 26.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 797.9 | 1 | | | | | 5" HMA (0.4) | | | | Fill: 0' to 3.0' |
| 796.9 | 2 | S-1 | 0.8 | 7-7-7 N=14 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, moist, (3.0) | | | | S-1: Poor recovery; possible coarse gravel / COBBLE |
| 795.9 | 3 | | | | | Fill | | | | |
| 794.9 | 4 | | | | | | | | | |
| 793.9 | 5 | S-2 | 1.4 | 12-5-9 N=14 | | Brown lean CLAY; mostly clayey fines, trace coarse to fine sand, trace fine gravel, moist | 4.5 | | | Driller noted difficult drilling at 4' |
| 792.9 | 6 | | | | | | | | | |
| 791.9 | 7 | S-3 | 1.5 | 7-9-21 N=30 | CL | | 4.5 | | | Environmental composite soil sample from 0.5' to 30' |
| 790.9 | 8 | | | | | | | | | |
| 789.9 | 9 | | | | | | | | | |
| 788.9 | 10 | S-4 | 1.5 | 13-17-23 N=40 | | (10.0) | 3.25 | | | |
| 787.9 | 11 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | No environmental water sample due to limited groundwater quantity |
| 786.9 | 12 | S-5 | 1.5 | 9-16-20 N=36 | | | 3.25 | | | |
| 785.9 | 13 | | | | | | | | | |
| 784.9 | 14 | | | | | | | | | |
| 783.9 | 15 | S-6 | 1.5 | 9-13-19 N=32 | | | 4.0 | | | |
| 782.9 | 16 | | | | CL | | | | | |
| 781.9 | 17 | S-7 | 1.5 | 7-12-18 N=30 | | | 4.5 | | | |
| 780.9 | 18 | | | | | Grades with trace coarse to fine sand | | | | |
| 779.9 | 19 | | | | | | | | | |
| 778.9 | 20 | S-8 | 1.5 | 9-13-20 N=33 | | Grades with wet sand seams | 4.5 | | | |
| 777.9 | 21 | | | | | (21.0) | | | | Driller noted difficult drilling at 20' |
| 776.9 | 22 | S-9 | 0.9 | 18-50/5" | | Gray silty SAND; mostly coarse to fine sand, some silty fines, trace coarse to fine gravel, wet | | | | S-9, S-10: Sampler refusal; possible coarse gravel / COBBLE |
| 775.9 | 23 | | | | | | | | | |
| 774.9 | 24 | | | | SM | | | | | |
| 773.9 | 25 | S-10 | 0.9 | 19-50/5" | | | | | | |
| 772.9 | 26 | | | | | (26.0) | | | | |
| | | | | | | End of Boring | | | | Auger refusal at 26.0' due to possible coarse gravel / BOULDER |

PID = Photoionization Detector.
Detection <50 ppm except where noted.

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-9
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285687.1 E=13289991.9 (MI South ift)
Elevation: 811.5 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 33.0 ft.

Date Begin: 03/07/2024 Date End: 03/07/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 30.0 |
| Sampler | SPT | 2" | End | 37.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 810.5 | 1 | | | | | 5" HMA (0.4) | | | | Fill: 0' to 8.0' |
| 809.5 | 2 | S-1 | 1.3 | 6-9-12 N=21 | | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little fine gravel, few silty fines, moist, Fill | | | | |
| 808.5 | 3 | | | | | | | | | |
| 807.5 | 4 | | | | | | | | | |
| 806.5 | 5 | S-2 | 1.5 | 9-6-6 N=12 | SP-SM | | | | | Debris at 4' |
| 805.5 | 6 | | | | | | | | | |
| 804.5 | 7 | S-3 | 1.5 | 13-11-6 N=17 | | Grades with trace recycled asphalt at 6' | | | | Driller noted difficult drilling at 6' |
| 803.5 | 8 | | | | | (8.0) | | | | |
| 802.5 | 9 | | | | | Gray gravelley SAND; mostly coarse to fine sand, some coarse to fine gravel, trace silty fines, moist | | | | |
| 801.5 | 10 | S-4 | 0.5 | 50/8" | | | | | | S-4 to S-7: Poor recovery; possible coarse gravel / COBBLE |
| 800.5 | 11 | | | | | | | | | |
| 799.5 | 12 | S-5 | 0.7 | 36-12-11 N=23 | SP | | | | | Environmental composite soil sample from 0.5' to 30' |
| 798.5 | 13 | | | | | | | | | |
| 797.5 | 14 | | | | | | | | | |
| 796.5 | 15 | S-6 | 1.0 | 16-15-15 N=30 | | (14.5) | | | | |
| 795.5 | 16 | | | | | Gray lean CLAY; mostly clayey fines, few coarse to fine sand, few coarse to fine gravel, moist | | | | No environmental water sample due to limited groundwater quantity |
| 794.5 | 17 | S-7 | 0.0 | 7-17-22 N=39 | | | | | | |
| 793.5 | 18 | | | | | | | | | |
| 792.5 | 19 | | | | | | | | | |
| 791.5 | 20 | S-8 | 1.5 | 13-25-17 N=42 | | | 4.5+ | | | |
| 790.5 | 21 | | | | | | | | | |
| 789.5 | 22 | S-9 | 1.5 | 7-14-22 N=36 | CL | | 4.5+ | | | |
| 788.5 | 23 | | | | | | | | | |
| 787.5 | 24 | | | | | | | | | |
| 786.5 | 25 | S-10 | 1.5 | 8-19-22 N=41 | | | 4.5+ | | | |
| 785.5 | 26 | | | | | | | | | Driller noted difficult drilling at 25' |
| 784.5 | 27 | S-11 | 1.5 | 8-12-14 N=26 | | | 4.5 | | | |
| 783.5 | 28 | | | | | | | | | |
| 782.5 | 29 | | | | | | | | | |
| 781.5 | 30 | S-12 | 1.5 | 14-17-18 N=35 | | (29.8) | 4.5 | | | |
| 780.5 | 31 | | | | | Gray SILT with sand; mostly silty fines, few fine sand, wet with occasional clay lenses | | | | |
| 779.5 | 32 | S-13 | 1.5 | 22-27-28 N=55 | | | | 15.5 | | S-13: LBW = 86.6% |
| 778.5 | 33 | | | | | | | | | |
| 777.5 | 34 | | | | ML | | | | | |
| 776.5 | 35 | S-14 | 1.3 | 12-28-27 N=55 | | | | | | |
| 775.5 | 36 | | | | | | | | | |
| 774.5 | 37 | S-15 | 1.5 | 21-31-28 N=59 | | (37.0) | | | | |
| 773.5 | 38 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | |
| 772.5 | 39 | | | | CL | | | | | |
| 771.5 | 40 | S-16 | 1.5 | 4-14-33 N=47 | | | 2.0 | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-9
**Sheet:** 2 of 2

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 770.5 | 41 | | | | | Gray lean CLAY; mostly clayey fines, moist | | | | S-18, S-19, S-20: Sampler refusal; possible coarse gravel / COBBLE |
| 769.5 | 42 | S-17 | 1.5 | 7-18-25 N=43 | | | 2.5 | | | |
| 768.5 | 43 | | | | | Grades with occasional sand lenses from 38' to 42' | | | | |
| 767.5 | 44 | | | | | | | | | |
| 766.5 | 45 | S-18 | 0.9 | 20-50/5" | CL | | 3.0 | | | |
| 765.5 | 46 | | | | | | | | | |
| 764.5 | 47 | S-19 | 0.7 | 21-50/3" | | | 2.5 | | | |
| 763.5 | 48 | | | | | | | | | |
| 762.5 | 49 | | | | | Grades with trace fine sand at 48' | | | | |
| 761.5 | 50 | S-20 | 0.5 | 50/8" | | 50.0 | 2.5 | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-10
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285314.8 E=13289950.9 (MI South ift)
Elevation: 814.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with grout, patched pavement with cold patch.

Date Begin: 03/13/2024 Date End: 03/13/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21.0 |
| Sampler | SPT | 2" | End | 23.0 |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 813.4 | 1 | | | | | 8" HMA, 6" Gravel Base | | | | Fill: 0' to 21.0' |
| 812.4 | 2 | S-1 | 1.3 | 8-11-11 N=22 | | 1.4 | | | | |
| 811.4 | 3 | | | | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few coarse to fine gravel, few clayey fines, moist, Fill | | | | Driller noted difficult drilling from 2' to 5' |
| 810.4 | 4 | | | | | | | | | S-2, S-4, S-7, S-8: Poor recovery; possible coarse gravel / COBBLE |
| 809.4 | 5 | S-2 | 0.5 | 6-19-13 N=32 | | | | | 240 | |
| 808.4 | 6 | | | | | | | | | |
| 807.4 | 7 | S-3 | 1.4 | 15-12-23 N=35 | | 7.0 | | | 238 | Environmental composite soil sample from 1.5' to 7.5' |
| 806.4 | 8 | | | | | | | | | |
| 805.4 | 9 | | | | | Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist, Fill | | | | |
| 804.4 | 10 | S-4 | 1.2 | 9-19-23 N=42 | | | | | | No environmental water sample due to limited groundwater quantity |
| 803.4 | 11 | | | | | | | | | |
| 802.4 | 12 | S-5 | 1.3 | 5-17-23 N=40 | | | | | | Driller noted difficult drilling from 10' to 20' |
| 801.4 | 13 | | | | | | | | | |
| 800.4 | 14 | | | | | | | | | |
| 799.4 | 15 | S-6 | 1.4 | 21-23-23 N=46 | SP | | | | | |
| 798.4 | 16 | | | | | | | | | |
| 797.4 | 17 | S-7 | 1.0 | 9-16-33 N=49 | | | | | | |
| 796.4 | 18 | | | | | | | | | |
| 795.4 | 19 | | | | | | | | | |
| 794.4 | 20 | S-8 | 0.6 | 9-15-19 N=34 | | | | | | |
| 793.4 | 21 | | | | | 21.0 | | | | |
| 792.4 | 22 | S-9 | 1.3 | 9-15-19 N=34 | SC | Gray clayey SAND; mostly fine sand, some clayey fines, wet | | | | |
| 791.4 | 23 | | | | | 23.0 | | | | |
| 790.4 | 24 | | | | | Gray sandy lean CLAY; mostly clayey fines, little fine sand, moist | 2.75 | | | |
| 789.4 | 25 | S-10 | 1.5 | 9-13-12 N=25 | | | | | | |
| 788.4 | 26 | | | | | | | | | |
| 787.4 | 27 | S-11 | 1.5 | 9-12-15 N=27 | | | 3.0 | | | |
| 786.4 | 28 | | | | CL | | | | | |
| 785.4 | 29 | | | | | | | | | |
| 784.4 | 30 | S-12 | 1.5 | 9-11-15 N=26 | | Grades with trace fine sand | 3.5 | | | |
| 783.4 | 31 | | | | | | | | | |
| 782.4 | 32 | S-13 | 1.5 | 5-4-6 N=10 | | | | 24.7 | | S-13: LBW = 98.2% |
| 781.4 | 33 | | | | | 33.0 | | | | |
| 780.4 | 34 | | | | | Gray SILT with sand; mostly silty fines, little fine sand, wet with occasional clay seams | | | | |
| 779.4 | 35 | S-14 | 1.5 | 4-7-9 N=16 | | | | | | |
| 778.4 | 36 | | | | | | | | | |
| 777.4 | 37 | S-15 | 1.5 | 4-7-13 N=20 | ML | | | | | |
| 776.4 | 38 | | | | | | | | | |
| 775.4 | 39 | | | | | | | | | |
| 774.4 | 40 | S-16 | 1.5 | 2-3-4 N=7 | | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| | LOG OF BORING | Project No.: 241082<br>Boring No.: SB-10<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 773.4 | 41 | | | | | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 772.4 | 42 | S-17 | 1.5 | 6-9-13 N=22 | | | | | | |
| 771.4 | 43 | | | | | | | | | |
| 770.4 | 44 | | | | | | | | | |
| 769.4 | 45 | S-18 | 1.5 | 4-7-9 N=16 | SM | | | | | |
| 768.4 | 46 | | | | | | | | | |
| 767.4 | 47 | S-19 | 1.5 | 5-9-7 N=16 | | Grades with trace coarse to fine gravel | | | | |
| 766.4 | 48 | | | | | | | | | |
| 765.4 | 49 | | | | | | | | | |
| 764.4 | 50 | S-20 | 1.5 | 8-12-17 N=29 | | 50.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-11
**Sheet:** 1 of 2

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=284994.6 E=13289974.9 (MI South ift)
Elevation: 812 ft Datum: NAVD 88 (GPS Observation)
Notes: Elevation estimated from Washtenaw County GIS contours

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 11.4 ft.

Date Begin: 03/20/2024 Date End: 03/20/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 20.0 |
| Sampler | SPT | 2" | End | 20.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 45.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 811.0 | 1 | | | | | 4 1/2" HMA, 5 1/2" Gravel Base 0.8 | | | | Fill: 0' to 17.5' |
| 810.0 | 2 | S-1 | 1.3 | 12-18-13 N=31 | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, few coarse to fine gravel, moist, Fill | | | | Environmental composite soil sample from 0.5' to 30' |
| 809.0 | 3 | | | | | 4.5 | | | | |
| 808.0 | 4 | S-2 | 1.4 | 4-7-6 N=13 | | Gray to brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist, Fill | | | | |
| 807.0 | 5 | | | | | | | | | |
| 806.0 | 6 | | | | | | | | | |
| 805.0 | 7 | S-3 | 1.3 | 8-11-15 N=26 | | | | | | Driller noted difficult drilling at 7' |
| 804.0 | 8 | | | | | | | | | |
| 803.0 | 9 | S-4 | 1.3 | 6-13-15 N=28 | | | | | | |
| 802.0 | 10 | | | | | | | | | |
| 801.0 | 11 | | | | SP | | | | | |
| 800.0 | 12 | S-5 | 1.4 | 5-7-19 N=26 | | | | | | |
| 799.0 | 13 | | | | | | | | | |
| 798.0 | 14 | S-6 | 1.5 | 5-12-19 N=31 | | | | | | |
| 797.0 | 15 | | | | | | | | | |
| 796.0 | 16 | | | | | | | | | |
| 795.0 | 17 | S-7 | 1.1 | 32-28-33 N=61 | | | | | | |
| 794.0 | 18 | | | | | 17.5 | | | | Driller noted difficult drilling from 17' to 22' |
| 793.0 | 19 | | | | | Brown poorly graded SAND with clay and gravel; mostly coarse to fine sand, little clayey fines with occasional clay seams, little coarse to fine gravel, moist | | | | |
| 792.0 | 20 | S-8 | 1.0 | 39-16-17 N=33 | | Grades wet at 20' | | | | S-8, S-9, S-10: Poor recovery; possible coarse gravel / COBBLE |
| 791.0 | 21 | | | | | | | | | |
| 790.0 | 22 | S-9 | 0.6 | 13-21-10 N=31 | | | | | | |
| 789.0 | 23 | | | | | | | | | |
| 788.0 | 24 | | | | SP-SC | | | | | |
| 787.0 | 25 | S-10 | 0.9 | 7-6-5 N=11 | | | | | | Environmental water sample at 25' |
| 786.0 | 26 | | | | | | | | | |
| 785.0 | 27 | S-11 | 1.5 | 14-12-13 N=25 | | | | | | Charged augers with water at 26.0' |
| 784.0 | 28 | | | | | | | | | |
| 783.0 | 29 | | | | | 29.0 | | | | *End water level may be influenced by charging augers |
| 782.0 | 30 | S-12 | 1.5 | 5-5-7 N=12 | | Gray lean CLAY; mostly clayey fines, trace fine sand, moist | 2.5 | | | |
| 781.0 | 31 | | | | CL | | | | | |
| 780.0 | 32 | S-13 | 1.5 | 4-6-8 N=14 | | 32.0 | 2.75 | | | |
| 779.0 | 33 | | | | | Gray SILT; mostly silty fines, trace fine sand, wet with occasional clay seams | | | | |
| 778.0 | 34 | | | | | | | | | |
| 777.0 | 35 | S-14 | 1.5 | 4-6-9 N=15 | ML | | | 23.6 | | S-14: LBW = 99.1% |
| 776.0 | 36 | | | | | | | | | |
| 775.0 | 37 | S-15 | 1.5 | 4-6-6 N=12 | | | | | | |
| 774.0 | 38 | | | | | Grades with occasional sand seams 38.0 | | | | |
| 773.0 | 39 | | | | | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 772.0 | 40 | S-16 | 1.5 | 4-8-15 N=23 | SM | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| | LOG OF BORING | Project No.: 241082<br>Boring No.: SB-11<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 771.0 | 41 | | | | | | | | | |
| 770.0 | 42 | S-17 | 1.5 | 5-2-18<br>N=20 | SM | Gray silty SAND; mostly fine sand, some silty fines, wet | | | | |
| 769.0 | 43 | | | | | | | | | |
| 768.0 | 44 | | | | | | | | | |
| 767.0 | 45 | S-18 | 1.5 | 5-11-15<br>N=26 | | 45.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector.<br>Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241082
**Boring No.:** SB-12
**Sheet:** 1 of 1

Project: Ann Arbor Miller Chapin Relief Sewer
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: IA Rev. By: IM
Coordinates: N=285099.4 E=13289477.2 (MI South ift)
Elevation: 798.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 7.1 ft.

Date Begin: 03/12/2024 Date End: 03/12/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 10.0 |
| Sampler | SPT | 2" | End | 5.0* |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | PID ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 797.4 | 1 | | | | | 3" HMA, 5" Concrete 0.7 | | | | Fill: 0' to 5.5' |
| 796.4 | 2 | S-1 | 1.3 | 6-5-3 N=8 | SP-SC | Brown poorly graded SAND with clay; mostly coarse to fine sand, few clayey fines, moist, Fill | | | | S-2, S-3, S-4, S-8, S-9: Poor recovery; possible coarse gravel / COBBLE |
| 795.4 | 3 | | | | | | | | | |
| 794.4 | 4 | | | | | Grades with few coarse to fine gravel | | | | |
| 793.4 | 5 | S-2 | 0.1 | 3-2-1 N=3 | | 5.5 | | | | Environmental composite soil sample from 0.5' to 10' |
| 792.4 | 6 | | | | | | | | | |
| 791.4 | 7 | S-3 | 0.4 | 5-6-2 N=8 | | Brown poorly graded SAND; mostly coarse to fine sand, trace silty fines, moist with frequent lenses of fibrous peat | | | | Environmental water sample at 11' |
| 790.4 | 8 | | | | | | | | | |
| 789.4 | 9 | | | | | | | | | |
| 788.4 | 10 | S-4 | 0.3 | 3-2-3 N=5 | SP/PT | Grades with little gravel and occasional clay lenses | | | | |
| 787.4 | 11 | | | | | Grades wet at 10' | | | | |
| 786.4 | 12 | S-5 | 1.5 | 2-2-2 N=4 | | 13.0 | | 48.5 | | S-5: 7.7% Organics |
| 785.4 | 13 | | | | | | | | | |
| 784.4 | 14 | | | | | Light brown poorly graded SAND; mostly coarse to fine sand, trace silty fines, wet | | | | |
| 783.4 | 15 | S-6 | 1.5 | 3-2-3 N=5 | | | | | | |
| 782.4 | 16 | | | | | | | | | |
| 781.4 | 17 | S-7 | 1.5 | 6-2-3 N=5 | | | | | | Charged augers with water at 16.0' |
| 780.4 | 18 | | | | | | | | | *End water level may be influenced by charging augers |
| 779.4 | 19 | | | | | | | | | |
| 778.4 | 20 | S-8 | 0.8 | 3-3-3 N=6 | | | | | | |
| 777.4 | 21 | | | | | | | | | |
| 776.4 | 22 | S-9 | 1.2 | 3-2-2 N=4 | SP | | | | | |
| 775.4 | 23 | | | | | | | | | |
| 774.4 | 24 | | | | | | | | | |
| 773.4 | 25 | S-10 | 1.5 | 2-2-4 N=6 | | Grades without silty fines | | | | |
| 772.4 | 26 | | | | | | | | | |
| 771.4 | 27 | S-11 | 1.3 | 4-4-5 N=9 | | | | | | |
| 770.4 | 28 | | | | | | | | | |
| 769.4 | 29 | | | | | | | | | |
| 768.4 | 30 | S-12 | 1.5 | 3-4-5 N=9 | | 30.0 | | | | |
| | | | | | | End of Boring | | | | PID = Photoionization Detector. Detection <50 ppm except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241691
**Boring No.:** SB-101
**Sheet:** 1 of 1

Project: Ann Arbor High Level Trunkline Sewer Improvements
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: KE Field Eng.: JV Rev. By: IM
Coordinates: N=285084.5 E=13289743.2 (MI South ift)
Elevation: 800.4 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Backfilled borehole with bentonite grout, patched pavement with cold patch.

Date Begin: 10/24/2024 Date End: 10/24/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 8 |
| Sampler | SPT | 2" | End | NA |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 799.4 | 1 | S-1 | 1.1 | 38-6-4 N=10 | | 4" HMA<br>8" Gravel Base (1.0) | | | | Fill: 0.0' to 2.5' |
| 798.4 | 2 | | | | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, few silty fines, few coarse to fine gravel, moist, Fill (2.5) | | | | Environmental composite soil sample from 1.0' to 30.0' |
| 797.4 | 3 | | | | | | | | | |
| 796.4 | 4 | S-2 | 0.9 | 3-3-3 N=6 | SC | Brown clayed SAND with gravel; mostly coarse to fine sand, little clayey fines, few coarse to fine gravel, moist | | | | S-2: Poor recovery; possible coarse gravel / COBBLE |
| 795.4 | 5 | | | | | | | | | |
| 794.4 | 6 | | | | | | | | | |
| 793.4 | 7 | S-3 | 1.1 | 3-6-5 N=11 | | | | | | |
| 792.4 | 8 | | | | | (8.0) | | | | |
| 791.4 | 9 | S-4 | 1.3 | 6-8-8 N=16 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, some coarse to fine gravel, few silty fines, wet (10.5) | | | | |
| 790.4 | 10 | | | | | | | | | |
| 789.4 | 11 | | | | SP | Gray poorly graded SAND with gravel; mostly coarse to fine sand, little fine gravel, trace silty fines, wet | | | | |
| 788.4 | 12 | S-5 | 1.5 | 5-6-8 N=14 | | | | | | |
| 787.4 | 13 | | | | | | | | | |
| 786.4 | 14 | S-6 | 1.5 | 3-4-11 N=15 | | | | | | Environmental water sample at 13.5' via temporary screen set from 8.5' to 13.5' |
| 785.4 | 15 | | | | | | | | | |
| 784.4 | 16 | | | | | (16.0) | | | | |
| 783.4 | 17 | S-7 | 1.5 | 4-10-8 N=18 | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, wet | | | | |
| 782.4 | 18 | | | | | | | | | Augers charged with water at 16.8' |
| 781.4 | 19 | | | | | (18.9) | | | | |
| 780.4 | 20 | S-8 | 1.5 | 4-4-5 N=9 | CL | Gray lean CLAY; mostly clayey fines, moist | 2.5 | | | |
| 779.4 | 21 | | | | | | | | | |
| 778.4 | 22 | S-9 | 1.2 | 6-8-10 N=18 | | | 2.5 | | | |
| 777.4 | 23 | | | | | | | | | |
| 776.4 | 24 | S-10 | 1.5 | 6-9-12 N=21 | | | 2.5 | | 1.1* | *S-10: 1.1 ppm H2S |
| 775.4 | 25 | | | | | | | | | |
| 774.4 | 26 | | | | | | | | | |
| 773.4 | 27 | S-11 | 1.5 | 5-7-11 N=18 | | | 3.5 | | | |
| 772.4 | 28 | | | | | | | | | |
| 771.4 | 29 | S-12 | 1.5 | 7-7-10 N=17 | | | 4.0 | | | |
| 770.4 | 30 | | | | | (30.0) | | | | |
| | | | | | | End of Boring | | | | VOC content correlated from combustible gas detector. Detection below threshold except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241691
**Boring No.:** SB-102
**Sheet:** 1 of 2

Project: Ann Arbor High Level Trunkline Sewer Improvements
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: KE Field Eng.: BG Rev. By: IM
Coordinates: N=285074 E=13290014.1 (MI South ift)
Elevation: 817.3 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Installed flush-mount monitoring well MW-102

Date Begin: 10/25/2024 Date End: 10/25/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 21 |
| Sampler | SPT | 2" | End | NA |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 50.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 816.3 | 1 | S-1 | 1.5 | 3-3-8 N=11 | | 3 1/2" HMA, 4" Concrete 0.6 | | | | Fill: 0.0' to 5.5' |
| 815.3 | 2 | | | | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, some coarse to fine gravel, few silty fines, moist, Fill | | | | Environmental composite soil sample from 1.0' to 50.0' |
| 814.3 | 3 | | | | | | | | | |
| 813.3 | 4 | S-2 | 1.5 | 7-15-15 N=30 | | 5.5 | | | | |
| 812.3 | 5 | | | | | | | | | |
| 811.3 | 6 | | | | | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, moist | | | | |
| 810.3 | 7 | S-3 | 1.5 | 15-14-16 N=30 | | | | | | |
| 809.3 | 8 | | | | | | | | | |
| 808.3 | 9 | S-4 | 1.0 | 9-13-16 N=29 | | | | | | S-4, S-5, S-6, S-7: Poor recovery; possible coarse gravel / COBBLE |
| 807.3 | 10 | | | | | | | | | |
| 806.3 | 11 | | | | SP-SM | | | | | |
| 805.3 | 12 | S-5 | 0.0 | 50/3" | | Grades with coarse gravel and frequent COBBLE | | | | S-5: Sampler refusal; possible coarse gravel / COBBLE |
| 804.3 | 13 | | | | | | | | | |
| 803.3 | 14 | S-6 | 1.2 | 17-18-17 N=35 | | | | | | |
| 802.3 | 15 | | | | | 15.5 | | | | |
| 801.3 | 16 | | | | | Brown poorly graded GRAVEL with silt and sand; mostly coarse to fine gravel, some coarse to fine sand, few silty fines, moist with occasional COBBLE | | | | |
| 800.3 | 17 | S-7 | 0.8 | 10-25-25 N=50 | | | | | | |
| 799.3 | 18 | | | | | | | | | |
| 798.3 | 19 | S-8 | 1.5 | 25-25-20 N=45 | | | | | | |
| 797.3 | 20 | | | | | | | | | |
| 796.3 | 21 | | | | GP-GM | | | | | |
| 795.3 | 22 | S-9 | 1.5 | 7-17-11 N=28 | | Grades wet at 21.0' | | | | |
| 794.3 | 23 | | | | | | | | | |
| 793.3 | 24 | S-10 | 1.5 | 35-23-16 N=39 | | | | | | |
| 792.3 | 25 | | | | | | | | | |
| 791.3 | 26 | | | | | 26.0 | | | | |
| 790.3 | 27 | S-11 | 1.5 | 15-14-20 N=34 | | Brown poorly graded SAND with silt and gravel; mostly fine sand, some coarse to fine gravel, few silty fines, wet | | | | Charged augers with water at 26.0' |
| 789.3 | 28 | | | | | | | | | |
| 788.3 | 29 | S-12 | 0.8 | 3-8-15 N=23 | | | | | | S-12, S-13: Poor recovery: possible coarse gravel / COBBLE |
| 787.3 | 30 | | | | SP-SM | | | | | |
| 786.3 | 31 | | | | | | | | | |
| 785.3 | 32 | S-13 | 0.8 | 14-22-23 N=45 | | | | | | S-13: LBW=6.0% |
| 784.3 | 33 | | | | | | | | | |
| 783.3 | 34 | | | | | 34.0 | | | | |
| 782.3 | 35 | S-14 | 1.5 | 23-17-15 N=32 | | Gray SILT with sand; mostly silty fines, little fine sand, wet | | | | |
| 781.3 | 36 | | | | | | | | | |
| 780.3 | 37 | S-15 | 1.5 | 11-11-15 N=26 | ML | | | | | S-15: LBW=78.2% |
| 779.3 | 38 | | | | | | | | | |
| 778.3 | 39 | | | | | | | | | |
| 777.3 | 40 | S-16 | 1.5 | 7-11-16 N=27 | | 40.0 | | | | |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

| MTC | LOG OF BORING | Project No.: 241691<br>Boring No.: SB-102<br>Sheet: 2 of 2 |
|---|---|---|

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100% — QP = Calibrated Penetrometer (tons/sq. ft.)

| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 776.3 | 41 | | | | | Gray SILT with sand; mostly silty fines, little fine sand, wet | | | | |
| 775.3 | 42 | S-17 | 1.5 | 7-7-12 N=19 | | | | | | |
| 774.3 | 43 | | | | | | | | | |
| 773.3 | 44 | | | | | | | | | |
| 772.3 | 45 | S-18 | 1.5 | 3-3-7 N=10 | ML | | | | | |
| 771.3 | 46 | | | | | | | | | |
| 770.3 | 47 | S-19 | 1.5 | 3-7-8 N=15 | | | | | | |
| 769.3 | 48 | | | | | | | | | |
| 768.3 | 49 | | | | | | | | | |
| 767.3 | 50 | S-20 | 1.5 | 4-5-8 N=13 | | 50.0 | | | | |
| | | | | | | End of Boring | | | | VOC content correlated from combustible gas detector. Detection below threshold except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

# LOG OF BORING

**Project No.:** 241691
**Boring No.:** SB-103
**Sheet:** 1 of 1

Project: Ann Arbor High Level Trunkline Sewer Improvements
Client: OHM Advisors
Location: Ann Arbor, Michigan
Drill Type: CME 55 LC
Crew Chief: KE Field Eng.: JV Rev. By: IM
Coordinates: N=286122.3 E=13289992.4 (MI South ift)
Elevation: 792.9 ft Datum: NAVD 88 (GPS Observation)
Notes:

Plugging Record: Installed flush-mount monitoring well MW-103.

Date Begin: 12/02/2024 Date End: 12/03/2024

| Tooling | Type | Dia. | Groundwater, ft. | |
|---|---|---|---|---|
| Casing | HSA | 4 1/4" | During | 15.5 |
| Sampler | SPT | 2" | End | NA |
| Core | | | Delayed Groundwater, ft. | |
| Tube | | | Date | Depth, ft. |
| SPT Hammer | Auto | | | |
| | | | | |

Depth Drilled: 30.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

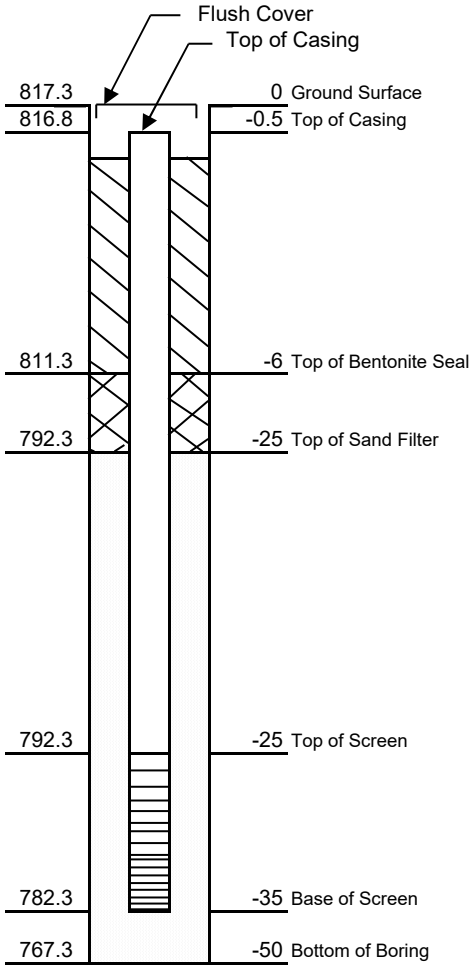
| Elev. FT. | Depth FT. | Sample Number | Recov. FT. | Penetration (Blows Per 6") ASTM D 1586 | *USCS Group Symbol | *DESCRIPTION | QP tsf | MST % | VOC ppm | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 791.9 | 1 | S-1 | 1.3 | 11-13-15 N=28 | | 7" HMA, 7" Gravel Base (1.2) | | | | Fill: 0' to 6.5' |
| 790.9 | 2 | | | | SP-SM | Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, few silty fines, few coarse to fine gravel, moist, Fill | | | | Environmental composite sample from 1.2' to 30.0' |
| 789.9 | 3 | | | | | | | | | |
| 788.9 | 4 | S-2 | 1.2 | 4-4-4 N=8 | | | | | | S-2, S-4, S-6: Poor recovery; possible coarse gravel / COBBLE |
| 787.9 | 5 | | | | | | | | | |
| 786.9 | 6 | | | | | (6.5) | | | | |
| 785.9 | 7 | S-3 | 1.3 | 3-4-3 N=7 | CL | Brown lean CLAY; mostly clayey fines, few coarse to fine gravel, few coarse to fine sand, moist (8.0) | 4.5+ | | | |
| 784.9 | 8 | | | | | | | | | |
| 783.9 | 9 | S-4 | 1.2 | 2-3-5 N=8 | SP-SM | Brown poorly graded SAND with silt; mostly coarse to fine sand, few coarse to fine gravel, few silty fines, moist (9.7) | 4.5+ | | | |
| 782.9 | 10 | | | | | | | | | |
| 781.9 | 11 | | | | CL | Gray lean CLAY; mostly clayey fines, few coarse to fine gravel, moist with occasional silt lenses (13.0) | 4.0 | | | |
| 780.9 | 12 | S-5 | 1.5 | 8-15-11 N=26 | | Grades with occasional sand lenses at 11.0' | | | | |
| 779.9 | 13 | | | | | | | | | |
| 778.9 | 14 | S-6 | 0.7 | 4-3-2 N=5 | SP-SC | Gray poorly graded SAND with clay and gravel; mostly fine sand, little coarse to fine gravel, few clayey fines, moist (15.5) | | | | |
| 777.9 | 15 | | | | | Grades wet at 15.5' | | | | |
| 776.9 | 16 | | | | | | | | | |
| 775.9 | 17 | S-7 | 1.5 | 9-15-24 N=39 | SC | Gray clayey SAND; mostly fine sand, some clayey fines, trace coarse to fine gravel, wet (18.0) | | | | S-7: LBW=40.6% |
| 774.9 | 18 | | | | | | | | | |
| 773.9 | 19 | S-8 | 1.5 | 13-24-28 N=52 | SP-SC | Gray poorly graded SAND with clay; mostly fine sand, few fine gravel, few clayey fines, wet (20.5) | 4.5+ | | | |
| 772.9 | 20 | | | | | | | | | |
| 771.9 | 21 | | | | CL | Gray lean CLAY with sand; mostly clayey fines, little coarse to fine sand, few coarse to fine gravel, moist | | | | Charged augers with water at 20.0' |
| 770.9 | 22 | S-9 | 1.5 | 23-25-33 N=58 | | | 4.5+ | | | |
| 769.9 | 23 | | | | | | | | | |
| 768.9 | 24 | S-10 | 1.5 | 33-50-31 N=81 | | | 4.5+ | | | |
| 767.9 | 25 | | | | | | | | | |
| 766.9 | 26 | | | | | | | | | |
| 765.9 | 27 | S-11 | 1.5 | 12-36-40 N=76 | | | 4.5+ | | | |
| 764.9 | 28 | | | | | | | | | |
| 763.9 | 29 | S-12 | 1.5 | 15-31-35 N=66 | | | 4.5+ | | | |
| 762.9 | 30 | | | | | (30.0) | | | | |
| | | | | | | End of Boring | | | | VOC content correlated from combustible gas detector. Detection below threshold except where noted. |

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

Materials Testing Consultants
www.mtc-test.com • 800.968.8378

# TEMPORARY MONITORING WELL INSTALLATION RECORD

Project Name: Ann Arbor High Level Trunkline Sewer Improvements | Project No.: 241691
MW No.: 102 | Location: | Installation Date: 10/25/24
Client: OHM Advisors | Crew Chief/Inspector: KE / BG




| | | | | | |
|---|---|---|---|---|---|
| Stainless Steel | | Type | 316 or 314 | |
| Casing type SCH 40 PVC | X | | Casing Dia. | 2" |
| (Riser Type) SCH 80 PVC | | | No. 5 ft Lengths Used | 1 |
| Galvanized | | | No. 10 ft Lengths Used | 2 |
| Black Steel | | | Other Lengths | |

| | | | | |
|---|---|---|---|---|
| | Stainless Steel | | Well Screen Length | 10' |
| Screen Type | SCH 40 PVC | X | Well Screen Dia. | 2" |
| | SCH 80 PVC | | No. 5 ft Lengths Used | |
| | Galvanized | | No. 10 ft Lengths Used | 1 |
| | Black Steel | | Other Lengths | |

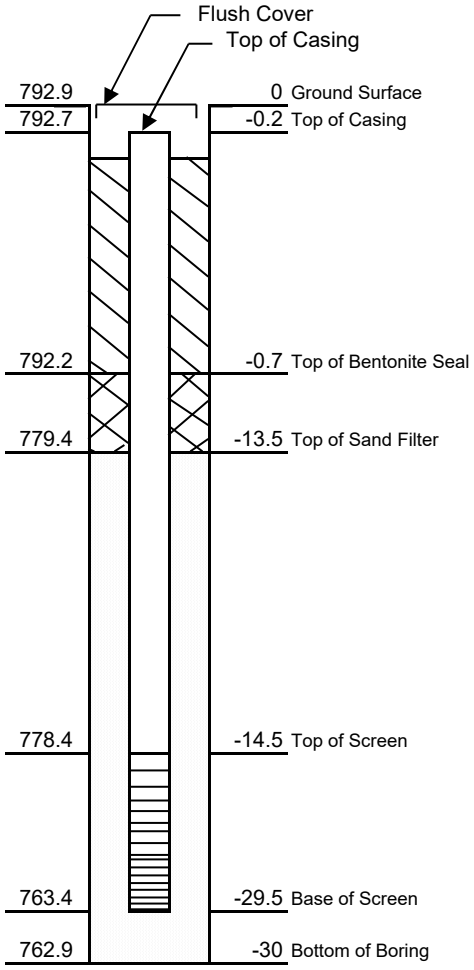
| Date | Water Level | Elevation |
|---|---|---|
| 10/25/2024 | 21 | 796.3 |
| 12/5/2024 | 21.5 | 795.8 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Remarks: Pulled auger and verified borehole cave-in from 50 ft to 35 ft.

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# TEMPORARY MONITORING WELL INSTALLATION RECORD

Project Name: Ann Arbor High Level Trunkline Sewer Improvements
Project No.: 241691
MW No.: 103 Location:
Installation Date: 12/03/24
Client: OHM Advisors
Crew Chief/Inspector: KE / JV



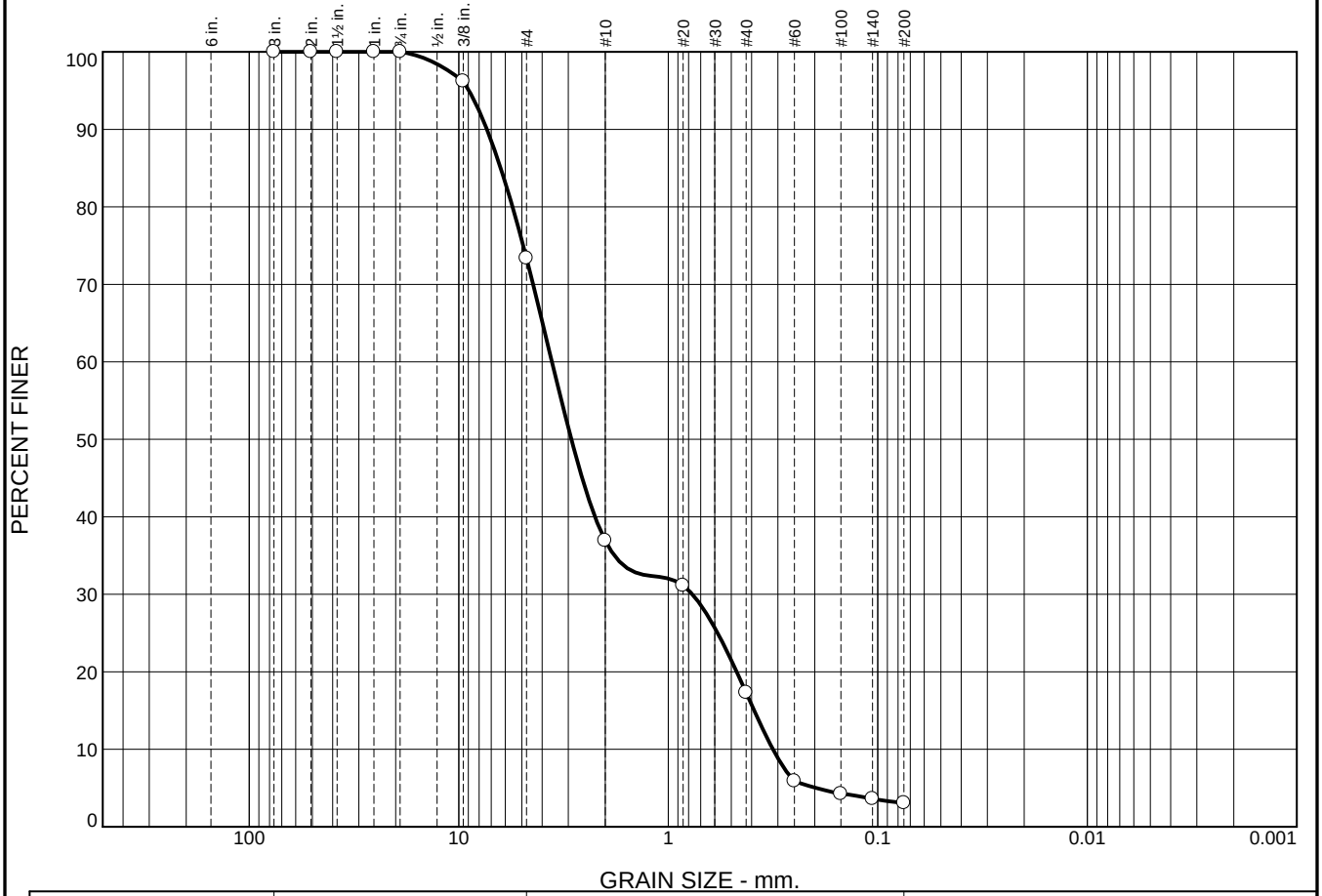

| | | | |
|---|---|---|---|
| Stainless Steel | | Type | 316 or 314 |
| Casing type SCH 40 PVC | X | | Casing Dia. 2" |
| (Riser Type) SCH 80 PVC | | | No. 5 ft Lengths Used 1 |
| Galvanized | | | No. 10 ft Lengths Used 1 |
| Black Steel | | | Other Lengths |

| | | | | |
|---|---|---|---|---|
| | Stainless Steel | | Well Screen Length | 15' |
| Screen Type | SCH 40 PVC | X | Well Screen Dia. | 2" |
| | SCH 80 PVC | | No. 5 ft Lengths Used | 1 |
| | Galvanized | | No. 10 ft Lengths Used | 1 |
| | Black Steel | | Other Lengths | |

| Date | Water Level | Elevation |
|---|---|---|
| 12/2/2024 | 15.5 | 777.4 |
| 12/5/2024 | 12.4 | 780.5 |

Remarks:

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 26.6 | 36.5 | 19.6 | 14.2 | 3.1 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 6.3084 | 3.5921 | 2.9019 | 0.7671 | 0.3889 | 0.3166 | 0.52 | 11.34 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Gravel | SP | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-101 **Sample Number:** S-5

**Date:** ○ 12/06/2024

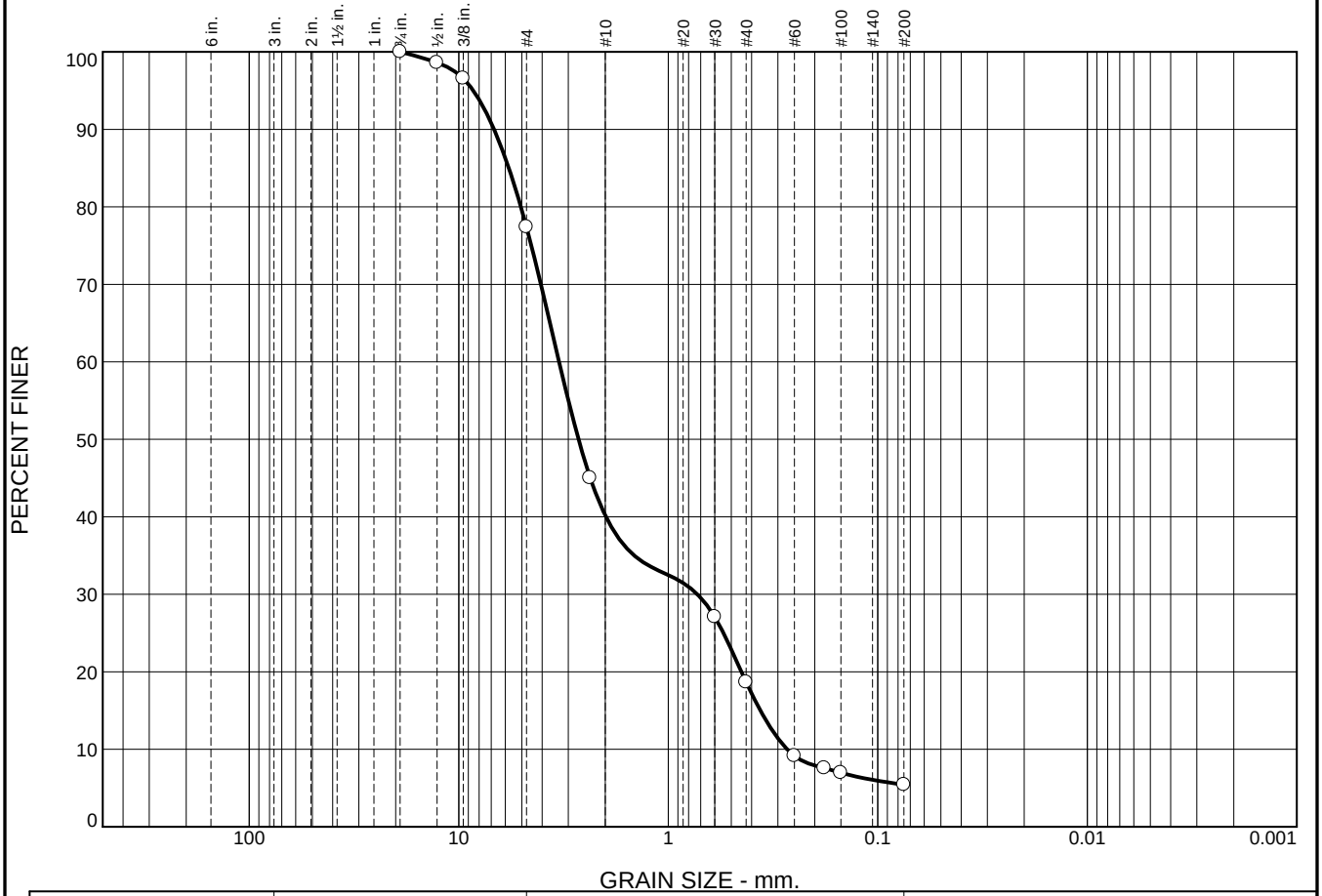
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 22.6 | 37.2 | 21.5 | 13.3 | 5.4 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 5.7684 | 3.3205 | 2.6824 | 0.7261 | 0.3632 | 0.2709 | 0.59 | 12.26 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Gravel | SP | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** B-101 **Sample Number:** S-6

**Date:** ○ 11/22/2024

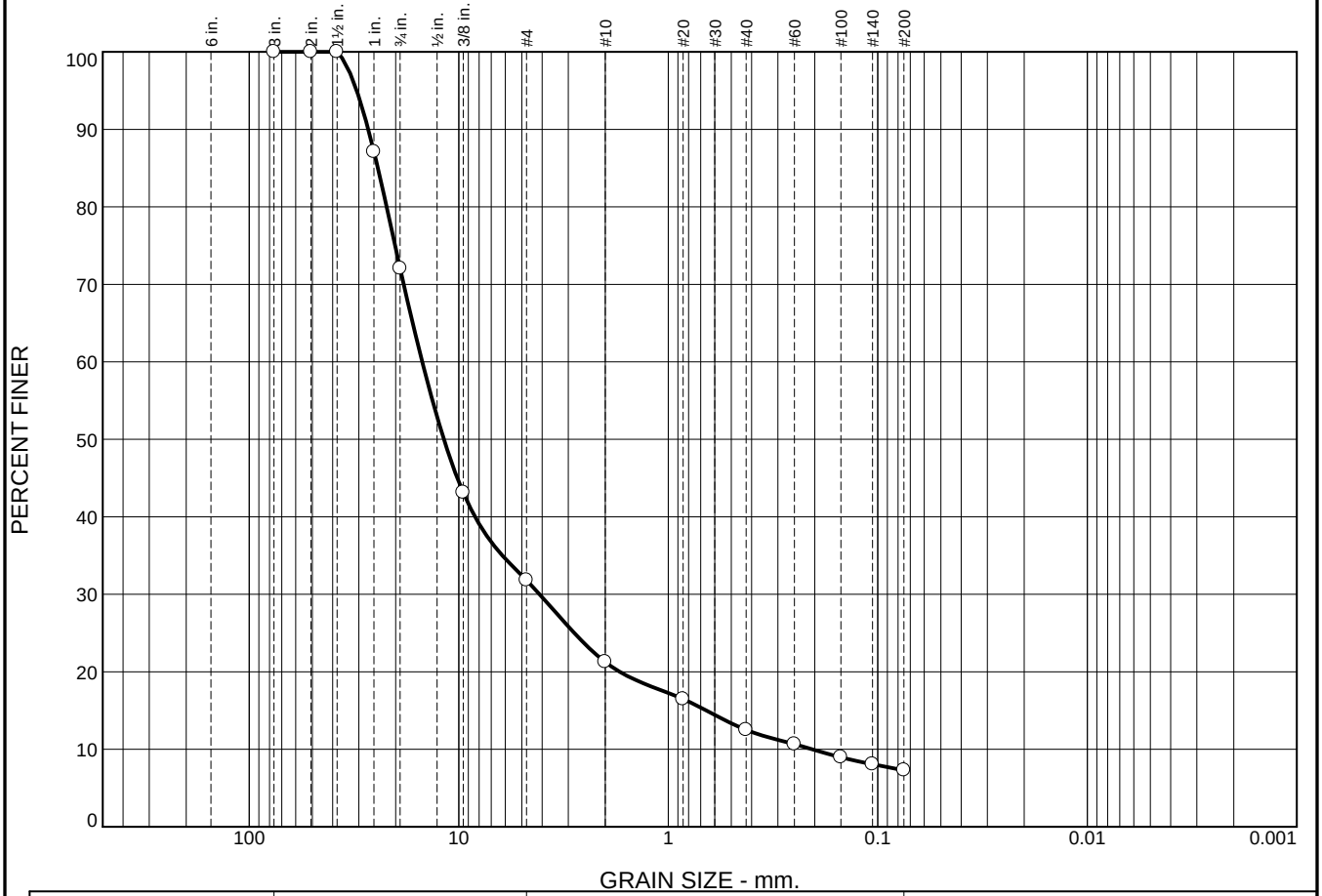
**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Remarks:**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 27.9 | 40.3 | 10.5 | 8.8 | 5.2 | 7.3 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 24.3285 | 14.9455 | 11.7718 | 4.1130 | 0.6576 | 0.2052 | 5.52 | 72.82 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Gravel with Silt | GP-GM | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-102 **Sample Number:** S-10

**Date:** ○ 12/17/2024

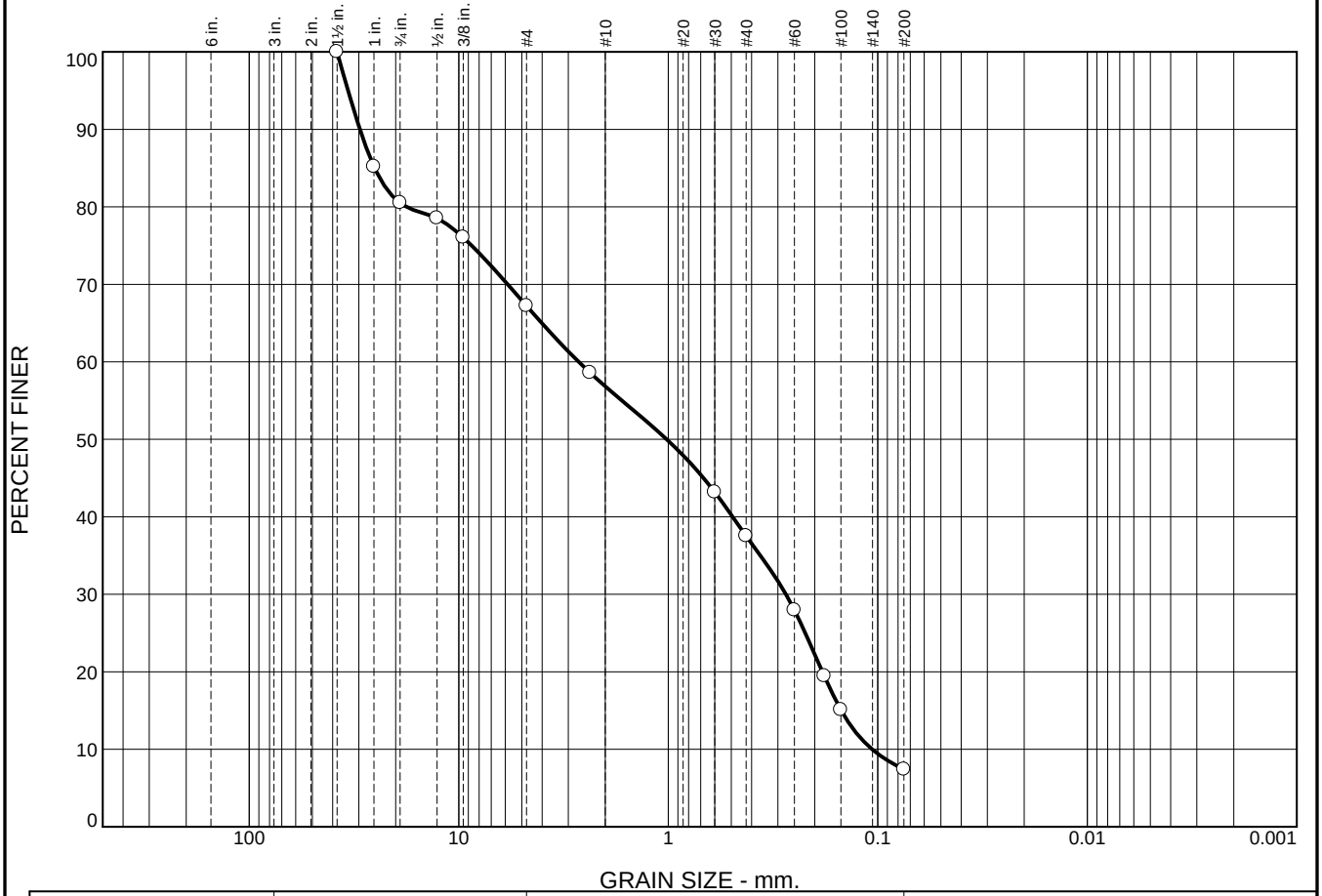
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 19.5 | 13.3 | 10.4 | 19.3 | 30.1 | 7.4 | |
| | | | | | | | | |
| | | | | | | | | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 25.2138 | 2.6765 | 1.0179 | 0.2747 | 0.1494 | 0.1064 | 0.26 | 25.15 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Silt and Gravel | SP-SM | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** B-102 **Sample Number:** S-12

**Date:** ○ 11/22/2024

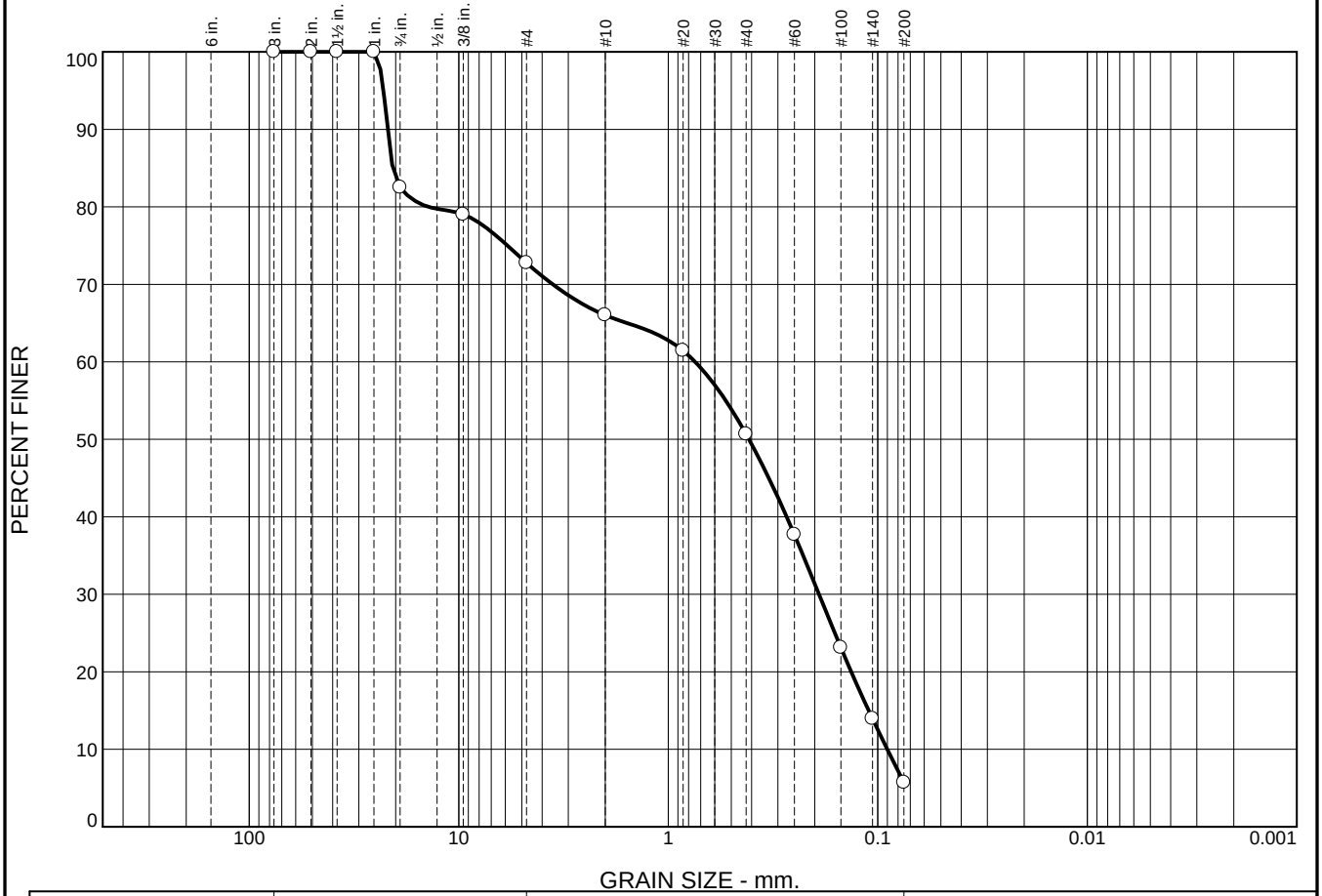
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 17.5 | 9.7 | 6.8 | 15.3 | 45.0 | 5.7 | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 20.6533 | 0.7442 | 0.4120 | 0.1908 | 0.1105 | 0.0901 | 0.54 | 8.26 |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Clay and Gravel | SP-SC | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-103 **Sample Number:** S-6

**Date:** ○ 12/17/2024

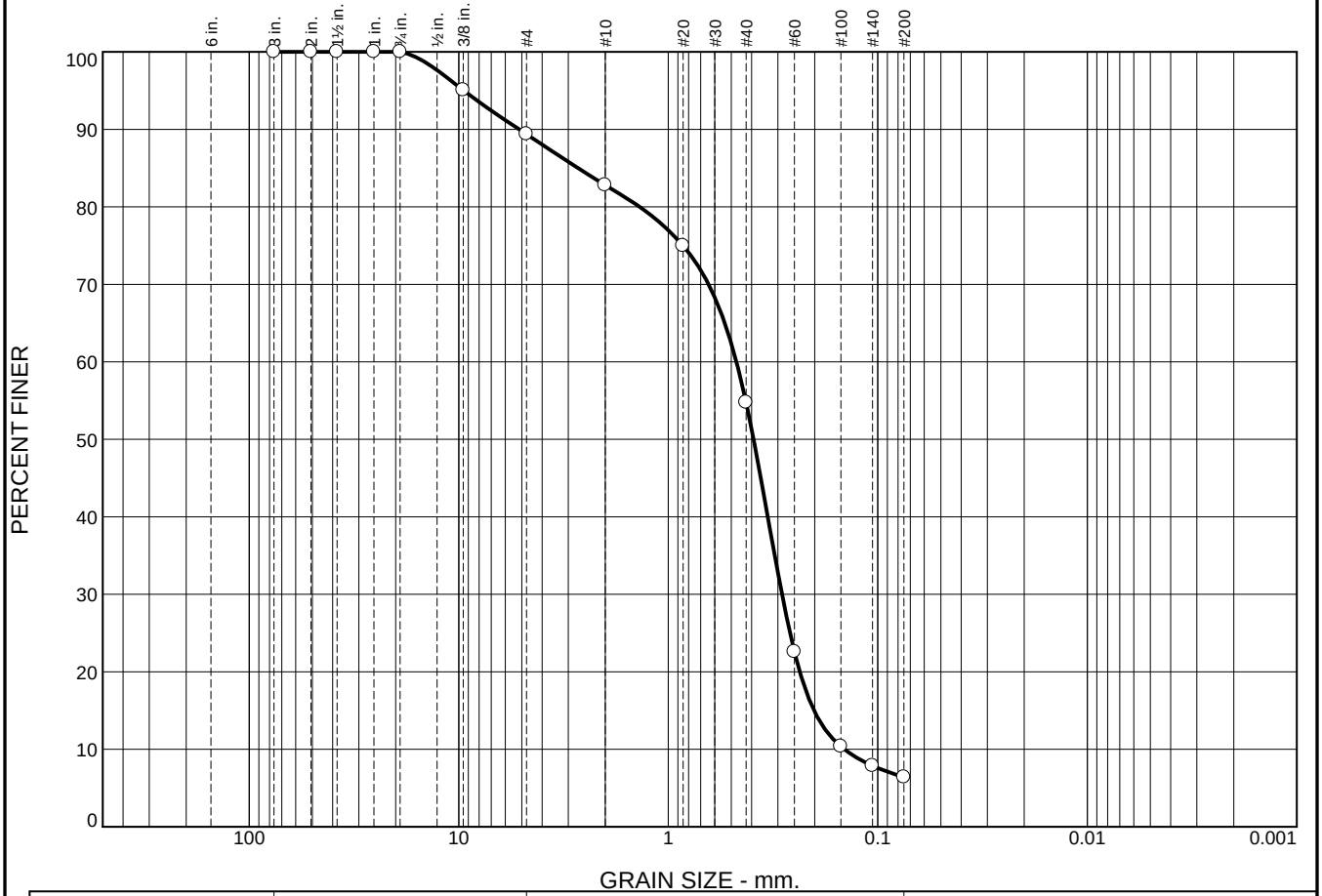
**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# Particle Size Distribution Report




| | % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|---|
| | | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| ○ | 0.0 | 0.0 | 10.6 | 6.6 | 28.0 | 48.4 | 6.4 | |
| | | | | | | | | |
| | | | | | | | | |

| | Colloids | LL | PL | $D_{85}$ | $D_{60}$ | $D_{50}$ | $D_{30}$ | $D_{15}$ | $D_{10}$ | $C_c$ | $C_u$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ○ | | | | 2.6927 | 0.4729 | 0.3914 | 0.2866 | 0.2014 | 0.1442 | 1.20 | 3.28 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| Material Description | USCS | AASHTO |
|---|---|---|
| ○ Poorly Graded Sand with Clay | SP-SC | |

**Project No.** 241691.0 **Client:** OHM Advisors

**Project:** Ann Arbor High Level Trunkline Sewer Improvements

○ **Location:** SB-103 **Sample Number:** S-8

**Date:** ○ 12/17/2024

**Remarks:**

**MATERIALS TESTING CONSULTANTS, INC.**

**Dexter, MI**

**Figure**

# SUMMARY OF LABORATORY TEST DATA

| Boring Number | Sample No.* | Sample Depth (ft) | Sample Description (USCS Symbol) | Loss By Wash (%) |
|---|---|---|---|---|
| SB-102 | S-13 | 31-32.5 | SP-SM | 6.0 |
| SB-102 | S-15 | 28.5-30 | ML | 78.2 |
| SB-103 | S-7 | 16-17.5 | SC | 40.6 |

*S = Split Spoon Sample (ASTM D1586)

PROJECT NO.: 241691

# TABLE 1

## 241691 - High Level Trunkline Sewer Improvements - Comparison of Soil Samples to Applicable Criteria

All criteria, unless otherwise noted, are expressed in units parts per billion (ppb). One ppb is equivalent to one micrograms per kilogram (µg/kg). Criteria with 6 or more digits are expressed in scientific notation. For example, 200,000 is presented as 2.0E+5. A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based value.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service (CAS) Number | Statewide Default Background Levels | Groundwater Protection | | | Contact | Soil Vapor | NOTES: | Composite Soil Sample Point (Depth) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Residential Drinking Water Protection Criteria (RDWP) | Nonresidential Drinking Water Protection Criteria (NRDWP) | Groundwater Surface Water Interface Protection Criteria (GSIP) | Nonresidential Direct Contact Criteria (NRDC) | Nonresidential Soil (VIAP) | | Sample Designation | SB-101 | SB-102 | SB-103 | SB-1 | SB-8 | SB-9 | SB-10 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | JV | BG | JV | IA | IA | IA | IA | IA | IA |
| | | | | | | | | | | Date | 10/24/24 | 10/25/24 | 12/2/24 | 3/11/24 | 3/6/24 | 3/7/24 | 3/13/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 285084.5 | 285074.0 | 286122.3 | 286096.8 | 285995.5 | 285687.1 | 285314.771 | 284994.6 | 285099.4 |
| | | | | | | | | | | Location E | 13289743.2 | 13290014.1 | 13289992.4 | 13289879.1 | 13290005.0 | 13289991.9 | 13289950.9 | 13289974.9 | 13289477.2 |
| | | | | | | | | | | Depth (ft) | 1.0 - 30.0 | 1.0 - 50.0 | 1.2 - 30.0 | 0.5 - 10 | 0.5 - 30 | 0.5 - 30 | 1.5 - 7.5 | 0.5 - 30 | 0.5 - 10 |
| Metals | Arsenic (B) | 7440382 | 5,800 | 4,600 | 4,600 | 4,600 | 37,000 | NA | | | **7,600** | **7,600** | **4,900** | 4,200 | 2,000 | 2,200 | **12,000** | **7,300** | **5,300** |
| | Barium (B) | 7440393 | 75,000 | 1.30E+06 | 1.30E+06 | (G) | 1.30E+08 | NA | | | 27,000 | 15,000 | 32,000 | **120,000** | 42,000 | 41,000 | 22,000 | 12,000 | 73,000 |
| | Cadmium (B) | 7440439 | 1,200 | 6,000 | 6,000 | (G,X) | 2.10E+06 | NA | | | **610** | **480** | **180** | **190** | **120** | **76** | **340** | **230** | **220** |
| | Chromium (Total) (B,H) | 7440473 | 18,000 (total) | | | | | | Data is for Total CR | | 7,300 | 6,100 | 8,100 | 5,600 | 13,000 | 14,000 | 14,000 | 6,700 | 8,500 |
| | Copper (B) | 7440508 | 32,000 | 5.80E+06 | 5.80E+06 | (G) | 7.30E+07 | NA | | | 18,000 | 15,000 | 10,000 | 18,000 | 13,000 | 7,500 | 16,000 | 11,000 | 17,000 |
| | Lead (B) | 7439921 | 21,000 | 7.00E+05 | 7.00E+05 | (G,X) | 9.0E+5 (DD) | NA | | | 6,800 | 6,400 | 8,500 | **58,000** | 6,000 | 4,200 | 15,000 | 7,100 | **53,000** |
| | Mercury (Total) (B,Z) | Varies | 130 | 1,700 | 1,700 | 50 (M); 1.2 | 5.80E+05 | 390 nc | | | ND | ND | ND | **78** | ND | ND | ND | ND | **140** |
| | Selenium (B) | 7782492 | 410 | 4,000 | 4,000 | 400 | 9.60E+06 | NA | | | **690** | **810** | **870** | ND | **200** | **280** | ND | **220** | **420** |
| | Silver (B) | 7440224 | 1,000 | 4,500 | 13,000 | 100 (M); 27 | 9.00E+06 | NA | | | **110** | ND | ND | ND | ND | ND | ND | ND | **270** |
| | Zinc (B) | 7440666 | 47000 | 2.40E+06 | 5.00E+06 | (G) | 6.30E+08 | NA | | | **48,000** | **47,000** | **29,000** | **41,000** | **29,000** | **19,000** | **35,000** | **30,000** | **54,000** |
| PNAs | Acenaphthene | 83329 | NA | 3.00E+05 | 8.80E+05 | 8,700 | 1.30E+08 | 3.60E+06 | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Acenaphthylene | 208968 | NA | 5,900 | 17,000 | ID | 5.20E+06 | DATA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Anthracene | 120127 | NA | 41,000 | 41,000 | ID | 7.30E+08 | 2.2E+08 nc | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Benzo(a)anthracene (Q) | 56553 | NA | NLL | NLL | NLL | 80,000 | 1.1E+07 ca | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Benzo(a)pyrene (Q) | 50328 | NA | NLL | NLL | NLL | 8,000 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Benzo(b)fluoranthene (Q) | 205992 | NA | NLL | NLL | NLL | 80,000 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Benzo(g,h,i)perylene | 191242 | NA | NLL | NLL | NLL | 7.00E+06 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Benzo(k)fluoranthene (Q) | 207089 | NA | NLL | NLL | NLL | 8.00E+05 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Chrysene (Q) | 218019 | NA | NLL | NLL | NLL | 8.00E+06 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Dibenzo(a,h)anthracene (Q) | 53703 | NA | NLL | NLL | NLL | 8,000 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Fluoranthene | 206440 | NA | 7.30E+05 | 7.30E+05 | 5,500 | 1.30E+08 | NA | | | ND | ND | NA | ND | ND | ND | **950** | ND | **340** |
| | Fluorene | 86737 | NA | 3.90E+05 | 8.90E+05 | 5,300 | 8.70E+07 | 8.3E+06 nc | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Indeno(1,2,3-cd)pyrene (Q) | 193395 | NA | NLL | NLL | NLL | 80,000 | NA | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | 2-Methylnaphthalene | 91576 | NA | 57,000 | 1.70E+05 | 4,200 | 2.60E+07 | 30,000 nc | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Naphthalene | 91203 | NA | 35,000 | 1.00E+05 | 730 | 5.20E+07 | 1,900 ca | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Phenanthrene | 85018 | NA | 56,000 | 1.60E+05 | 2,100 | 5.20E+06 | 29,000 nc | | | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | Pyrene | 129000 | NA | 4.80E+05 | 4.80E+05 | ID | 8.40E+07 | 4.4E+08 nc | | | ND | ND | NA | ND | ND | ND | **410** | ND | ND |
| | 1,1,1,2-Tetrachloroethane | 630206 | NA | 1,500 | 6,400 | ID | 2.2E+6 (C) | 91 (M) ca | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,1,1-Trichloroethane | 71556 | NA | 4,000 | 4,000 | 1,800 | 1.0E+9 (C,D) | 7,500 (EE) st | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,1,2,2-Tetrachloroethane | 79345 | NA | 170 | 700 | 1,600 (X) | 2.40E+05 | 77 ca | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,1,2-Trichloroethane | 79005 | NA | 100 | 100 | 6,600 (X) | 8.40E+05 | 6.6 (M) nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,1-Dichloroethane | 75343 | NA | 18,000 | 50,000 | 15,000 | 8.7E+7 (C) | 74 ca | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,1-Dichloroethene (I) | 75354 | NA | 140 | 140 | 2,600 | 6.6E+5 (C) | 220 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2,3-Trichlorobenzene | 87616 | NA | NA | NA | NA | NA | 15,000 nc | Only in EGLE Vapor Criteria | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2,3-Trichloropropane | 96184 | NA | 840 | 2,400 | NA | 4.2E+6 (C) | 46 (M) nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2,3-Trimethylbenzene | 526738 | NA | NA | NA | NA | NA | 4,800 (JT) nc | Only in EGLE Vapor Criteria | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2,4-Trichlorobenzene | 120821 | NA | 4,200 | 4,200 | 5,900 (X) | 5.8E+6 (C,DD) | 930 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2,4-Trimethylbenzene (I) | 95636 | NA | 2,100 | 2,100 | 570 | 1.0E+8 (C) | 2,600 (JT) nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2-Dichlorobenzene | 95501 | NA | 14,000 | 14,000 | 280 | 6.3E+7 (C) | 26,000 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2-Dichloroethane (I) | 107062 | NA | 100 | 100 | 7,200 (X) | 4.20E+05 | 23 (M) ca | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,2-Dichloropropane (I) | 78875 | NA | 100 | 100 | 4,600 (X) | 6.6E+5 (C) | 37 (M) nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,3,5-Trimethylbenzene (I) | 108678 | NA | 1,800 | 1,800 | 1,100 | 1.0E+8 (C) | 1,800 (JT) nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,3-Dichlorobenzene | 541731 | NA | 170 | 480 | 680 | 6.6E+5 (C) | 180 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,3-Dichloropropene, cis- | 10061015 | NA | NA | NA | NA | NA | NA | Isomers not in EGLE Criteria | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 1,4-Dichlorobenzene | 106467 | NA | 1,700 | 1,700 | 360 | 1.90E+06 | 660 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 2-Butanone (MEK) (I) | 78933 | NA | 2.60E+05 | 7.60E+05 | 44,000 | 7.0E+8 (C,DD) | 3.7E+05 (DD) dev | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 2-Hexanone | 591786 | NA | 20,000 | 58,000 | ID | 1.0E+8 (C) | 3,800 nc | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 4-Isopropyltoluene | 99876 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 4-Methyl-2-pentanone (MIBK) (I) | 108101 | NA | 36,000 | 1.00E+05 | ID | 1.8E+8 (C) | 40,000 st | | | ND | ND | ND | ND | ND | ND | ND | ND | ND |

# TABLE 1

## 241691 - High Level Trunkline Sewer Improvements - Comparison of Soil Samples to Applicable Criteria

All criteria, unless otherwise noted, are expressed in units parts per billion (ppb). One ppb is equivalent to one micrograms per kilogram (µg/kg). Criteria with 6 or more digits are expressed in scientific notation. For example, 200,000 is presented as 2.0E+5. A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based value.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service (CAS) Number | Statewide Default Background Levels | Groundwater Protection | | | Contact | Soil Vapor | NOTES: | Composite Soil Sample Point (Depth) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Residential Drinking Water Protection Criteria (RDWP) | Nonresidential Drinking Water Protection Criteria (NRDWP) | Groundwater Surface Water Interface Protection Criteria (GSIP) | Nonresidential Direct Contact Criteria (NRDC) | Nonresidential Soil (VIAP) | | Sample Designation | SB-101 | SB-102 | SB-103 | SB-1 | SB-8 | SB-9 | SB-10 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | JV | BG | JV | IA | IA | IA | IA | IA | IA |
| | | | | | | | | | | Date | 10/24/24 | 10/25/24 | 12/2/24 | 3/11/24 | 3/6/24 | 3/7/24 | 3/13/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 285084.5 | 285074.0 | 286122.3 | 286096.8 | 285995.5 | 285687.1 | 285314.771 | 284994.6 | 285099.4 |
| | | | | | | | | | | Location E | 13289743.2 | 13290014.1 | 13289992.4 | 13289879.1 | 13290005.0 | 13289991.9 | 13289950.9 | 13289974.9 | 13289477.2 |
| | | | | | | | | | | Depth (ft) | 1.0 - 30.0 | 1.0 - 50.0 | 1.2 - 30.0 | 0.5 - 10 | 0.5 - 30 | 0.5 - 30 | 1.5 - 7.5 | 0.5 - 30 | 0.5 - 10 |
| VOCs | Acetone (I) | 67641 | NA | 15,000 | 42,000 | 34,000 | 7.30E+07 | 3.1E+06 (EE) st | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Acrylonitrile (I) | 107131 | NA | 100 (M); 52 | 220 | 100 (M); 40 | 74,000 | 34 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Benzene (I) | 71432 | NA | 100 | 100 | 4,000 (X) | 8.4E+5 (C) | 47 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromobenzene (I) | 108861 | NA | 550 | 1,500 | NA | 1.7E+6 (C) | 2,800 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromochloromethane | 74975 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromodichloromethane | 75274 | NA | 1,600 (W) | 1,600 (W) | ID | 4.90E+05 | 16 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromoform | 75252 | NA | 1,600 (W) | 1,600 (W) | ID | 3.8E+6 (C) | 1,300 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Bromomethane | 74839 | NA | 200 | 580 | 100 | 1.00E+06 | 16 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Carbon disulfide | 75150 | NA | 16,000 | 46,000 | ID | 4.3E+7 (C,DD) | 920 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Carbon tetrachloride | 56235 | NA | 100 | 100 | 760 (X) | 4.4E+5 (C) | 8.7 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Chlorobenzene | 108907 | NA | 2,000 | 2,000 | 500 | 1.4E+7 (C) | 1,400 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Chloroethane | 75003 | NA | 8,600 | 34,000 | 22,000 (X) | 1.2E+7 (C) | 5,800 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Chloroform | 67663 | NA | 1,600 (W) | 1,600 (W) | 7,000 | 5.5E+6 (C) | 7.4 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Chloromethane | 74873 | NA | 5,200 | 22,000 | ID | 7.4E+6 (C) | 120 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | cis-1,2-Dichloroethene | 156592 | NA | 1,400 | 1,400 | 12,000 | 8.0E+6 (C) | 37 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Cyclohexane | 110827 | NA | NA | NA | NA | NA | 5,600 nc | Only in EGLE Vapor Criteria | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Dibromochloromethane | 124481 | NA | 1,600 (W) | 1,600 (W) | ID | 5.00E+05 | 27 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Dibromochloropropane | 96128 | NA | 10 (M); 4.0 | 10 (M); 4.0 | ID | 20,000 (C) | DATA | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Dibromomethane | 74953 | NA | 1,600 | 4,600 | NA | 8.0E+6 (C) | 62 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Dichlorodifluoromethane | 75718 | NA | 95,000 | 2.70E+05 | ID | 1.7E+8 (C) | 220 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Diethyl ether | 60297 | NA | 200 | 200 | ID | 3.6E+8 (C) | 6,200 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Diisopropyl ether | 108203 | NA | 600 | 1,700 (C) | ID | 3.0E+6 (C) | 2,300 (DD) dev | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Ethylbenzene (I) | 100414 | NA | 1,500 | 1,500 | 360 | 7.1E+7 (C) | 340 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Ethylene dibromide (EDB) | 106934 | NA | 20 (M); 1.0 | 20 (M); 1.0 | 110 (X) | 430 | 2.1 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Ethyl-tert-butyl ether (ETBE) | 637923 | NA | 980 | 980 | ID | ID | DATA | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Iodomethane | 74884 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Isopropyl benzene | 98828 | NA | 91,000 | 2.60E+05 | 3,200 | 8.0E+7 (C) | 110 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Methylene chloride | 75092 | NA | 100 | 100 | 30,000 (X) | 5.8E+6 (C) | 2,300 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Methyl-tert-butyl ether (MTBE) | 1634044 | NA | 800 | 800 | 1.4E+5 (X) | 7.1E+6 (C) | 2,100 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Naphthalene | 91203 | NA | 35,000 | 1.00E+05 | 730 | 5.20E+07 | 1,900 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | n-Butylbenzene | 104518 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 9,800 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | n-Propylbenzene (I) | 103651 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 21,000 (DD) dev | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | sec-Butylbenzene | 135988 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 66,000 (C) nc (40,000) | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Styrene | 100425 | NA | 2,700 | 2,700 | 2,100 (X) | 1.9E+6 (C) | 4,300 ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | t-Amyl methyl ether (TAME) | 994058 | NA | 3,900 | 3,900 | NA | 9.5E+7 (C) | 600 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | t-Butyl alcohol | 75650 | NA | 78,000 | 2.20E+05 | NA | 3.9E+8 (C) | 57,000 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | t-Butylbenzene (I) | 98066 | NA | 1,600 | 4,600 | ID | 8.00E+06 | 11 (M) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Tetrachloroethylene | 127184 | NA | 100 | 100 | 1,200 (X) | 9.3E+5 (C) | 74 (EE) st | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Tetrahydrofuran | 109999 | NA | 1,900 | 5,400 | 2.2E+5 (X) | 9.50E+06 | 2.2E+05 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Toluene (I) | 108883 | NA | 16,000 | 16,000 | 5,400 | 1.6E+8 (C) | 64,000 (EE) st | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | trans-1,2-Dichloroethene | 156605 | NA | 2,000 | 2,000 | 30,000 (X) | 1.2E+7 (C) | 210 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | trans-1,4-Dichloro-2-butene | 110576 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Trichloroethylene (TCE) | 79016 | NA | 100 | 100 | 4,000 (X) | 6.6E+5 (C,DD) | 4.0 (M) (DD) dev | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Trichlorofluoromethane | 75694 | NA | 52,000 | 1.50E+05 | NA | 2.6E+8 (C) | 340 nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Vinyl chloride | 75014 | NA | 40 | 40 | 260 (X) | 34,000 | 8.2 (M) ca | | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | Xylenes (I) | 1330207 | NA | 5,600 | 5,600 | 980 | 1.0E+9 (C,D) | 5,000 (J) nc | | ND | ND | ND | ND | ND | ND | ND | ND | ND |

# TABLE 2

## 241691 - High Level Trunkline Sewer Improvements - Comparison of Groundwater Samples to Applicable Criteria

All criteria, unless otherwise noted, are expressed in units of parts per billion (ppb). One ppb is equivalent to 1 microgram per liter (ug/L). A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based or solubility value, whichever is lower.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service Number | Groundwater Protection | | | Indoor Air | Water Solubility | Soil Vapor | NOTES: | Water Sample Point (Depth) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Residential Drinking Water Criteria (RDW) | Nonresidential Drinking Water Criteria (NRDW) | Groundwater Surface Water Interface Criteria (GSI) | Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria (GVIIC) | | Nonresidential Groundwater Not in Contact (VIAP) | | Sample Designation | SB-101 | MW-102 | MW-103 | SB-1 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | JV | MDE | MDE | IA | IA | IA |
| | | | | | | | | | | Date | 10/24/24 | 12/5/24 | 12/5/24 | 3/11/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 285084.5 | 285074.0 | 286122.3 | 286096.8 | 284,995 | 285,099 |
| | | | | | | | | | | Location E | 13289743.2 | 13290014.1 | 13289992.4 | 13289879.1 | 13,289,975 | 13,289,477 |
| | | | | | | | | | | Depth (ft) | 10 | 25 | 15 | 15 | 25 | 11 |
| Metals | Arsenic | 7440382 | 10 (A) | 10 (A) | 10 | NLV | NA | NA | | | **29** | **6** | **5** | **11** | **2** | **8** |
| | Barium (B) | 7440393 | 2,000 (A) | 2,000 (A) | (G) | NLV | NA | NA | | | **600** | **200** | **200** | **200** | ND | ND |
| | Cadmium (B) | 7440439 | 5.0 (A) | 5.0 (A) | (G,X) | NLV | NA | NA | | | **2** | ND | ND | ND | ND | ND |
| | Chromium (III) (B,H) | 16065831 | 100 (A) | 100 (A) | (G,X) | NLV | NA | NA | Data is for Total CR | | **38** | **7** | ND | **8** | ND | ND |
| | Copper (B) | 7440508 | 1,000 (E) | 1,000 (E) | (G) | NLV | NA | NA | | | **76** | **16** | **6** | **13** | **58** | ND |
| | Lead (B) | 7439921 | 4.0 (L) | 4.0 (L) | (G,X) | NLV | NA | NA | | | **42** | **13** | **4** | **22** | ND | ND |
| | Mercury (Total) (B,Z) | Varies | 2.0 (A) | 2.0 (A) | 0.0013 | 56 (S) | 56 | 3.7 nc | | | **0.2** | ND | ND | ND | ND | ND |
| | Selenium (B) | 7782492 | 50 (A) | 50 (A) | 5 | NLV | NA | NA | | | ND | ND | ND | ND | ND | ND |
| | Silver (B) | 7440224 | 34 | 98 | 0.2 (M); 0.06 | NLV | NA | NA | | | **0.3** | ND | ND | ND | ND | ND |
| | Zinc (B) | 7440666 | 2,400 | 5,000 (E) | (G) | NLV | NA | NA | | | **190** | **50** | **60** | **70** | **20** | ND |
| PNAs | Acenaphthene | 83329 | 1,300 | 3,800 | 38 | 4,200 (S) | 4,240 | 3,900 (S) sol | | | ND | ND | ND | NA | ND | ND |
| | Acenaphthylene | 208968 | 52 | 150 | ID | 3,900 (S) | 3,930 | 710 (CC) nc | | | ND | ND | ND | NA | ND | ND |
| | Anthracene | 120127 | 43 (S) | 43 (S) | ID | 43 (S) | 43.4 | 43 (S) sol | | | ND | ND | ND | NA | ND | ND |
| | Benzo(a)anthracene (Q) | 56553 | 2.1 | 8.5 | ID | NLV | 9.4 | 9.4 (S) (MM) sol | | | ND | ND | ND | NA | ND | ND |
| | Benzo(a)pyrene (Q) | 50328 | 5.0 (A) | 5.0 (A) | ID | NLV | 1.62 | NA | | | ND | ND | ND | NA | ND | ND |
| | Benzo(b)fluoranthene (Q) | 205992 | 1.5 (S,AA) | 1.5 (S,AA) | ID | ID | 1.5 | NA | | | ND | ND | ND | NA | ND | ND |
| | Benzo(g,h,i)perylene | 191242 | 1.0 (M); 0.26 (S) | 1.0 (M); 0.26 (S) | ID | NLV | 0.26 | NA | | | ND | ND | ND | NA | ND | ND |
| | Benzo(k)fluoranthene (Q) | 207089 | 1.0 (M); 0.8 (S) | 1.0 (M); 0.8 (S) | NA | NLV | 0.8 | NA | | | ND | ND | ND | NA | ND | ND |
| | Chrysene (Q) | 218019 | 1.6 (S) | 1.6 (S) | ID | ID | 1.6 | NA | | | ND | ND | ND | NA | ND | ND |
| | Dibenz(a,h)anthracene (Q) | 53703 | 2.0 (M); 0.21 | 2.0 (M); 0.85 | ID | NLV | 2.49 | NA | | | ND | ND | ND | NA | ND | ND |
| | Fluoranthene | 206440 | 210 (S) | 210 (S) | 1.6 | 210 (S) | 206 | NA | | | ND | ND | ND | NA | ND | ND |
| | Fluorene | 86737 | 880 | 2,000 (S) | 12 | 2,000 (S) | 1,980 | 1,700 (S) sol | | | ND | ND | ND | NA | ND | ND |
| | Indeno(1,2,3-cd)pyrene (Q) | 193395 | 2.0 (M); 0.022 (S) | 2.0 (M); 0.022 (S) | ID | NLV | 0.022 | NA | | | ND | ND | ND | NA | ND | ND |
| | 2-Methylnaphthalene | 91576 | 260 | 750 | 19 | 25,000 (S) | 24,600 | 2,900 nc | | | ND | ND | ND | NA | ND | ND |
| | Naphthalene | 91203 | 520 | 1,500 | 11 | 31,000 (S) | 31,000 | 300 ca | | | ND | ND | ND | NA | ND | ND |
| | Phenanthrene | 85018 | 52 | 150 | 2.0 (M); 1.7 | 1,000 (S) | 1,000 | 420 nc | | | ND | ND | ND | NA | ND | ND |
| | Pyrene | 129000 | 140 (S) | 140 (S) | ID | 140 (S) | 135 | 140 (S) sol | | | ND | ND | ND | NA | ND | ND |
| | Acetone (I) | 67641 | 730 | 2,100 | 1,700 | 1.0E+9 (D,S) | 1.00E+09 | 4.0E+07 (FF) st | | | ND | ND | ND | **86** | ND | **36** |
| | Acrylonitrile (I) | 107131 | 2.6 | 11 | 2.0 (M); 1.2 | 1.90E+05 | 7.50E+07 | 330 ca | | | ND | ND | ND | ND | ND | ND |
| | Benzene (I) | 71432 | 5.0 (A) | 5.0 (A) | 200 (X) | 35,000 | 1.75E+06 | 66 ca | | | ND | ND | ND | ND | ND | ND |
| | Bromobenzene (I) | 108861 | 18 | 50 | NA | 3.90E+05 | 4.13E+05 | 2,700 nc | | | ND | ND | ND | ND | ND | ND |
| | Bromochloromethane | 74975 | | | | | | | Not in EGLE Criteria | | ND | ND | ND | ND | ND | ND |
| | Bromodichloromethane | 75274 | 80 (A,W) | 80 (A,W) | ID | 37,000 | 6.74E+06 | 73 nc | | | ND | ND | ND | ND | ND | ND |
| | Bromoform | 75252 | 80 (A,W) | 80 (A,W) | ID | 3.1E+6 (S) | 3.10E+06 | 6,200 ca | | | ND | ND | ND | ND | ND | ND |
| | Bromomethane | 74839 | 10 | 29 | 5.0 (M); 4.2 | 9,000 | 1.45E+07 | 80 nc | | | ND | ND | ND | ND | ND | ND |
| | 2-Butanone (MEK) (I) | 78933 | 13,000 | 38,000 | 2,200 | 2.4E+8 (S) | 2.40E+08 | 4.3E+06 (DD) dev | | | ND | ND | ND | **24** | ND | ND |
| | Carbon disulfide (I,R) | 75150 | 800 | 2,300 | ID | 5.50E+05 | 1.19E+06 | 3,100 nc | | | ND | ND | ND | ND | ND | ND |
| | Carbon tetrachloride | 56235 | 5.0 (A) | 5.0 (A) | 38 (X) | 2,400 | 7.93E+05 | 18 ca | | | ND | ND | ND | ND | ND | ND |
| | Chlorobenzene (I) | 108907 | 100 (A) | 100 (A) | 25 | 4.7E+5 (S) | 4.72E+05 | 1,400 nc | | | ND | ND | ND | ND | ND | ND |
| | Chloroethane | 75003 | 430 | 1,700 | 1,100 (X) | 5.7E+6 (S) | 5.74E+06 | 22,000 nc | | | ND | ND | ND | ND | ND | ND |
| | Chloroform | 67663 | 80 (A,W) | 80 (A,W) | 350 | 1.80E+05 | 7.92E+06 | 32 ca | | | ND | ND | ND | ND | ND | ND |
| | Chloromethane (I) | 74873 | 260 | 1,100 | ID | 45,000 | 6.34E+06 | 560 ca | | | ND | ND | **1** | **1** | ND | ND |
| | Cyclohexane | 110827 | | | | | | 8,100 (GW) nc | Only in EGLE Vapor Criteria | | ND | ND | ND | ND | ND | ND |
| | Dibromochloromethane | 124481 | 80 (A,W) | 80 (A,W) | ID | 1.10E+05 | 2.60E+06 | 130 ca | | | ND | ND | ND | ND | ND | ND |
| | Dibromochloropropane | 96128 | 0.2 (A) | 0.2 (A) | ID | 1,200 (S) | 1,230 | 2.1E-02 (M) (CC) | | | ND | ND | ND | ND | ND | ND |
| | 1,2-Dibromoethane Ethylene dibromide (EDB) | 106934 | 0.05 (A) | 0.05 (A) | 5.7 (X) | 15,000 | 4.20E+06 | 8.9 ca | | | ND | ND | ND | ND | ND | ND |
| | Dibromomethane | 74953 | 80 | 230 | NA | ID | 1.10E+07 | 380 nc | | | ND | ND | ND | ND | ND | ND |
| | 1,2-Dichlorobenzene | 95501 | 600 (A) | 600 (A) | 13 | 1.6E+5 (S) | 1.56E+05 | 16,000 nc | | | ND | ND | ND | ND | ND | ND |
| | 1,3-Dichlorobenzene | 541731 | 6.6 | 19 | 28 | 41,000 | 1.11E+05 | 110 nc | | | ND | ND | ND | ND | ND | ND |
| | 1,4-Dichlorobenzene | 106467 | 75 (A) | 75 (A) | 17 | 74,000 (S) | 73,800 | 400 ca | | | ND | ND | ND | ND | ND | ND |

# TABLE 2

## 241691 - High Level Trunkline Sewer Improvements - Comparison of Groundwater Samples to Applicable Criteria

All criteria, unless otherwise noted, are expressed in units of parts per billion (ppb). One ppb is equivalent to 1 microgram per liter (ug/L). A footnote is designated by a letter in parentheses and is explained in the footnote pages that follow the criteria tables. When the risk-based criterion is less than the target detection limit (TDL), the TDL is listed as the criterion (§324.20120a(10)). In these cases, 2 numbers are present in the cell. The first number is the criterion (i.e., TDL), and the second number is the risk-based or solubility value, whichever is lower.

| Hazardous Substance Type | Hazardous Substance | Chemical Abstract Service Number | Groundwater Protection | | | Indoor Air | Water Solubility | Soil Vapor | NOTES: | Water Sample Point (Depth) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Residential Drinking Water Criteria (RDW) | Nonresidential Drinking Water Criteria (NRDW) | Groundwater Surface Water Interface Criteria (GSI) | Nonresidential Groundwater Volatilization to Indoor Air Inhalation Criteria (GVIIC) | | Nonresidential Groundwater Not in Contact (VIAP) | | Sample Designation | SB-101 | MW-102 | MW-103 | SB-1 | SB-11 | SB-12 |
| | | | | | | | | | | Sampled by | JV | MDE | MDE | IA | IA | IA |
| | | | | | | | | | | Date | 10/24/24 | 12/5/24 | 12/5/24 | 3/11/24 | 3/20/24 | 3/12/24 |
| | | | | | | | | | | Location N | 285084.5 | 285074.0 | 286122.3 | 286096.8 | 284,995 | 285,099 |
| | | | | | | | | | | Location E | 13289743.2 | 13290014.1 | 13289992.4 | 13289879.1 | 13,289,975 | 13,289,477 |
| | | | | | | | | | | Depth (ft) | 10 | 25 | 15 | 15 | 25 | 11 |
| VOCs | Dichlorodifluoromethane | 75718 | 1,700 | 4,800 | ID | 3.0E+5 (S) | 3.00E+05 | 410 (GW) nc | | ND | ND | ND | ND | ND | ND | |
| | 1,1-Dichloroethane | 75343 | 880 | 2,500 | 740 | 2.30E+06 | 5.06E+06 | 300 ca | | ND | ND | ND | ND | ND | ND | |
| | 1,2-Dichloroethane (I) | 107062 | 5.0 (A) | 5.0 (A) | 360 (X) | 59,000 | 8.52E+06 | 97 ca | | ND | ND | ND | ND | ND | ND | |
| | 1,1-Dichloroethylene (I) | 75354 | 7.0 (A) | 7.0 (A) | 130 | 1,300 | 2.25E+06 | 480 nc | | ND | ND | ND | ND | ND | ND | |
| | cis-1,2-Dichloroethylene | 156592 | 70 (A) | 70 (A) | 620 | 2.10E+05 | 3.50E+06 | 140 nc | | ND | ND | **2** | ND | ND | ND | |
| | 1,2-Dichloropropane (I) | 78875 | 5.0 (A) | 5.0 (A) | 230 (X) | 36,000 | 2.80E+06 | 110 nc | | ND | ND | ND | ND | ND | ND | |
| | Diethyl ether | 60297 | 10 (E) | 10 (E) | ID | 6.1E+7 (S) | 6.10E+07 | 53,000 nc | | ND | ND | ND | ND | ND | ND | |
| | Diisopropyl ether DIPE) | 108203 | 30 | 86 | ID | 8,000 (S) | 8,041 | 13,000 (DD) dev | | ND | ND | ND | ND | ND | ND | |
| | Ethylbenzene (I) | 100414 | 74 (E) | 74 (E) | 18 | 1.7E+5 (S) | 1.69E+05 | 170 ca | | ND | ND | ND | ND | ND | ND | |
| | Ethyl-tert-butyl ether (ETBE) | 637923 | 49 (E) | 49 (E) | ID | 5.6E+6 (S) | 5.63E+06 | 580 (CC) nc | | ND | ND | ND | ND | ND | ND | |
| | 2-Hexanone | 591786 | 1,000 | 2,900 | ID | 8.70E+06 | 1.60E+07 | 29,000 nc | | ND | ND | ND | ND | ND | ND | |
| | Isopropyl benzene | 98828 | 800 | 2,300 | 28 | 56,000 (S) | 56,000 | 36 ca | | ND | ND | ND | ND | ND | ND | |
| | Iodomethane | 74884 | | | | | | | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | |
| | Methylene chloride | 75092 | 5.0 (A) | 5.0 (A) | 1,500 (X) | 1.40E+06 | 1.70E+07 | 12,000 nc | | ND | ND | ND | ND | ND | ND | |
| | 2-Methylnaphthalene | 91576 | 260 | 750 | 19 | 25,000 (S) | 2.46E+04 | 2,900 nc | | ND | ND | ND | ND | ND | ND | |
| | 4-Methyl-2-pentanone (MIBK) (I) | 108101 | 1,800 | 5,200 | ID | 2.0E+7 (S) | 2.00E+07 | 3.3E+05 st | | ND | ND | ND | ND | ND | ND | |
| | Methyl-tert-butyl ether (MTBE) | 1634044 | 40 (E) | 40 (E) | 7,100 (X) | 4.7E+7 (S) | 4.68E+07 | 17,000 ca | | ND | ND | ND | ND | ND | ND | |
| | Naphthalene | 91203 | 520 | 1,500 | 11 | 31,000 (S) | 3.10E+04 | 300 ca | | ND | ND | ND | ND | ND | ND | |
| | n-Butylbenzene | 104518 | 80 | 230 | ID | ID | NA | 1,600 nc | | ND | ND | ND | ND | ND | ND | |
| | n-Propylbenzene (I) | 103651 | 80 | 230 | ID | ID | NA | 6,100 (DD) dev | | ND | ND | ND | ND | ND | ND | |
| | p-Isopropyltoluene | 99876 | NA | NA | NA | NA | NA | NA | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | |
| | sec-Butylbenzene | 135988 | 80 | 230 | ID | ID | NA | 12,000 nc | | ND | ND | ND | ND | ND | ND | |
| | Styrene | 100425 | 100 (A) | 100 (A) | 80 (X) | 3.1E+5 (S) | 3.10E+05 | 2,300 ca | | ND | ND | ND | ND | ND | ND | |
| | t-Butyl alcohol | 75650 | 3,900 | 11,000 | NA | 1.0E+9 (D,S) | 1.00E+09 | 7.5E+05 nc | | ND | ND | ND | ND | ND | ND | |
| | t-Amyl methyl ether (TAME) | 994058 | 190 (E) | 190 (E) | NA | 5.70E+05 | 2.64E+06 | 3,500 nc | | ND | ND | ND | ND | ND | ND | |
| | t-Butylbenzene (I) | 98066 | 80 | 230 | ID | ID | NA | 2.6 nc | | ND | ND | ND | ND | ND | ND | |
| | 1,1,1,2-Tetrachloroethane | 630206 | 77 | 320 | ID | 96,000 | 1.10E+06 | 210 ca | | ND | ND | ND | ND | ND | ND | |
| | 1,1,2,2-Tetrachloroethane | 79345 | 8.5 | 35 | 78 (X) | 77,000 | 2.97E+06 | 170 ca | | ND | ND | ND | ND | ND | ND | |
| | Tetrachloroethylene | 127184 | 5.0 (A) | 5.0 (A) | 60 (X) | 1.70E+05 | 2.00E+05 | 130 (EE) st | | ND | **12** | ND | ND | ND | ND | |
| | Tetrahydrofuran | 109999 | 95 | 270 | 11,000 (X) | 1.60E+07 | 1.00E+09 | 2.0E+06 nc | | ND | ND | ND | ND | ND | ND | |
| | Toluene (I) | 108883 | 790 (E) | 790 (E) | 270 | 5.3E+5 (S) | 5.26E+05 | 59,00 (EE) st | | ND | ND | ND | ND | ND | ND | |
| | trans-1,4-Dichloro-2-butene | 110576 | | | | | | | Not in EGLE Criteria | ND | ND | ND | ND | ND | ND | |
| | trans-1,2-Dichloroethylene | 156605 | 100 (A) | 100 (A) | 1,500 (X) | 2.00E+05 | 6.30E+06 | 580 nc | | ND | ND | ND | ND | ND | ND | |
| | 1,2,3-Trichlorobenzene | 87616 | NA | NA | NA | NA | NA | 2,600 nc | Rule 57 & EGLE Vapor Criteria | ND | ND | ND | ND | ND | ND | |
| | 1,2,4-Trichlorobenzene | 120821 | 70 (A) | 70 (A) | 99 (X) | 3.0E+5 (S) | 3.00E+05 | 160 nc | | ND | ND | ND | ND | ND | ND | |
| | 1,1,1-Trichloroethane | 71556 | 200 (A) | 200 (A) | 89 | 1.3E+6 (S) | 1.33E+06 | 19,000 (EE) st | | ND | ND | ND | ND | ND | ND | |
| | 1,1,2-Trichloroethane | 79005 | 5.0 (A) | 5.0 (A) | 330 (X) | 1.10E+05 | 4.42E+06 | 20 nc | | ND | ND | ND | ND | ND | ND | |
| | Trichloroethylene (TCE) | 79016 | 5.0 (A) | 5.0 (A) | 200 (X) | 4,900 | 1.10E+06 | 10 (DD) dev | | ND | ND | ND | ND | ND | ND | |
| | Trichlorofluoromethane | 75694 | 2,600 | 7,300 | NA | 1.1E+6 (S) | 1.10E+06 | 560 (GW) nc | | ND | ND | ND | ND | ND | ND | |
| | 1,2,3-Trichloropropane | 96184 | 42 | 120 | NA | 18,000 | 1.90E+06 | 84 nc | | ND | ND | ND | ND | ND | ND | |
| | 1,2,3-Trimethylbenzene | 526738 | NA | NA | NA | NA | NA | 1,800 (JT) nc | Rule 57 & EGLE Vapor Criteria | ND | ND | ND | ND | ND | ND | |
| | 1,2,4-Trimethylbenzene (I) | 95636 | 63 (E) | 63 (E) | 17 | 56,000 (S) | 55,890 | 990 (JT) nc | | ND | ND | ND | ND | ND | ND | |
| | 1,3,5-Trimethylbenzene (I) | 108678 | 72 (E) | 72 (E) | 45 | 61,000 (S) | 61,150 | 690 (JT) nc | | ND | ND | ND | ND | ND | ND | |
| | Vinyl chloride | 75014 | 2.0 (A) | 2.0 (A) | 13 (X) | 13,000 | 2,760,000 | 18 ca | | ND | ND | ND | ND | ND | ND | |
| | Xylenes (I) | 1330207 | 280 (E) | 280 (E) | 49 | 1.9E+5 (S) | 1.86E+05 | 3,000 (J) nc | | ND | ND | ND | ND | ND | ND | |

## R 299.49 FOOTNOTES FOR GENERIC CLEANUP CRITERIA TABLES

### Cleanup Criteria Requirements for Response Activity

### R 299.49 Footnotes for generic cleanup criteria tables.

Rule 49. (1) The footnotes that apply to the generic criteria tables in R 299.44, R 299.46, and R 299.48 are as follows:

(A) Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.

(B) Background, as defined in R 299.1(b), may be substituted if higher than the calculated cleanup criterion. Background levels may be less than criteria for some inorganic compounds.

(G) Groundwater surface water interface (GSI) criterion depends on the pH or water hardness, or both, of the receiving surface water. The final chronic value (FCV) for the protection of aquatic life shall be calculated based on the pH or hardness of the receiving surface water. Where water hardness exceeds 400 mg CaCO3/L, use 400 mg CaCO3/L for the FCV calculation. The FCV formula provides values in units of µg/L or ppb. The generic GSI criterion is the lesser of the calculated FCV, the wildlife value (WV), and the surface water human non-drinking water value (HNDV). The soil GSI protection criteria for these hazardous substances are the greater of the 20 times the GSI criterion or the GSI soil-water partition values using the GSI criteria developed with the procedure described in this footnote.

| Hazardous Substance | FCV Formula (ug/L) | FCV Conversion Factor (CF) | WV (µg/L) | HNDV (µg/L) |
|---|---|---|---|---|
| Acetate | EXP(0.2732*(pH) + 7.0362) | NA | NA | 1300000 |
| Acetic Acid | EXP(0.2732*(pH) + 7.0362) | NA | NA | 1300000 |
| Barium | EXP(1.0629*(LnH + 1.11869) | NA | NA | 160000 |
| Beryllium | EXP(1.6839*(LnH - 5.8575) | NA | NA | 1200 |
| Cadmium ¤ | (EXP(0.7852*(LnH - 2.715))*CF | 1.101672 - ((LnH)*(0.041838)) | NA | 130 |
| Chromium (III) ¤ | (EXP(0.819*(lnH) + 0.6848))*CF | 0.86 | NA | 9400 |
| Copper | (EXP(0.8545*(LnH - 1.702))*CF | 0.96 | NA | 38000 |
| Lead ¤ | (EXP(0.9859*(LnH) - 1.0967))*CF | 1.46203 - ((LnH)*(0.14571)) | NA | 190 |
| Manganese ¤ | EXP(0.8784*(LnH) + 3.5385) | NA | NA | 59000 |
| Nickel | (EXP(0.846*(LnH) + 0.0584))*CF | 0.997 | NA | 210000 |
| Pentachlorophenol ¤ | EXP(1.005*(pH) - 5.134) | NA | NA | 2.8 |
| Zinc | (EXP(0.8473*(LnH) + 0.0884))*CF | 0.986 | NA | 16000 |

Where EXP(x) = The base of the natural logarithm raised to the power x(ex)

LnH = The natural logarithm of water hardness in mg CaCO3/L

* = The multiplication symbol.

¤ = The GSI criterion developed here may not be protective for surface water that is used as a drinking water source. Refer to footnote (X) for further guidance.

A spreadsheet that may be used to calculate GSI and GSI protection criteria for (G)-footnoted hazardous substances is available on the Department of Environmental Quality (DEQ) internet web site.

(H) Valence-specific chromium data (Cr III and Cr VI) shall be compared to the corresponding valence-specific cleanup criteria. If both Cr III and Cr VI are present in groundwater, the total concentration of both cannot exceed the drinking water criterion of 100 µg/L. If analytical data are provided for total chromium only, they shall be compared to the cleanup criteria for Cr VI. Cr III soil cleanup criterion for protection of drinking water can only be used at sites where groundwater is prevented from being used as a public water supply, currently and in the future, through an approved land or resource use restriction.

(L) Criteria for lead are derived using a biologically based model, as allowed for under Section 20120a(9) of the NREPA, and are not calculated using the algorithms and assumptions specified in pathway-specific rules. The generic residential drinking water criterion of 4 µg/L is linked to the generic residential soil direct contact criterion of 400 mg/kg. A higher concentration in the drinking water, up to the state action level of 15 µg/L, may be allowed as a site-specific remedy and still allow for drinking water use, under Section 20120a(2) and 20120b of the NREPA if soil concentrations are appropriately lower than 400 mg/kg. If a site-specific criterion is approved based on this subdivision, a notice shall be filed on the deed for all property where the groundwater concentrations will exceed 4 µg/L to provide notice of the potential for unacceptable risk if soil or groundwater concentrations increase. Acceptable combinations of site-specific soil and drinking water concentrations are presented in the following table:

| Acceptable Combinations of Lead in Drinking Water and Soil | |
|---|---|
| Drinking Water Conc. (µg/L) | Soil Conc. (mg/kg) |
| 5 | 386-395 |
| 6 | 376-385 |
| 7 | 376-385 |
| 8 | 366-375 |
| 9 | 356-365 |
| 10 | 246-355 |
| 11 | 336-345 |
| 12 | 336-345 |
| 13 | 326-335 |
| 14 | 316-325 |
| 15 | 306-315 |

(M) Calculated criterion is below the analytical target detection limit, therefore, the criterion defaults to the target detection limit.

(X) The GSI criterion shown in the generic cleanup criteria tables is not protective for surface water that is used as a drinking water source. For a groundwater discharge to the Great Lakes and their connecting waters or discharge in close proximity to a water supply intake in inland surface waters, the generic GSI criterion shall be the surface water human drinking water value (HDV) listed in the table in this footnote, except for those HDV indicated with an asterisk. For HDV with an asterisk, the generic GSI criterion shall be the lowest of the HDV, the WV, and the calculated FCV. See formulas in footnote (G). Soil protection criteria based on the HDV shall be as listed in the table in this footnote, except for those values with an asterisk. Soil GSI protection criteria based on the HDV shall be as listed in the table in this footnote, except for those values with an asterisk. Soil GSI protection criteria for compounds with an asterisk shall be the greater of 20 times the GSI criterion or the GSI soil-water partition values using the GSI criteria developed with the procedure described in this footnote.

| Hazardous Substance | CAS Number | Surface Water Human Drinking Water Values (HDV) (µg/L) | Soil GSI Protection Criteria for HDV (µg/kg) |
|---|---|---|---|
| Acetonitrile | 75058 | 5600 | 110000 |
| Acrylamide | 79061 | 0.5 (M); 0.12 | 10 |
| Alachlor | 15972608 | 3.5 | 88 |
| Antimony | 7440360 | 2.0 (M); 1.7 | 1200 |
| Benzene | 71432 | 12 | 240 |
| Boron | 7440428 | 4000 | 80000 |
| Bromate | 15541454 | 10 (M); 0.5 | 200 |
| n-Butanol | 71363 | 3500 | 70000 |
| Butyl benzyl phthalate | 85687 | 6.9 | 13000 |
| Cadmium | 7440439 | 2.5* | * |
| Carbon tetrachloride | 56235 | 4.7 | 94 |
| Chloride | 16887006 | 50000 | 1000000 |
| Chloroethane | 75003 | 170 | 3400 |
| Chromium (III) | 16065831 | 120* | * |
| Cyanazine | 21725462 | 2.0 (M); 0.93 | 200 (M); 40 |
| 1,2-Dichloroethane | 107062 | 6 | 120 |
| trans-1,2-Dichloroethylene | 156605 | 470 | 9400 |
| 1,2-Dichloropropane | 78875 | 9.1 | 180 |
| 1,3-Dichloropropene | 542756 | 3.3 | 100 (M); 66 |
| N,N-Dimethylacetamide | 127195 | 700 | 14000 |
| 1,4-Dioxane | 123911 | 3.5 | 70 |
| Ethylene dibromide | 106934 | 0.17 | 20 (M); 3.4 |
| Ethylene glycol | 107211 | 56000 | 1100000 |
| Hexachloroethane | 67721 | 5.3 | 310 |
| Isophorone | 78591 | 310 | 6200 |
| Isopropyl alcohol | 67630 | 28000 | 560000 |

| | | | |
|---|---|---|---|
| Lead | 7439921 | 14* | * |
| Manganese | 7439965 | 1,300* | * |
| Methanol | 67561 | 14000 | 280000 |
| Methyl-tert-butyl ether (MTBE) | 1634044 | 100 | 2000 |
| Methylene chloride | 75092 | 47 | 940 |
| Molybdenum | 7439987 | 120 | 2400 |
| Nitrobenzene | 98953 | 4.7 | 330 (M); 94 |
| Pentachlorophenol | 87865 | 1.8* | * |
| Perfluorobutane sulfonic acid (PFBS) | 375735 | 8.3 | 166 |
| Perfluorooctanoic acid (PFOA) | 335671 | 0.066 | 350 |
| Perfluorooctane sulfonic acid (PFOS) | 1763231 | 0.011 | 0.22 |
| Styrene | 100425 | 20 | 530 |
| 1,2,4,5-Tetrachlorobenzene | 95943 | 2.8 | 3300 |
| 1,1,2,2-Tetrachloroethane | 79345 | 3.2 | 64 |
| Tetrachloroethylene | 127184 | 11 | 220 |
| Tetrahydrofuran | 109999 | 350 | 7000 |
| Thallium | 7440280 | 2.0 (M); 1.2 | 1400 |
| 1,2,4-Trichlorobenzene | 120821 | 80 | 4700 |
| 1,1,2-Trichloroethane | 79005 | 12 | 240 |
| Trichloroethylene | 79016 | 29 | 580 |
| Vinyl chloride | 75014 | 1.0 (M); 0.25 | 40 (M); 20 |

(Z) Mercury is typically measured as total mercury. The generic cleanup criteria, however, are based on data for different species of mercury. Specifically, data for elemental mercury, chemical abstract service (CAS) number 7439976, serve as the basis for the soil volatilization to indoor air criteria, groundwater volatilization to indoor air, and soil inhalation criteria. Data for methyl mercury, CAS number 22967926, serve as the basis for the GSI criterion; and data for mercuric chloride, CAS number 7487947, serve as the basis for the drinking water, groundwater contact, soil direct contact, and the groundwater protection criteria. Comparison to criteria shall be based on species-specific analytical data only if sufficient facility characterization has been conducted to rule out the presence of other species of mercury.

Brighton Analytical L.L.C. TM

2105 Pless Drive Brighton, Michigan 48114 Phone (810)229-7575 Fax (810)229-8650 E-mail labs@brightonanalytical.com

November 07, 2024

Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

Subject: 241691 AA Sewer
241691

Dear : Mr. MacMillan

Thank you for making Brighton Analytical, L.L.C. your laboratory of choice. Attached are the results for the samples submitted on 10/25/2024 for the above mentioned project. NELAP/TNI Accredited Analysis and EGLE Drinking Water Certified Analysis will be identified in their respective reporting formats. Hard copies can be supplied at your request for a fee of $20.00 per copy.

The invoice for this project will be emailed separately. If you have any questions concerning the data or invoice, please don't hesitate to contact our office. We welcome your comments and suggestions to improve our quality systems. Please reference Brighton Analytical, L.L.C. Project ID 103779 when calling or emailing. We thank you for this opportunity to partner with you on this project and hope to work with you again in the future.

Sincerely,
Brighton Analytical, L.L.C.

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06859** Project Number: **241691**
Sample ID: **SB-101 Solids**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **7600** | ug/Kg | 100 | SW846 6010B | JG | 10/30/2024 |
| Total Barium | **27000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Cadmium | **610** | ug/Kg | 50 | SW846 6010B | JG | 10/30/2024 |
| Total Chromium | **7300** | ug/Kg | 500 | SW846 6010B | JG | 10/30/2024 |
| Total Copper | **18000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Lead | **6800** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | MH | 10/29/2024 |
| Total Selenium | **690** | ug/Kg | 200 | SW846 6010B | JG | 10/30/2024 |
| Total Silver | **110** | ug/Kg | 100 | SW846 6010B | JG | 10/30/2024 |
| Total Zinc | **48000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 10/30/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 10/29/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | MH | 11/04/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 10/29/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06859** Project Number: **241691**
Sample ID: **SB-101 Solids**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 10/29/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 10/29/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 10/29/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 10/29/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06859** Project Number: **241691**
Sample ID: **SB-101 Solids**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 10/29/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 10/29/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 10/29/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 10/24/2024 |
| %Solid | **82** | % | | ASTM D2216 | AP | 10/28/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
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e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06859** Project Number: **241691**

Sample ID: **SB-101 Solids**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 11/7/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
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Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06860** Project Number: **241691**
Sample ID: **SB-101 Water Sample**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **29** | ug/L | 1 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Barium | **600** | ug/L | 100 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Cadmium | **2.0** | ug/L | 0.2 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Chromium | **38** | ug/L | 5 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Copper | **76** | ug/L | 4 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Lead | **42** | ug/L | 3 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Mercury | **0.2** | ug/L | 0.2 | EPA 245.1 | MH | 10/29/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Silver | **0.3** | ug/L | 0.2 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Total Zinc | **190** | ug/L | 10 | EPA 200.8 rev5.4 | MH | 10/30/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 10/29/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | MH | 10/30/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 11/06/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 11/06/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 11/06/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 11/06/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 11/06/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 11/06/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | MH | 11/05/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | BY | 10/28/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |

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NELAC Accredited #176507

Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06860** Project Number: **241691**
Sample ID: **SB-101 Water Sample**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 10/28/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |

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Sample Date: 10/24/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06860** Project Number: **241691**

Sample ID: **SB-101 Water Sample**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 10/28/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 10/28/2024 |

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Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06860** Project Number: **241691**

Sample ID: **SB-101 Water Sample**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Sample does not meet method holding time requirement for pna extraction.

Released by Cynthia L Williams

Date 11/7/2024

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2105 Pless Drive
Brighton, Michigan 48114
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Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06861** Project Number: **241691**

Sample ID: **SB-102 Soil**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **7600** | ug/Kg | 100 | SW846 6010B | JG | 10/30/2024 |
| Total Barium | **15000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Cadmium | **480** | ug/Kg | 50 | SW846 6010B | JG | 10/30/2024 |
| Total Chromium | **6100** | ug/Kg | 500 | SW846 6010B | JG | 10/30/2024 |
| Total Copper | **15000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Lead | **6400** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | MH | 10/29/2024 |
| Total Selenium | **810** | ug/Kg | 200 | SW846 6010B | JG | 10/30/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6010B | JG | 10/30/2024 |
| Total Zinc | **47000** | ug/Kg | 1000 | SW846 6010B | JG | 10/30/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | MH | 10/30/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 10/29/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Acenaphthylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(a)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(a)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Chrysene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Fluoranthene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Fluorene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Naphthalene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Phenanthrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| Pyrene | **Not detected** | ug/Kg | 330 | SW846 8270D | RG | 11/05/2024 |
| PNA solid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | MH | 11/04/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 10/29/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06861** Project Number: **241691**
Sample ID: **SB-102 Soil**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 10/29/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 10/29/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 10/29/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 10/29/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 10/29/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06861** Project Number: **241691**
Sample ID: **SB-102 Soil**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 10/29/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 10/29/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 10/29/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 10/29/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 10/29/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 10/25/2024 |
| %Solid | **81** | % | | ASTM D2216 | AP | 10/28/2024 |

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2105 Pless Drive
Brighton, Michigan 48114
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Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06861** Project Number: **241691**

Sample ID: **SB-102 Soil**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 11/7/2024

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
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Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06862** Project Number: **241691**
Sample ID: **Trip Blank**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | BY | 10/28/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 10/28/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |

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Brighton, Michigan 48114
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NELAC Accredited #176507

Sample Date: 10/25/2024
Submit Date: 10/25/2024
Report Date: 11/07/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**
BA Sample ID: **CW06862** Project Number: **241691**
Sample ID: **Trip Blank**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 10/28/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 10/28/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 10/28/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 10/28/2024 |

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Sample Date: 10/25/2024
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To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **103779** Project Name: **241691 AA Sewer**

BA Sample ID: **CW06862** Project Number: **241691**

Sample ID: **Trip Blank**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 11/7/2024

# Brighton Analytical, L.L.C™

2105 Pless Drive
Brighton, MI 48114
Phone: 810-229-7575 Fax: 810-229-8650
email:bai-brighton@sbcglobal.net

BA PROJECT #: 103779

| | |
|---|---|
| COMPANY NAME | MTC |
| PROJECT NAME (48 SPACES MAXIMUM) | 241691 AA Sewer |
| PROJECT NUMBER (25 SPACES MAXIMUM) | 241691 |
| Sample collected by | Ben Goike |

ABBREVIATIONS FOR SAMPLE MATRIX
S = Solid
L = Liquid
DW = Drinking H2O
WW = Wastewater
O = Oil
P = Wipe
A = Air (Tedlar Bag)
F = Filter
T = Tube
GW = Groundwater
SW = Surface Water
M - Misc.

REQUESTED TURNAROUND: (X BOX WITH TAT NEEDED)
Default TAT Standard: 7 - 10 Business days
RUSH: 1 Business day (verify with lab) @3x Surcharge
RUSH: 2 Business days @2x Surcharge (Non TCLP)
RUSH: 3 Business days @1.5x Surcharge (TCLP @ 2X)
☐ STD ☐ 1 DAY ☐ 2 DAY ☐ 3 DAY

If RUSH approved by

Analysis Requested/Method

| Brighton ID # | Sample Description (35 Characters Limit) | Sampling Date | Sampling Time | VOA'S (PRES) Y/N | HDPE UNPRESERVED | HDPE $HNO_3$ | HDPE $H_2SO_4$ | HDPE NAOH | AMBER GLASS (UNPRESERVED) | AMBER GLASS (PRESERVED) | GLASS, NO PRESERVATIVE | STERILIZED BACTERIA | METALS FILTERED: (F)field OR (L)lab | MEOH Preserved: (Field or (L)ab Preserved | Sample Matrix | VOC | PNA | MI 10 Metals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1) 6859 | SB-101 solids | 10/24 | 14:00 | | | | | | | | 1 | | | F | S | X | X | X |
| 2) 6860 | SB-101 water sample | 10/24 | 14:00 | 2 | X | 1 | | | 1 | | | | | | GW | X | X | X |
| 3) 6861 | SB-102 soil | 10/25 | 15:00 | | | | | | | | 1 | | | F | S | X | X | X |
| 4) 6862 | Trip Blank | 10/25 | 15:00 | * | | | | | | | | | | | | X | | |
| 5) | | | | | | | | | | | | | | | | | | |
| 6) | | | | | | | | | | | | | | | | | | |
| 7) | | | | | | | | | | | | | | | | | | |
| 8) | | | | | | | | | | | | | | | | | | |
| 9) | | | | | | | | | | | | | | | | | | |
| 10) | | | | | | | | | | | | | | | | | | |

* air bubble dh 10/25/24

Special Instructions:

PAGE: ___ OF ___

COMPANY INFO:
MTC

Attn: Isaac MacMillan
PHONE:
SEND:
EMAIL: IMacmillan@MTC-Test.com

For Laboratory Use Only:
Sample received within holding time? yes ☒ no ☐
Temperature of samples °C: ON ICE
pH verified in login? yes ☒ no ☐
Headspace/bubbles in VOA'S? yes ☐ no ☒ n/a ☐
Sample containers and COC match? yes ☒ no ☐

P.O. NUMBER:
BILLING ADDRESS (IF REQUIRED)
MeOH (2)
MTC

For Laboratory Use Only: Field pH/Temp/Time/Initials

Drinking Water Only:
Send to LCHD? yes ☐ no ☐
Chlorinated Water Supply? yes ☐ no ☐
MCL Failure yes ☐ no ☐
Client Notified (date/time/initials): _____

*Please fill out the Chain of Custody completely and review. Incorrect or incomplete information will result in a "hold" on all analyses. All hold samples = $10.*

| Trans. # | RELINQUISHED BY: | RECEIVED BY: | DATE: | TIME: | Trans # | RELINQUISHED BY: | RECEIVED BY: | DATE/TIME: |
|---|---|---|---|---|---|---|---|---|
| 1 | Ryan Watkins | | 10/25 | | 3 | | | |
| 2 | | | | | 4 | | | |

Brighton Analytical L.L.C.

# BRIGHTON ANALYTICAL, LLC

# QUALITY ASSURANCE/QUALITY CONTROL

# GC/MS

## SEMI-VOLATILE METHOD 8270/625

### REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 11/6/2024 Std ID: #4420/#4436 Inst./Detec: HP5973/GC-MS

Laboratory ID#: CW07245 Matrix: WATER Analyst: RG Ext.date:11/05/2024

| SURROGATES | Matrix Spike-Precision* | | | Matrix Spike-Acuracy | | | | LCS-%recovery | |
|---|---|---|---|---|---|---|---|---|---|
| | Spike 1 | Spike 2 | RPD | Spike Conc. ug/L | Recovery(% | Range (%) | Sample(%) surr.recov. | LCS-MStd | Method Blank |
| 2-Fluorophenol | 78 | 75 | 3.9 | 100 | 77 | 37-114 | 33** | 52 | 37 |
| D5-Phenol | 86 | 108 | 22.7** | 100 | 97 | 23-141 | 22** | 44 | 33 |
| D5-Nitrobenzene | 77 | 74 | 4.0 | 100 | 76 | 28-130 | 72 | 69 | 65 |
| 2-Fluorobiphenyl | 89 | 82 | 8.2 | 100 | 86 | 37-117 | 58 | 60 | 54 |
| 2,4,6-Tribromophenol | 60 | 75 | 22.2** | 100 | 68 | 35-130 | 50 | 61 | 44 |
| D14-Terphenyl | 91 | 82 | 10.4 | 100 | 87 | 46-117 | 94 | 80 | 87 |
| COMPOUNDS | | | | | | | | | |
| Phenol | 80 | 102 | 24.2** | 100 | 91 | 25-137 | ND | 41 | <5 |
| 2-Chlorophenol | 90 | 87 | 3.4 | 100 | 89 | 46-129 | ND | 80 | <5 |
| 1,4-Dichlorobenzene | 59 | 49 | 18.5 | 100 | 54 | 14-89 | ND | 32 | <5 |
| 2-Methylphenol | 73 | 91 | 22.0** | 100 | 82 | 25-144 | ND | 61 | <5 |
| N-nitrosodipropylamine | 78 | 73 | 6.6 | 100 | 76 | 32-151 | ND | 64 | <5 |
| 1,2,4-Trichlorobenzene | 72 | 73 | 1.4 | 100 | 73 | 23-116 | ND | 45 | <5 |
| 4-Chloro-3-methylphenol | 73 | 145 | 66.1** | 100 | 109 | 5-210 | ND | 88 | <5 |
| 2-Methylnapthalene | 66 | 79 | 17.9 | 100 | 73 | 29-121 | ND | 50 | <5 |
| 2,4,5-Trichlorophenol | 67 | 95 | 34.6** | 100 | 81 | 20-144 | ND | 69 | <5 |
| Acenaphthene | 83 | 84 | 1.2 | 100 | 84 | 49-119 | ND | 100 | <5 |
| 3-Nitroaniline | 56 | 75 | 29.0** | 100 | 66 | 5-180 | ND | 53 | <5 |
| Dibenzofuran | 76 | 79 | 3.9 | 100 | 78 | 53-119 | ND | 66 | <5 |
| 2,4- Dinitrotoluene | 51 | 75 | 38.1** | 100 | 63 | 5-178 | ND | 54 | <5 |
| 4 - Nitrophenol | 33 | 39 | 16.7 | 100 | 36 | 5-184 | ND | 32 | <5 |
| Pentachlorophenol | 39 | 67 | 52.8** | 100 | 53 | 5-166 | ND | 44 | <5 |
| DI-n-butylphthalate | 108 | 128 | 16.9 | 100 | 118 | 63-166 | ND | 107 | <5 |
| Pyrene | 91 | 81 | 11.6 | 100 | 86 | 47-126 | ND | 98 | <5 |

* Matrix Spike Precision +/-20 RPD

Comments: **Out of range due to sample matrix.

# GC/MS

## SEMI-VOLATILE METHOD 8270

### REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 11/5/2024 Std ID: #4420/#4436 Inst./Detec:HP5973/GC-MS

Laboratory ID#: CW07147 Matrix: soil Analyst: RG Ext.date:11/04/2024

| SURROGATES | Matrix Spike-Precision* | | | Matrix Spike-Acuracy | | | | LCS-%recovery | |
|---|---|---|---|---|---|---|---|---|---|
| | Spike 1 | Sp[ike 2 | RPD | Spike Conc. ug/L | % Recovery | Range (%) | Sample surr.recov. | LCS-MStd | Method Blank |
| 2-Fluorophenol | 67 | 62 | 7.8 | 100 | 65 | 12-135 | 71 | 77 | 62 |
| D5-Phenol | 68 | 65 | 4.5 | 100 | 67 | 14-145 | 92 | 73 | 65 |
| D5-Nitrobenzene | 66 | 65 | 1.5 | 100 | 66 | 14-137 | 65 | 91 | 75 |
| 2-Fluorobiphenyl | 85 | 83 | 2.4 | 100 | 84 | 27-122 | 74 | 122 | 94 |
| 2,4,6-Tribromophenol | 63 | 59 | 6.6 | 100 | 61 | 18-127 | 55 | 66 | 52 |
| D14-Terphenyl | 74 | 75 | 1.3 | 100 | 75 | 35-124 | 82 | 124 | 102 |
| **COMPOUNDS** | | | | | | | | | |
| Phenol | 61 | 60 | 1.7 | 100 | 61 | 14-143 | ND | 72 | <330 |
| 2-Chlorophenol | 66 | 65 | 1.5 | 100 | 66 | 24-143 | ND | 87 | <330 |
| 1,4-Dichlorobenzene | 49 | 48 | 2.1 | 100 | 49 | 17-101 | ND | 74 | <330 |
| 2-Methylphenol | 59 | 62 | 5.0 | 100 | 61 | 18-142 | ND | 79 | <330 |
| N-nitrosodipropylamine | 60 | 59 | 1.7 | 100 | 60 | 26-143 | ND | 84 | <330 |
| 1,2,4-Trichlorobenzene | 62 | 62 | 0.0 | 100 | 62 | 25-123 | ND | 95 | <330 |
| 4-Chloro-3-methylphenol | 62 | 56 | 10.2 | 100 | 59 | 22-160 | ND | 50 | <330 |
| 2-Methylnapthalene | 61 | 63 | 3.2 | 100 | 62 | 20-143 | ND | 83 | <330 |
| 2,4,5-Trichlorophenol | 68 | 54 | 23.0** | 100 | 61 | 24-125 | ND | 61 | <330 |
| Acenaphthene | 77 | 73 | 5.3 | 100 | 75 | 26-141 | ND | 98 | <330 |
| 3-Nitroaniline | 59 | 50 | 16.5 | 100 | 55 | 21-153 | ND | 58 | <830 |
| Dibenzofuran | 74 | 68 | 8.5 | 100 | 71 | 5-171 | ND | 92 | <330 |
| 2,4- Dinitrotoluene | 52 | 43 | 18.9 | 100 | 48 | 23-146 | ND | 49 | <330 |
| 4 - Nitrophenol | 59 | 51 | 14.5 | 100 | 55 | 5-156 | ND | 35 | <830 |
| Pentachlorophenol | 39 | 36 | 8.0 | 100 | 38 | 5-134 | ND | 28 | <800 |
| DI-n-butylphthalate | 93 | 90 | 3.3 | 100 | 92 | 22-171 | ND | 126 | <330 |
| Pyrene | 74 | 76 | 2.7 | 100 | 75 | 38-142 | ND | 115 | <330 |

* Matrix Spike Precision +/-20 RPD

Comments: **Out of range due to sample matrix.

# GC/MS

# VOLATILE METHOD 8260C

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: October 28, 2024 Spike Std. ID: 4607.4.4 Inst./Detec: HP7890/5973 Vol 6

Laboratory ID: CW06860 Matrix: Water Analyst: BY

| | Matrix Spike - Precision | | | Matrix Spike - Accuracy | | | | Sample background | LCS | Method Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| d4-1,2-Dichloroethane | 52.2 | 53.6 | 2.6 | 50 | 104 | 107 | 70-130 | 106% | 105% | 106% |
| d8-Toluene | 48.9 | 49.0 | 0.3 | 50 | 98 | 98 | 70-130 | 97% | 98% | 100% |
| 4-Bromofluorobenzene | 51.9 | 50.9 | 1.8 | 50 | 104 | 102 | 70-130 | 116% | 101% | 117% |
| **COMPOUNDS** | | | | | | | | | | |
| 1,1- Dichloroethene | 50.3 | 47.6 | 5.5 | 50 | 101% | 95% | 70-130 | <1 | 101% | <1 |
| 1,1- Dichloroethane | 48.9 | 47.3 | 3.4 | 50 | 98% | 95% | 70-130 | <1 | 102% | <1 |
| Chloroform | 50.0 | 46.8 | 6.6 | 50 | 100% | 94% | 70-130 | <1 | 101% | <1 |
| 1,2- Dichlororethane | 51.0 | 48.4 | 5.2 | 50 | 102% | 97% | 70-130 | <1 | 104% | <1 |
| Carbon tetrachloride | 48.6 | 45.8 | 6.0 | 50 | 97% | 92% | 70-130 | <1 | 102% | <1 |
| 1,2- Dichloropropane | 47.0 | 44.1 | 6.4 | 50 | 94% | 88% | 70-130 | <1 | 95% | <1 |
| cis- 1,3 -dichloropropene | 45.0 | 42.8 | 4.9 | 50 | 90% | 86% | 70-130 | <1 | 101% | <1 |
| Trichloroethene | 46.7 | 43.4 | 7.3 | 50 | 93% | 87% | 70-130 | <1 | 96% | <1 |
| Dibromochloromethane | 49.5 | 47.1 | 4.8 | 50 | 99% | 94% | 70-130 | <1 | 102% | <1 |
| 1,1,2- Trichloroethane | 48.2 | 44.7 | 7.5 | 50 | 96% | 89% | 70-130 | <1 | 93% | <1 |
| Tetrachloroethane | 47.2 | 43.4 | 8.5 | 50 | 94% | 87% | 70-130 | <1 | 102% | <1 |
| 1,1,2,2 -Tetrachloroethane | 47.5 | 46.7 | 1.6 | 50 | 95% | 93% | 70-130 | <1 | 96% | <1 |
| Chlorobenzene | 50.2 | 47.5 | 5.7 | 50 | 100% | 95% | 70-130 | <1 | 96% | <1 |
| 1,3- Dichlorobenzene | 51.1 | 48.8 | 4.6 | 50 | 102% | 98% | 70-130 | <1 | 101% | <1 |
| 1,4- Dichlorobenzene | 48.6 | 48.4 | 0.3 | 50 | 97% | 97% | 70-130 | <1 | 97% | <1 |
| 1,2-Dichlorobenzene | 51.1 | 50.1 | 2.0 | 50 | 102% | 100% | 70-130 | <1 | 100% | <1 |

ug/L is equivalent to ppb

Comments: _____

# REPRESENTATIVE BATCH QUALITY CONTROL

## Accuracy & Precision

**Analyst:** MH **Parameter:** Mercury

**Analysis Date:** 10/29/24 **Method Reference:** 245.1/7470/7471

**Matrix:** Total / Dissolved **Batch:** W1

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Spike Concentration (ug/L)** | **Background (ug/L)** | **Recoveries (%)** | **Acceptable Range (%)** | **Method Blank Concentration (ug/L)** |
| CW06860 | 2.00 | 0.200 | 101 / 104 | 70 - 130 | <0.2 |

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Observed A (ug/L)** | **Observed B (ug/L)** | **RPD (%)** | **Acceptable Range (%)** | |
| CW06860 | 2.21 | 2.29 | 0.81 | 0 - 20 | |

| Method Standard (Laboratory Control Spike): | | | | |
|---|---|---|---|---|
| | **Standard ID #** | **Recovery (%)** | **Acceptable Range (%)** | |
| Independent Secondary Reference Material: | Spex 102924 | 92.9 | 90 - 110 | |
| Method Standard (Laboratory Control Spike): | Hg- 102924 | 102.1 | 85 - 115 | |

**COMMENTS:** _____

# REPRESENTATIVE BATCH QUALITY CONTROL

## Accuracy & Precision

**Analyst:** MH **Parameter:** Mercury

**Analysis Date:** 10/29/24 **Method Reference:** 245.1/7470/7471

**Matrix:** SOIL **Batch:** S1

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Spike Concentration (ug/Kg)** | **Background (ug/Kg)** | **Recoveries (%)** | **Acceptable Range (%)** | **Method Blank Concentration (ug/Kg)** |
| CW06861 | 100 | 6.3 | 87 / 99 | 70 - 130 | <50 |

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Observed A (ug/Kg)** | **Observed B (ug/Kg)** | **RPD (%)** | **Acceptable Range (%)** | |
| CW06861 | 93.4 | 105.7 | 12.4 | 0 - 20 | |

| MISCELLANEOUS | | | | |
|---|---|---|---|---|
| | **Standard ID #** | **Recovery (%)** | **Acceptable Range (%)** | |
| Independent Secondary Reference Material: | Spex 102924 | 92.9 | 90 - 110 | |
| Method Standard (Laboratory Control Spike): | Hg- 102924 | 103.2 | 85 - 115 | |

**COMMENTS:** _____

# ICP-OES
## METHOD 6010

REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 10/30/2024 Standard ID: 070824 S Batch: 10/30/2024 S1

Matrix Spike Lab ID: MSTD1&2 Matrix: Soil Analyst: JG

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/L) | Matrix Spike Dup (ug/L) | RPD (%) | Spk Conc (ug/L) | MS Recovery (%) | MSD Recovery (%) | Blank Conc (ug/L) | Method Blk (ug/L) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Silver | 1029.00 | 1030.00 | 0.1 | 1000 | 102.9 | 103.0 | 0.0 | <100 | 102.9 | 102.9 |
| Arsenic | 96712 | 97414 | 0.7 | 100000 | 96.7 | 97.4 | 0.0 | <100 | 96.7 | 102.4 |
| Barium | 100044 | 100087 | 0.0 | 100000 | 100.0 | 100.1 | 0.0 | <100 | 100.0 | 103.6 |
| Cadmium | 99758 | 100044 | 0.3 | 100000 | 99.8 | 100.0 | 0.0 | <100 | 99.8 | 106.1 |
| Chromium | 101957 | 102096 | 0.1 | 100000 | 102.0 | 102.1 | 0.0 | <100 | 102.0 | 105.9 |
| Copper | 102687 | 102715 | 0.0 | 100000 | 102.7 | 102.7 | 0.0 | <100 | 102.7 | 104.7 |
| Lead | 101543 | 101746 | 0.2 | 100000 | 101.5 | 101.7 | 0.0 | <100 | 101.5 | 108.3 |
| Selenium | 88275 | 88522 | 0.3 | 100000 | 88.3 | 88.5 | 0.0 | <100 | 88.3 | 101.5 |
| Zinc | 95268 | 95446 | 0.2 | 100000 | 95.3 | 95.4 | 0.0 | <100 | 95.3 | 104.6 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments:

# ICP-MS
# EPA METHOD 200.8/6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 10/30/2024 Standard ID: 092024 H2O Batch: 10/30/2024 W2

Matrix Spike Lab ID: CW07024 Matrix: Total Analyst: MH

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/L) | Matrix Spike Dup (ug/L) | RPD (%) | Spk Conc (ug/L) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/L) | Method Blk (ug/L) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Beryllium | 1057 | 997 | 5.8 | 1000 | 105.7 | 99.7 | 0 | <1 | 100.6 | 101.8 |
| Sodium | 94544 | 94542 | 0.0 | 10000 | 89.4 | 89.4 | 85604 | <1000 | 99.5 | 101.2 |
| Magnesium | 11053 | 11174 | 1.1 | 10000 | 98.9 | 100.1 | 1163 | <100 | 102.4 | 102.7 |
| Calcium | 17038 | 17408 | 2.1 | 10000 | 95.2 | 98.9 | 7521 | <100 | 106.0 | 105.2 |
| Chromium | 1009 | 1023 | 1.4 | 1000 | 100.8 | 102.2 | 1 | <1 | 101.9 | 97.3 |
| Manganese | 1006 | 1036 | 2.9 | 1000 | 99.3 | 102.3 | 13 | <5 | 103.3 | 102.1 |
| Iron | 10176 | 10173 | 0.0 | 10000 | 101.8 | 101.7 | 0 | <20 | 100.9 | 103.2 |
| Cobalt | 1035 | 1052 | 1.6 | 1000 | 103.5 | 105.2 | 0 | <10 | 105.9 | 103.2 |
| Nickel | 978 | 987 | 0.9 | 1000 | 97.8 | 98.7 | 0 | <1 | 99.9 | 102.0 |
| Copper | 1026 | 1042 | 1.5 | 1000 | 102.4 | 104.0 | 2 | <1 | 105.6 | 105.1 |
| Zinc | 1343 | 1081 | 21.6 | 1000 | 128.3 | 102.1 | 60 | <10 | 102.4 | 100.6 |
| Arsenic | 1156 | 1032 | 11.3 | 1000 | 114.4 | 102.0 | 12 | <1 | 99.5 | 99.9 |
| Selenium | 972 | 995 | 2.3 | 1000 | 97.2 | 99.5 | 0 | <1 | 98.9 | 100.4 |
| Molybdenum | 1150 | 1030 | 11.0 | 1000 | 114.9 | 102.9 | 1 | <10 | 99.5 | 97.0 |
| Silver | 11.59 | 10.37 | 11.1 | 10 | 115.9 | 103.7 | 0 | <0.2 | 106.5 | 105.6 |
| Cadmium | 1185 | 1054 | 11.7 | 1000 | 118.5 | 105.4 | 0 | <0.2 | 103.3 | 102.5 |
| Antimony | 1165 | 1069 | 8.6 | 1000 | 116.5 | 106.9 | 0 | <1 | 106.5 | 97.6 |
| Barium | 1189 | 1063 | 11.2 | 1000 | 117.9 | 105.3 | 10 | <5 | 104.5 | 102.9 |
| Thallium | 1108 | 1010 | 9.3 | 1000 | 110.8 | 101.0 | 0 | <0.5 | 98.7 | 104.3 |
| Lead | 1140 | 1031 | 10.0 | 1000 | 114.0 | 103.1 | 0 | <1 | 98.1 | 99.3 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: _____

# GC/MS

# VOLATILE METHOD 8260C

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: October 29, 2024 Spike Std. ID: 4607.4.4 Inst./Detec: HP7890/5973 Vol 5

Laboratory ID: CW06688 Matrix: Soil Analyst: BY

| | Matrix Spike - Precision | | | Matrix Spike - Accuracy | | | | Sample background | LCS | Method Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| d4-1,2-Dichloroethane | 54.2 | 54.3 | 0.1 | 50 | 108 | 109 | 70-130 | 102% | 89% | 102% |
| d8-Toluene | 49.6 | 49.6 | 0.1 | 50 | 99 | 99 | 70-130 | 101% | 91% | 101% |
| 4-Bromofluorobenzene | 46.9 | 46.6 | 0.6 | 50 | 94 | 93 | 70-130 | 100% | 93% | 100% |
| **COMPOUNDS** | | | | | | | | | | |
| 1,1- Dichloroethene | 40.9 | 41.5 | 1.4 | 50 | 82% | 83% | 70-130 | <1 | 106% | <1 |
| 1,1- Dichloroethane | 39.7 | 40.5 | 1.9 | 50 | 79% | 81% | 70-130 | <1 | 109% | <1 |
| Chloroform | 36.4 | 36.9 | 1.4 | 50 | 73% | 74% | 70-130 | <1 | 111% | <1 |
| 1.2- Dichlororethane | 40.9 | 41.1 | 0.3 | 50 | 82% | 82% | 70-130 | <1 | 94% | <1 |
| Carbon tetrachloride | 36.3 | 36.6 | 0.8 | 50 | 73% | 73% | 70-130 | <1 | 111% | <1 |
| 1,2- Dichloropropane | 39.1 | 39.5 | 1.0 | 50 | 78% | 79% | 70-130 | <1 | 103% | <1 |
| cis- 1,3 -dichloropropene | 37.5 | 37.7 | 0.5 | 50 | 75% | 75% | 70-130 | <1 | 104% | <1 |
| Trichloroethene | 41.3 | 41.9 | 1.4 | 50 | 83% | 84% | 70-130 | <1 | 97% | <1 |
| Dibromochloromethane | 38.8 | 39.7 | 2.2 | 50 | 78% | 79% | 70-130 | <1 | 104% | <1 |
| 1,1,2- Trichloroethane | 40.2 | 40.7 | 1.2 | 50 | 80% | 81% | 70-130 | <1 | 94% | <1 |
| Tetrachloroethane | 38.7 | 38.5 | 0.6 | 50 | 77% | 77% | 70-130 | <1 | 111% | <1 |
| 1,1,2,2 -Tetrachloroethane | 40.2 | 38.7 | 3.7 | 50 | 80% | 77% | 70-130 | <1 | 93% | <1 |
| Chlorobenzene | 35.1 | 35.1 | 0.0 | 50 | 70% | 70% | 70-130 | <1 | 93% | <1 |
| 1,3- Dichlorobenzene | 39.1 | 39.0 | 0.3 | 50 | 78% | 78% | 70-130 | <1 | 103% | <1 |
| 1,4- Dichlorobenzene | 39.9 | 39.3 | 1.6 | 50 | 80% | 79% | 70-130 | <1 | 104% | <1 |
| 1,2-Dichlorobenzene | 39.4 | 38.6 | 2.0 | 50 | 79% | 77% | 70-130 | <1 | 103% | <1 |

ug/L is equivalent to ppb

Comments: _____

Brighton Analytical L.L.C.

# METHODS REGULATED BY NELAC AND OR STATE OF MICHIGAN

EPA 120.1-1982
EPA 150.1-1982
EPA 160.2-1979
EPA 160.3-1979
EPA 1631E-2002
EPA 200.7-1994
EPA 200.8 REV 5.4-1994
EPA 245.1-1994
EPA 245.2-1974
EPA 300.0R2.1-1993
EPA 310.1-1978
EPA 335.1-1974
EPA 335.4-1993
EPA 350.1 REV.2-1993
EPA 351.2 REV.2-1993
EPA 365.2-1971
EPA 405.1-1974
EPA 410.4 REV.2-1993
EPA 415.1-1974
EPA 420.1-1978
EPA 524.4-2013
EPA 608.3-2016
EPA 615-1993
EPA 624-1984
EPA 624.1-2016
EPA 625-1984
EPA 625.1-2016
SM 2540C-1997
SM 2540D-1997
SM 4500 H+B-1996
SM 4500 PE-1997
SM 5210B-1997
SM 5310B-1996
SM 9223B-1997
SW846 6010B-1996
SW846 6020A-2007
SW846 7471-1994
SW846 8081B-2007
SW846 8082A-2000
SW846 8151A-1996
SW846 8260C-2006
SW846 8270D-2007
SW846 9040B-1994

Brighton Analytical L.L.C. TM

2105 Pless Drive Brighton, Michigan 48114 Phone (810)229-7575 Fax (810)229-8650 E-mail labs@brightonanalytical.com

December 12, 2024

Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

Subject: High Level Trunkline Sewer Improvement
241691

Dear : Mr. MacMillan

Thank you for making Brighton Analytical, L.L.C. your laboratory of choice. Attached are the results for the samples submitted on 12/06/2024 for the above mentioned project. NELAP/TNI Accredited Analysis and EGLE Drinking Water Certified Analysis will be identified in their respective reporting formats. Hard copies can be supplied at your request for a fee of $20.00 per copy.

The invoice for this project will be emailed separately. If you have any questions concerning the data or invoice, please don't hesitate to contact our office. We welcome your comments and suggestions to improve our quality systems. Please reference Brighton Analytical, L.L.C. Project ID 104551 when calling or emailing. We thank you for this opportunity to partner with you on this project and hope to work with you again in the future.

Sincerely,
Brighton Analytical, L.L.C.

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 12/02/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09084**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-103 0-30'**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **4900** | ug/Kg | 100 | SW846 6020A | JG | 12/09/2024 |
| Total Barium | **32000** | ug/Kg | 1000 | SW846 6020A | JG | 12/09/2024 |
| Total Cadmium | **180** | ug/Kg | 50 | SW846 6020A | JG | 12/09/2024 |
| Total Chromium | **8100** | ug/Kg | 500 | SW846 6020A | JG | 12/09/2024 |
| Total Copper | **10000** | ug/Kg | 1000 | SW846 6020A | JG | 12/09/2024 |
| Total Lead | **8500** | ug/Kg | 1000 | SW846 6020A | JG | 12/09/2024 |
| Total Mercury | **Not detected** | ug/Kg | 50 | SW846 7471A | MH | 12/10/2024 |
| Total Selenium | **870** | ug/Kg | 200 | SW846 6020A | JG | 12/09/2024 |
| Total Silver | **Not detected** | ug/Kg | 100 | SW846 6020A | JG | 12/10/2024 |
| Total Zinc | **29000** | ug/Kg | 1000 | SW846 6020A | JG | 12/09/2024 |
| Metal Soil (digestion) | **Digested** | | | 3050B | JG | 12/09/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 12/10/2024 |
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| Acetone | **Not detected** | ug/Kg | 750 | SW846 8260C | BY | 12/06/2024 |
| Acrylonitrile | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 12/06/2024 |
| Benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Bromobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Bromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Bromodichloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Bromoform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Bromomethane(Methyl bromide) | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 12/06/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Carbon disulfide | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Carbon tetrachloride | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Chlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Chloroethane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Chloroform | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Chloromethane(Methyl chloride) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Cyclohexane | **Not detected** | ug/Kg | 500 | SW846 8260C | BY | 12/06/2024 |
| Dibromochloromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| 1,2-Dibromoethane(Ethylene dibromide) | **Not detected** | ug/Kg | 20 | SW846 8260C | BY | 12/06/2024 |
| Dibromomethane(Methylene bromide) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |

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NELAC Accredited #176507

Sample Date: 12/02/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551** Project Name: **High Level Trunkline Sewer Improvement**

BA Sample ID: **CW09084** Project Number: **241691**

Sample ID: **SB-103 0-30'**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| 1,3-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 12/06/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Diethyl ether | **Not detected** | ug/Kg | 200 | SW846 8260C | BY | 12/06/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Ethyl benzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Ethyltertiary butylether(ETBE) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Isopropylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Methylene chloride | **Not detected** | ug/Kg | 100 | SW846 8260C | BY | 12/06/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Naphthalene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| n-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| n-Propylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| sec-Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Styrene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| tertiary Amylmethylether(TAME) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/Kg | 2500 | SW846 8260C | BY | 12/06/2024 |
| tertiary Butylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Tetrachloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| Toluene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/Kg | 250 | SW846 8260C | BY | 12/06/2024 |

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Sample Date: 12/02/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551** Project Name: **High Level Trunkline Sewer Improvement**

BA Sample ID: **CW09084** Project Number: **241691**

Sample ID: **SB-103 0-30'**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis(Methanol Preserved)** | | | | | | |
| 1,1,1-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Trichloroethene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Trichlorofluoromethane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/Kg | 50 | SW846 8260C | BY | 12/06/2024 |
| Vinyl chloride | **Not detected** | ug/Kg | 40 | SW846 8260C | BY | 12/06/2024 |
| Xylenes | **Not detected** | ug/Kg | 150 | SW846 8260C | BY | 12/06/2024 |
| EPA Method 5035 Methanol Preserv | **Extracted** | | | EPA 5035 | MTC | 12/02/2024 |
| %Solid | **92** | % | | ASTM D2216 | AP | 12/06/2024 |

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

All soil results based on dry weight.

Released by Cynthia L Williams

Date 12/12/2024

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e-mail: labs@brightonanalytical.com
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Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551** Project Name: **High Level Trunkline Sewer Improvement**

BA Sample ID: **CW09085** Project Number: **241691**

Sample ID: **SB-103**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **5** | ug/L | 1 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Barium | **200** | ug/L | 100 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Chromium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Copper | **6** | ug/L | 4 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Lead | **4** | ug/L | 3 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | MH | 12/10/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Zinc | **60** | ug/L | 10 | EPA 200.8 rev5.4 | JG | 12/11/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 12/10/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | JG | 12/10/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | MH | 12/11/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | BY | 12/11/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |

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Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09085**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-103**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloromethane(Methyl Chloride) | **1** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| cis-1,2-Dichloroethene | **2** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 12/11/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |

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Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09085**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-103**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 12/11/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tetrachloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 12/11/2024 |

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09085**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-103**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by Cynthia L Williams

Date 12/12/2024

**Brighton Analytical LLC**
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Brighton, Michigan 48114
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Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09086**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-102**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Total Metal Analysis** | | | | | | |
| Total Arsenic | **6** | ug/L | 1 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Barium | **200** | ug/L | 100 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Cadmium | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Chromium | **7** | ug/L | 5 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Copper | **16** | ug/L | 4 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Lead | **13** | ug/L | 3 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Mercury | **Not detected** | ug/L | 0.2 | EPA 245.1 | MH | 12/10/2024 |
| Total Selenium | **Not detected** | ug/L | 5 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Silver | **Not detected** | ug/L | 0.2 | EPA 200.8 rev5.4 | JG | 12/10/2024 |
| Total Zinc | **50** | ug/L | 10 | EPA 200.8 rev5.4 | JG | 12/11/2024 |
| Mercury (digestion) | **Digested** | | | 7470/7471 | MH | 12/10/2024 |
| Metal Water Total (digest) | **Digested** | | | 3020A | JG | 12/10/2024 |
| **PNA Analysis** | | | | | | |
| Acenaphthene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Acenaphthylene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Anthracene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(a)anthracene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(a)pyrene | **Not detected** | ug/L | 0.2 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(b)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(g,h,i)perylene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Benzo(k)fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Chrysene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Dibenzo(a,h)anthracene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| Fluoranthene | **Not detected** | ug/L | 1 | EPA 625/625.1 | RG | 12/11/2024 |
| Fluorene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Indeno(1,2,3-cd)pyrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| Phenanthrene | **Not detected** | ug/L | 2 | EPA 625/625.1 | RG | 12/11/2024 |
| Pyrene | **Not detected** | ug/L | 5 | EPA 625/625.1 | RG | 12/11/2024 |
| PNA liquid GC/MS (extraction) | **Extracted** | | | 3510C/3545 | MH | 12/11/2024 |
| **Volatile Analysis** | | | | | | |
| Acetone | **Not detected** | ug/L | 20 | SW846 8260C | BY | 12/11/2024 |
| Acrylonitrile | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |

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Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551** Project Name: **High Level Trunkline Sewer Improvement**

BA Sample ID: **CW09086** Project Number: **241691**

Sample ID: **SB-102**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Bromobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromodichloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromoform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Bromomethane(Methyl Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 2-Butanone (MEK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Carbon disulfide | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Carbon tetrachloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloroform | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Chloromethane(Methyl Chloride) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| cis-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| cis-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Cyclohexane | **Not detected** | ug/L | 10 | SW846 8260C | BY | 12/11/2024 |
| Dibromochloromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dibromo-3-Chloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dibromoethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Dibromomethane(Methylene Bromide) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,3-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,4-Dichlorobenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Dichlorodifluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2-Dichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Diethyl ether | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Diisopropyl Ether(DIPE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Ethyl benzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Ethyltertiarybutylether(ETBE) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 2-Hexanone(Methyl Butyl Ketone) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Isopropylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Methyl iodide(Iodomethane) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Methylene chloride | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 2-Methylnaphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 4-Methyl-2-pentanone(MIBK) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |

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2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551** Project Name: **High Level Trunkline Sewer Improvement**
BA Sample ID: **CW09086** Project Number: **241691**
Sample ID: **SB-102**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **Volatile Analysis** | | | | | | |
| Methyl(tert)butyl ether(MTBE) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Naphthalene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| n-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| n-Propylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| p-Isopropyl Toluene(p-Cymene) | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| sec-Butylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Styrene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tertiary Butyl Alcohol(TBA) | **Not detected** | ug/L | 50 | SW846 8260C | BY | 12/11/2024 |
| tertiaryAmylmethylether(TAME) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| tertiaryButylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,1,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,2,2-Tetrachloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tetrachloroethene | **12** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Tetrahydrofuran(THF) | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| Toluene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,4-Dichloro-2-butene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,2-Dichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| trans-1,3-Dichloropropene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 1,2,4-Trichlorobenzene | **Not detected** | ug/L | 5 | SW846 8260C | BY | 12/11/2024 |
| 1,1,1-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,1,2-Trichloroethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Trichloroethene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Trichlorofluoromethane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trichloropropane | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,3-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,2,4-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| 1,3,5-Trimethylbenzene | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Vinyl chloride | **Not detected** | ug/L | 1 | SW846 8260C | BY | 12/11/2024 |
| Xylenes(total) | **Not detected** | ug/L | 3 | SW846 8260C | BY | 12/11/2024 |

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Sample Date: 12/05/2024
Submit Date: 12/06/2024
Report Date: 12/12/2024

To:
Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **104551**
BA Sample ID: **CW09086**
Project Name: **High Level Trunkline Sewer Improvement**
Project Number: **241691**
Sample ID: **SB-102**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

Released by 

Date 12/12/2024

# Brighton Analytical, L.L.C™

2105 Pless Drive
Brighton, MI 48114
Phone: 810-229-7575 Fax: 810-229-8650
email:bai-brighton@sbcglobal.net

BA PROJECT #: 10455-1

**ABBREVIATIONS FOR SAMPLE MATRIX**

S = Solid
L = Liquid
DW = Drinking H,0
WW = Wastewater
O = Oil
P = Wipe
A = Air (Tedlar Bag)
F = Filter
T = Tube
GW = Groundwater
SW = Surface Water
M - Misc.

**Analysis Requested/Method**

PAGE: ___ OF ___

**COMPANY INFO:**

Materials Testing Consultants

Attn: Isaac MacMillan
PHONE:
SEND:
EMAIL: imacmillan@MTC-test.com

| | |
|---|---|
| COMPANY NAME | MTC |
| PROJECT NAME (48 SPACES MAXIMUM) | High level trunkline sewer improvement |
| PROJECT NUMBER (25 SPACES MAXIMUM) | 241691 |
| Sample collected by | MDE |

If RUSH approved by:

REQUESTED TURNAROUND: (X BOX WITH TAT NEEDED)
Default TAT Standard: 7 - 10 Business days
RUSH: 1 Business day (verify with lab) @3x Surcharge
RUSH: 2 Business days @2x Surcharge (Non TCLP)
RUSH: 3 Business days @1.5x Surcharge (TCLP @ 2X)

☐ STD ☐ 1 DAY ☐ 2 DAY ☐ 3 DAY

**Container Type & Quantity**

| Brighton ID # | Sample Description (35 Characters Limit) | Sampling Date | Sampling Time | VOA'S (PRES) Y N | HDPE UNPRESERVED | HDPE $HNO_3$ | HDPE $H_2SO_4$ | HDPE NAOH | AMBER GLASS (UNPRESERVED) | AMBER GLASS (PRESERVED) | GLASS, NO PRESERVATIVE | STERILIZED BACTERIA | METALS FILTERED: (F)ield OR (L)ab | MEOH Preserved: (F)ield or (L)ab Preserved | Sample Matrix | MI 10 Metals | VOCs | PNAs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9084 | SB-103 0-30ft | 12/2 | 15:00 | | | | | | | | 1 | | | 1 | S | X | X | |
| 2) 9085 | SB-103 | 12/5 | 14:15 | 2 | 1 | | | | 1 | | | | | | GW | X | X | X |
| 3) 9086 | SB-102 | 12/5 | 16:30 | 2 | 1 | | | | 1 | | | | | | GW | X | X | X |
| 4) | | | | | | | | | | | | | | | | | | |
| 5) | | | | | | | | | | | | | | | | | | |
| 6) | | | | | | | | | | | | | | | | | | |
| 7) | | | | | | | | | | | | | | | | | | |
| 8) | | | | | | | | | | | | | | | | | | |
| 9) | | | | | | | | | | | | | | | | | | |
| 10) | | | | | | | | | | | | | | | | | | |

Sample received within holding time? yes ☒ no ☐
Temperature of samples °C: ICE
pH verified in login? yes ☒ no ☐
Headspace/bubbles in VOA'S? yes ☐ no ☒ n/a ☐
Sample containers and COC match? yes ☒ no ☐

P.O. NUMBER:

BILLING ADDRESS (IF REQUIRED)
Methanol
EPA5035 MTC

**For Laboratory Use Only: Field pH/Temp/Time/Initials**

**Drinking Water Only:**

Send to LCHD? yes ☐ no ☐
Chlorinated Water Supply? yes ☐ no ☐

MCL Failure yes ☐ no ☐
Client Notified (date/time/initials): _____

**Special Instructions:**

***Please fill out the Chain of Custody completely and review. Incorrect or incomplete information will result in a "hold" on all analyses. All hold samples = $10.***

| Trans. # | RELINQUISHED BY: | RECEIVED BY: | DATE: | TIME: | Trans. # | RELINQUISHED BY: | RECEIVED BY: | DATE/TIME: |
|---|---|---|---|---|---|---|---|---|
| 1 | [signature] | Samantha Staggs | 12-5-24 | 17:20 | 3 | [signature] | [signature] | 12/6/24 11:45 |
| 2 | Samantha Staggs | Ben Goike | 12-6-24 | ~~17:2~~ 9:25 | 4 | | | |

Brighton Analytical L.L.C.

# BRIGHTON ANALYTICAL, LLC

# QUALITY ASSURANCE/QUALITY CONTROL

# GC/MS

## SEMI-VOLATILE METHOD 8270/625

### REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: 12/11/2024 Std ID: #4420/#4436 Inst./Detec: HP5973/GC-MS

Laboratory ID#: CW09127 Matrix: WATER Analyst: RG Ext.date:12/11/2024

| SURROGATES | Matrix Spike-Precision* | | | Matrix Spike-Acuracy | | | | LCS-%recovery | |
|---|---|---|---|---|---|---|---|---|---|
| | Spike 1 | Spike 2 | RPD | Spike Conc. ug/L | Recovery(% | Range (%) | Sample(%) surr.recov. | LCS-MStd | Method Blank |
| 2-Fluorophenol | 82 | 79 | 3.7 | 100 | 81 | 45-108 | 56 | 54 | 47 |
| D5-Phenol | 80 | 88 | 9.5 | 100 | 84 | 35-131 | 47 | 40 | 39 |
| D5-Nitrobenzene | 80 | 82 | 2.5 | 100 | 81 | 34-116 | 79 | 74 | 60 |
| 2-Fluorobiphenyl | 85 | 82 | 3.6 | 100 | 84 | 35-121 | 68 | 65 | 44 |
| 2,4,6-Tribromophenol | 97 | 101 | 4.0 | 100 | 99 | 30-125 | 105 | 95 | 75 |
| D14-Terphenyl | 91 | 89 | 2.2 | 100 | 90 | 49-114 | 93 | 79 | 86 |
| COMPOUNDS | | | | | | | | | |
| Phenol | 90 | 101 | 11.5 | 100 | 96 | 38-129 | ND | 43 | <5 |
| 2-Chlorophenol | 97 | 97 | 0.0 | 100 | 97 | 53-125 | ND | 77 | <5 |
| 1,4-Dichlorobenzene | 62 | 60 | 3.3 | 100 | 61 | 11-93 | ND | 29 | <5 |
| 2-Methylphenol | 77 | 87 | 12.2 | 100 | 82 | 29-132 | ND | 59 | <5 |
| N-nitrosodipropylamine | 90 | 87 | 3.4 | 100 | 89 | 39-131 | ND | 68 | <5 |
| 1,2,4-Trichlorobenzene | 84 | 83 | 1.2 | 100 | 84 | 29-111 | ND | 43 | <5 |
| 4-Chloro-3-methylphenol | 106 | 129 | 19.6 | 100 | 118 | 5-204 | ND | 113 | <5 |
| 2-Methylnapthalene | 100 | 112 | 11.3 | 100 | 106 | 37-111 | ND | 78 | <5 |
| 2,4,5-Trichlorophenol | 106 | 117 | 9.9 | 100 | 112 | 25-139 | ND | 101 | <5 |
| Acenaphthene | 103 | 98 | 5.0 | 100 | 101 | 55-109 | ND | 80 | <5 |
| 3-Nitroaniline | 97 | 110 | 12.6 | 100 | 104 | 5-169 | ND | 89 | <5 |
| Dibenzofuran | 98 | 99 | 1.0 | 100 | 99 | 55-114 | ND | 79 | <5 |
| 2,4- Dinitrotoluene | 101 | 123 | 19.6 | 100 | 112 | 5-162 | ND | 94 | <5 |
| 4 - Nitrophenol | 112 | 132 | 16.4 | 100 | 122 | 5-174 | ND | 69 | <5 |
| Pentachlorophenol | 88 | 99 | 11.8 | 100 | 94 | 5-160 | ND | 92 | <5 |
| Dl-n-butylphthalate | 139 | 127 | 9.0 | 100 | 133 | 65-159 | ND | 120 | <5 |
| Pyrene | 102 | 94 | 8.2 | 100 | 98 | 48-122 | ND | 75 | <5 |

* Matrix Spike Precision +/-20 RPD

Comments: _____

# ICP-MS
## EPA METHOD 200.8/6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 12/11/2024 Standard ID: 103024 H2O Batch: 12/10/2024 W1

Matrix Spike Lab ID: CW09089 Matrix: Total Analyst: JG

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/L) | Matrix Spike Dup (ug/L) | RPD (%) | Spk Conc (ug/L) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/L) | Method Blk (ug/L) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Sodium | 175557 | 185330 | 5.4 | 10000 | 0.0 | 24.9 | 182844 | <1000 | 99.7 | 90.1 |
| Magnesium | 11243 | 11646 | 3.5 | 10000 | 109.8 | 113.8 | 264 | <100 | 98.9 | 90.9 |
| Potassium | 12435 | 12656 | 1.8 | 10000 | 118.4 | 120.6 | 595 | <100 | 101.1 | 91.1 |
| Zinc | 1363 | 1431 | 4.9 | 1000 | 95.8 | 102.6 | 405 | <10 | 101.9 | 99.9 |
| Selenium | 1013 | 1048 | 3.4 | 1000 | 101.1 | 104.6 | 2 | <1 | 102.2 | 97.5 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: Na out of range due to sample matrix

# GC/MS

# VOLATILE METHOD 8260C

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: December 11, 2024 Spike Std. ID: 4653.2.1 Inst./Detec: HP7890/5973 Vol 5

Laboratory ID: CW09043 Matrix: Water Analyst: BY

| | Matrix Spike - Precision | | | Matrix Spike - Accuracy | | | | Sample background | LCS | Method Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| d4-1,2-Dichloroethane | 46.9 | 47.2 | 0.5 | 50 | 94 | 94 | 70-130 | 92% | 89% | 91% |
| d8-Toluene | 48.1 | 48.4 | 0.5 | 50 | 96 | 97 | 70-130 | 95% | 91% | 96% |
| 4-Bromofluorobenzene | 45.7 | 44.9 | 1.8 | 50 | 91 | 90 | 70-130 | 94% | 93% | 99% |
| **COMPOUNDS** | | | | | | | | | | |
| 1,1- Dichloroethene | 48.7 | 47.0 | 3.5 | 50 | 97% | 94% | 70-130 | <1 | 87% | <1 |
| 1,1- Dichloroethane | 47.2 | 44.8 | 5.3 | 50 | 94% | 90% | 70-130 | <1 | 87% | <1 |
| Chloroform | 49.6 | 47.9 | 3.5 | 50 | 99% | 96% | 70-130 | <1 | 92% | <1 |
| 1,2- Dichlororethane | 46.3 | 45.2 | 2.5 | 50 | 93% | 90% | 70-130 | <1 | 90% | <1 |
| Carbon tetrachloride | 54.0 | 53.8 | 0.4 | 50 | 108% | 108% | 70-130 | <1 | 95% | <1 |
| 1,2- Dichloropropane | 45.3 | 46.4 | 2.3 | 50 | 91% | 93% | 70-130 | <1 | 86% | <1 |
| cis- 1,3 -dichloropropene | 47.5 | 49.0 | 3.1 | 50 | 95% | 98% | 70-130 | <1 | 90% | <1 |
| Trichloroethene | 51.4 | 51.8 | 0.8 | 50 | 103% | 104% | 70-130 | <1 | 93% | <1 |
| Dibromochloromethane | 50.6 | 53.3 | 5.1 | 50 | 101% | 107% | 70-130 | <1 | 98% | <1 |
| 1,1,2- Trichloroethane | 50.0 | 52.6 | 5.1 | 50 | 100% | 105% | 70-130 | <1 | 97% | <1 |
| Tetrachloroethane | 54.2 | 54.5 | 0.5 | 50 | 108% | 109% | 70-130 | <1 | 98% | <1 |
| 1,1,2,2 -Tetrachloroethane | 46.9 | 49.5 | 5.5 | 50 | 94% | 99% | 70-130 | <1 | 92% | <1 |
| Chlorobenzene | 46.3 | 45.8 | 1.1 | 50 | 93% | 92% | 70-130 | <1 | 91% | <1 |
| 1,3- Dichlorobenzene | 49.5 | 49.1 | 0.9 | 50 | 99% | 98% | 70-130 | <1 | 94% | <1 |
| 1,4- Dichlorobenzene | 49.5 | 49.8 | 0.7 | 50 | 99% | 100% | 70-130 | <1 | 95% | <1 |
| 1,2-Dichlorobenzene | 49.9 | 49.7 | 0.3 | 50 | 100% | 99% | 70-130 | <1 | 95% | <1 |

ug/L is equivalent to ppb

Comments: _____

# ICP-MS
# EPA METHOD 200.8/6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 12/10/2024 Standard ID: 103024 H2O Batch: 12/10/2024 W2

Matrix Spike Lab ID: CW09114 Matrix: Total Analyst: JG

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/L) | Matrix Spike Dup (ug/L) | RPD (%) | Spk Conc (ug/L) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/L) | Method Blk (ug/L) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Calcium | 65308 | 67181 | 2.8 | 10000 | 54.7 | 73.4 | 59843 | <100 | 97.1 | 97.0 |
| Chromium | 1067 | 1111 | 4.0 | 1000 | 106.5 | 110.9 | 2 | <1 | 93.0 | 91.6 |
| Iron | 10519 | 10871 | 3.3 | 10000 | 104.7 | 108.2 | 48 | <20 | 91.4 | 91.7 |
| Nickel | 1063 | 1104 | 3.8 | 1000 | 105.3 | 109.4 | 10 | <1 | 92.7 | 96.3 |
| Copper | 1110 | 1153 | 3.8 | 1000 | 110.7 | 115.0 | 3 | <1 | 92.2 | 95.3 |
| Arsenic | 979 | 1134 | 14.7 | 1000 | 97.7 | 113.2 | 2 | <1 | 101.3 | 95.7 |
| Selenium | 933 | 960 | 2.9 | 1000 | 93.1 | 95.8 | 2 | <1 | 96.1 | 98.4 |
| Silver | 10.23 | 12.11 | 16.8 | 10 | 102.3 | 121.1 | 0 | <0.2 | 108.3 | 98.6 |
| Cadmium | 976 | 1156 | 16.9 | 1000 | 97.6 | 115.6 | 0 | <0.2 | 98.6 | 95.1 |
| Barium | 1009 | 1155 | 13.5 | 1000 | 99.8 | 114.4 | 11 | <5 | 101.0 | 96.6 |
| Lead | 993 | 1143 | 14.0 | 1000 | 99.3 | 114.3 | 0 | <1 | 98.7 | 90.7 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: Ca out of range due to sample matrix

# ICP-MS
# METHOD 6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 12/10/2024 Standard ID: 070824 S Batch: 12/9/2024 S1

Matrix Spike Lab ID: CW09084 Matrix: Soil Analyst: JG

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/Kg) | Matrix Spike Dup (ug/Kg) | RPD (%) | Spk Conc (ug/Kg) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/Kg) | Method Blk (ug/Kg) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Silver | 1241 | 1253 | 1.0 | 1000 | 120.3 | 121.5 | 38 | <100 | 101.2 | 98.6 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: _____

# REPRESENTATIVE BATCH QUALITY CONTROL

## Accuracy & Precision

**Analyst:** MH **Parameter:** Mercury

**Analysis Date:** 12/10/24 **Method Reference:** 245.1/7470/7471

**Matrix:** SOIL **Batch:** S1

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Spike Concentration (ug/Kg)** | **Background (ug/Kg)** | **Recoveries (%)** | **Acceptable Range (%)** | **Method Blank Concentration (ug/Kg)** |
| CW08975 | 100 | 21.5 | 105 / 103 | 70 - 130 | <50 |

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Observed A (ug/Kg)** | **Observed B (ug/Kg)** | **RPD (%)** | **Acceptable Range (%)** | |
| CW08975 | 126.5 | 124.9 | 1.3 | 0 - 20 | |

| MISCELLANEOUS | | | | |
|---|---|---|---|---|
| | **Standard ID #** | **Recovery (%)** | **Acceptable Range (%)** | |
| Independent Secondary Reference Material: | Spex 121024 | 93.9 | 90 - 110 | |
| Method Standard (Laboratory Control Spike): | Hg- 121024 | 106.8 | 85 - 115 | |

**COMMENTS:** _____

# REPRESENTATIVE BATCH QUALITY CONTROL

## Accuracy & Precision

**Analyst:** MH **Parameter:** Mercury

**Analysis Date:** 12/10/24 **Method Reference:** 245.1/7470/7471

**Matrix:** Total **Batch:** W1

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Spike Concentration (ug/L)** | **Background (ug/L)** | **Recoveries (%)** | **Acceptable Range (%)** | **Method Blank Concentration (ug/L)** |
| CW09081 | 2.00 | 0.008 | 107 / 100 | 70 - 130 | <0.2 |

| SPIKE - ACCURACY | | | | | |
|---|---|---|---|---|---|
| **Laboratory ID** | **Observed A (ug/L)** | **Observed B (ug/L)** | **RPD (%)** | **Acceptable Range (%)** | |
| CW09081 | 2.14 | 2.02 | 1.52 | 0 - 20 | |
| | | | | | |
| | **Standard ID #** | **Recovery (%)** | **Acceptable Range (%)** | | |
| Independent Secondary Reference Material: | Spex 121024 | 93.9 | 90 - 110 | | |
| Method Standard (Laboratory Control Spike): | Hg- 121024 | 105.5 | 85 - 115 | | |

**COMMENTS:** _____

# ICP-MS
# METHOD 200.8/6020

**REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY**

Analysis Date: 12/09/2024 Standard ID: 070824 S Batch: 12/9/2024 S1

Matrix Spike Lab ID: CW09084 Matrix: Soil Analyst: JG

| Metals | Matrix Spike - Precision * | | | Matrix Spike - Accuracy** | | | | Miscellaneous*** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Matrix Spike (ug/Kg) | Matrix Spike Dup (ug/Kg) | RPD (%) | Spk Conc (ug/Kg) | MS Recovery (%) | MSD Recovery (%) | Sample Conc (ug/Kg) | Method Blk (ug/Kg) | LCS-Method STD (%) | Ind. Std. SPEX 1&3 (%) |
| Chromium | 108946 | 90768 | 18.2 | 100000 | 101.5 | 83.3 | 7479 | <500 | 90.7 | 93.2 |
| Copper | 103785 | 90276 | 13.9 | 100000 | 94.4 | 80.9 | 9396 | <1000 | 95.6 | 97.6 |
| Zinc | 120453 | 104391 | 14.3 | 100000 | 94.0 | 78.0 | 26406 | <1000 | 94.2 | 93.0 |
| Arsenic | 98399 | 86059 | 13.4 | 100000 | 93.9 | 81.5 | 4515 | <100 | 93.8 | 95.1 |
| Selenium | 92861 | 80659 | 14.1 | 100000 | 92.1 | 79.9 | 799 | <100 | 93.2 | 96.5 |
| Cadmium | 109143 | 93937 | 15.0 | 100000 | 109.0 | 93.8 | 171 | <50 | 90.7 | 102.9 |
| Barium | 155083 | 129584 | 17.9 | 100000 | 125.3 | 99.8 | 29748 | <100 | 89.7 | 94.6 |
| Lead | 140157 | 121053 | 14.6 | 100000 | 132.3 | 113.2 | 7842 | <1000 | 107.8 | 109.2 |

* Matrix spike precision range +/- 20% RPD
** Matrix spike accuracy range +/- 30% recovery
*** LCS accuracy range +/- 15% recovery / Ind std accuracy range +/- 10% recovery

Comments: Pb out of range due to sample matrix

# GC/MS

# VOLATILE METHOD 8260C

## REPRESENTATIVE BATCH PRECISION AND ACCURACY QUALITY CONTROL SUMMARY

Analysis Date: December 6, 2024 Spike Std. ID: 4653.1.5 Inst./Detec: HP7890/5973 Vol 5

Laboratory ID: CW08835 Matrix: Soil Analyst: BY

| | Matrix Spike - Precision | | | Matrix Spike - Accuracy | | | | Sample background | LCS | Method Blank |
|---|---|---|---|---|---|---|---|---|---|---|
| d4-1,2-Dichloroethane | 46.6 | 45.9 | 1.7 | 50 | 93 | 92 | 70-130 | 96% | 89% | 93% |
| d8-Toluene | 44.6 | 46.8 | 4.7 | 50 | 89 | 94 | 70-130 | 88% | 91% | 93% |
| 4-Bromofluorobenzene | 44.5 | 44.9 | 1.0 | 50 | 89 | 90 | 70-130 | 91% | 93% | 95% |
| **COMPOUNDS** | | | | | | | | | | |
| 1,1- Dichloroethene | 36.3 | 36.9 | 1.6 | 50 | 73% | 74% | 70-130 | <1 | 90% | <1 |
| 1,1- Dichloroethane | 38.2 | 39.7 | 4.0 | 50 | 76% | 79% | 70-130 | <1 | 81% | <1 |
| Chloroform | 44.7 | 43.9 | 1.9 | 50 | 89% | 88% | 70-130 | <1 | 93% | <1 |
| 1.2- Dichlororethane | 45.8 | 43.4 | 5.2 | 50 | 92% | 87% | 70-130 | <1 | 89% | <1 |
| Carbon tetrachloride | 36.9 | 39.8 | 7.7 | 50 | 74% | 80% | 70-130 | <1 | 90% | <1 |
| 1,2- Dichloropropane | 40.5 | 40.5 | 0.0 | 50 | 81% | 81% | 70-130 | <1 | 84% | <1 |
| cis- 1,3 -dichloropropene | 42.3 | 40.8 | 3.6 | 50 | 85% | 82% | 70-130 | <1 | 84% | <1 |
| Trichloroethene | 42.6 | 43.8 | 2.8 | 50 | 85% | 88% | 70-130 | <1 | 95% | <1 |
| Dibromochloromethane | 45.1 | 43.6 | 3.5 | 50 | 90% | 87% | 70-130 | <1 | 99% | <1 |
| 1,1,2- Trichloroethane | 50.4 | 47.5 | 5.9 | 50 | 101% | 95% | 70-130 | <1 | 102% | <1 |
| Tetrachloroethane | 46.1 | 46.5 | 0.8 | 50 | 92% | 93% | 70-130 | <1 | 103% | <1 |
| 1,1,2,2 -Tetrachloroethane | 49.6 | 45.6 | 8.5 | 50 | 99% | 91% | 70-130 | <1 | 96% | <1 |
| Chlorobenzene | 42.9 | 43.6 | 1.5 | 50 | 86% | 87% | 70-130 | <1 | 87% | <1 |
| 1,3- Dichlorobenzene | 48.2 | 47.0 | 2.4 | 50 | 96% | 94% | 70-130 | <1 | 95% | <1 |
| 1,4- Dichlorobenzene | 48.2 | 47.6 | 1.3 | 50 | 96% | 95% | 70-130 | <1 | 97% | <1 |
| 1,2-Dichlorobenzene | 48.7 | 48.0 | 1.4 | 50 | 97% | 96% | 70-130 | <1 | 96% | <1 |

ug/L is equivalent to ppb

Comments: _____

Brighton Analytical L.L.C.

# METHODS REGULATED BY NELAC AND OR STATE OF MICHIGAN

EPA 120.1-1982
EPA 150.1-1982
EPA 160.2-1979
EPA 160.3-1979
EPA 1631E-2002
EPA 200.7-1994
EPA 200.8 REV 5.4-1994
EPA 245.1-1994
EPA 245.2-1974
EPA 300.0R2.1-1993
EPA 310.1-1978
EPA 335.1-1974
EPA 335.4-1993
EPA 350.1 REV.2-1993
EPA 351.2 REV.2-1993
EPA 365.2-1971
EPA 405.1-1974
EPA 410.4 REV.2-1993
EPA 415.1-1974
EPA 420.1-1978
EPA 524.4-2013
EPA 608.3-2016
EPA 615-1993
EPA 624-1984
EPA 624.1-2016
EPA 625-1984
EPA 625.1-2016
SM 2540C-1997
SM 2540D-1997
SM 4500 H+B-1996
SM 4500 PE-1997
SM 5210B-1997
SM 5310B-1996
SM 9223B-1997
SW846 6010B-1996
SW846 6020A-2007
SW846 7471-1994
SW846 8081B-2007
SW846 8082A-2000
SW846 8151A-1996
SW846 8260C-2006
SW846 8270D-2007
SW846 9040B-1994

# APPENDIX B – JULY 2025 LAB REPORT FOR 1,4-DIOXANE SAMPLES

Brighton Analytical L.L.C. TM

2105 Pless Drive Brighton, Michigan 48114 Phone (810)229-7575 Fax (810)229-8650 E-mail labs@brightonanalytical.com

July 08, 2025

Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

Subject: Ann Arbor Sewer Trunk - Water Sampling
241691

Dear : Mr. Rousseau

Thank you for making Brighton Analytical, L.L.C. your laboratory of choice. Attached are the results for the samples submitted on 07/02/2025 for the above mentioned project. NELAP/TNI Accredited Analysis and EGLE Drinking Water Certified Analysis will be identified in their respective reporting formats. Hard copies can be supplied at your request for a fee of $20.00 per copy. Quality Control summaries can also be provided upon request.

The invoice for this project will be emailed separately. If you have any questions concerning the data or invoice, please don't hesitate to contact our office. We welcome your comments and suggestions to improve our quality systems. Please reference Brighton Analytical, L.L.C. Project ID 108307 when calling or emailing. We thank you for this opportunity to partner with you on this project and hope to work with you again in the future.

Sincerely,
Brighton Analytical, L.L.C.

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 07/02/2025
Submit Date: 07/02/2025
Report Date: 07/08/2025

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **108307**
BA Sample ID: **CY01138**
Project Name: **Ann Arbor Sewer Trunk - Water Sampling**
Project Number: **241691**
Sample ID: **SB-103**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **1,4-Dioxane(SIM)** | | | | | | |
| 1,4-Dioxane (SIM) | **Not detected** | ug/L | 1 | EPA 1624(SIM) | BY | 07/07/2025 |

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

**No duplication of this report is allowed, except in its entirety.**

Released by 

Date 7/8/2025

**Brighton Analytical LLC**
2105 Pless Drive
Brighton, Michigan 48114
Phone: (810)229-7575 (810)229-8650
e-mail: labs@brightonanalytical.com
EGLE Certified #9404
NELAC Accredited #176507

Sample Date: 07/02/2025
Submit Date: 07/02/2025
Report Date: 07/08/2025

To: Materials Testing Consultants
693 Plymouth Rd. NE
Grand Rapids, MI 49505

BA Report Number: **108307**
BA Sample ID: **CY01139**
Project Name: **Ann Arbor Sewer Trunk - Water Sampling**
Project Number: **241691**
Sample ID: **SB-102**

| Parameters | Result | Units | DL | Method Reference | Analyst | Analysis Date |
|---|---|---|---|---|---|---|
| **1,4-Dioxane(SIM)** | | | | | | |
| 1,4-Dioxane (SIM) | **Not detected** | ug/L | 1 | EPA 1624(SIM) | BY | 07/07/2025 |

DL=Reported detection limit for analytical method requested. Some compounds require special analytical methods to achieve EGLE designated target detection limits (TDL).

**No duplication of this report is allowed, except in its entirety.**

Released by 

Date 7/8/2025

# Brighton Analytical, L.L.C™

2105 Pless Drive
Brighton, MI 48114
Phone: 810-229-7575 Fax: 810-229-8650
email:bai-brighton@sbcglobal.net

BA PROJECT #: 108307

**ABBREVIATIONS FOR SAMPLE MATRIX**

S = Solid
L = Liquid
DW = Drinking H,0
WW = Wastewater
O = Oil
P = Wipe
A = Air (Tedlar Bag)
F = Filter
T = Tube
GW = Groundwater
SW = Surface Water
M - Misc.

**Analysis Requested/Method**

| | |
|---|---|
| COMPANY NAME | Materials testing Consultants |
| PROJECT NAME (48 SPACES MAXIMUM) | Ann Arbor Sewer trunk - water sampling |
| PROJECT NUMBER (25 SPACES MAXIMUM) | 241691 |
| Sample collected by | Mitchell Eagle |

If RUSH approved by: _____

REQUESTED TURNAROUND: (X BOX WITH TAT NEEDED)
Default TAT Standard: 7 - 10 Business days
RUSH: 1 Business day (verify with lab) @3x Surcharge
RUSH: 2 Business days @2x Surcharge (Non TCLP)
RUSH: 3 Business days @1.5x Surcharge (TCLP @ 2X)

- [X] STD
- [ ] 1 DAY
- [ ] 2 DAY
- [ ] 3 DAY

**Container Type & Quantity**

| Brighton ID # | Sample Description (35 Characters Limit) | Sampling Date | Sampling Time | VOA'S (PRES) Y N | HDPE UNPRESERVED | HDPE $HNO_3$ | HDPE $H_2SO_4$ | HDPE NAOH | AMBER GLASS (UNPRESERVED) | AMBER GLASS (PRESERVED) | GLASS, NO PRESERVATIVE | STERILIZED BACTERIA | METALS FILTERED: (F)ield OR (L)ab | MEOH Preserved: (F)ield or (L)ab Preserved | Sample Matrix | 1,4 Dioxane |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1) 1138 | SB-103 | 7/2/25 | 10:40 | 2 | | | | | | | | | | | GW | X |
| 2) 1139 | SB-102 | 7/2/25 | 12:20 | 2 | | | | | | | | | | | GW | X |
| 3) | | | | | | | | | | | | | | | | |
| 4) | | | | | | | | | | | | | | | | |
| 5) | | | | | | | | | | | | | | | | |
| 6) | | | | | | | | | | | | | | | | |
| 7) | | | | | | | | | | | | | | | | |
| 8) | | | | | | | | | | | | | | | | |
| 9) | | | | | | | | | | | | | | | | |
| 10) | | | | | | | | | | | | | | | | |

**Special Instructions:**

PAGE: ___ OF ___

**COMPANY INFO:**

693 Plymouth Ave
NE Grand Rapids
MI 49505

Attn: Guy Rousseau
PHONE:
SEND:
EMAIL: GRousseau@mtc-test.com

**For Laboratory Use Only:**

Sample received within holding time? yes ☒ no ☐
Temperature of samples °C: ICE
pH verified in login? yes ☐ no ☒
Headspace/bubbles in VOA'S? yes ☐ no ☒ n/a ☐
Sample containers and COC match? yes ☒ no ☐

P.O. NUMBER:

BILLING ADDRESS (IF REQUIRED)

**For Laboratory Use Only: Field pH/Temp/Time/Initials**

**Drinking Water Only:**

Send to LCHD? yes ☐ no ☐
Chlorinated Water Supply? yes ☐ no ☐

MCL Failure yes ☐ no ☐
Client Notified (date/time/initials): _____

***Please fill out the Chain of Custody completely and review. Incorrect or incomplete information will result in a "hold" on all analyses. All hold samples = $10.***

| Trans. # | RELINQUISHED BY: | RECEIVED BY: | DATE: | TIME: | Trans. # | RELINQUISHED BY: | RECEIVED BY: | DATE/TIME: |
|---|---|---|---|---|---|---|---|---|
| 1 | | | 7/2/25 | 2:40 | 3 | | | |
| 2 | | | | | 4 | | | |

Brighton Analytical L.L.C.

# METHODS REGULATED BY NELAC AND OR STATE OF MICHIGAN

EPA 120.1-1982
EPA 150.1-1982
EPA 160.2-1979
EPA 160.3-1979
EPA 1631E-2002
EPA 200.7-1994
EPA 200.8 REV 5.4-1994
EPA 245.1-1994
EPA 245.2-1974
EPA 300.0R2.1-1993
EPA 310.1-1978
EPA 335.1-1974
EPA 335.4-1993
EPA 350.1 REV.2-1993
EPA 351.2 REV.2-1993
EPA 365.2-1971
EPA 405.1-1974
EPA 410.4 REV.2-1993
EPA 415.1-1974
EPA 420.1-1978
EPA 524.4-2013
EPA 608.3-2016
EPA 615-1993
EPA 624-1984
EPA 624.1-2016
EPA 625-1984
EPA 625.1-2016
SM 2540C-1997
SM 2540D-1997
SM 4500 H+B-1996
SM 4500 PE-1997
SM 5210B-1997
SM 5310B-1996
SM 9223B-1997
SW846 6010B-1996
SW846 6020A-2007
SW846 7471-1994
SW846 8081B-2007
SW846 8082A-2000
SW846 8151A-1996
SW846 8260C-2006
SW846 8270D-2007
SW846 9040B-1994

# APPENDIX C – UNITED STATES DEPARTMENT OF AGRICULTURE WEB SOIL SURVEY MAP




Map Scale: 1:4,020 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

## MAP LEGEND

**Area of Interest (AOI)**
- Area of Interest (AOI)

**Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washtenaw County, Michigan
Survey Area Data: Version 23, Aug 28, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 8, 2022—Oct 4, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| FoB | Fox sandy loam, till plain, 2 to 6 percent slopes | 31.8 | 53.4% |
| FoC | Fox sandy loam, Huron Lobe, 6 to 12 percent slopes | 12.3 | 20.6% |
| MdA | Matherton sandy loam, 0 to 4 percent slopes | 13.1 | 22.1% |
| WawabC | Wawasee loam, 6 to 12 percent slopes | 2.3 | 3.9% |
| **Totals for Area of Interest** | | **59.5** | **100.0%** |

# ATTACHMENT B
# GENERAL DECLARATIONS

City of Ann Arbor
Guy C. Larcom Municipal Building
Ann Arbor, Michigan 48107

Ladies and Gentlemen:

The undersigned, as Bidder, declares that this Bid is made in good faith, without fraud or collusion with any person or persons bidding on the same Contract; that this Bidder has carefully read and examined the bid documents, including City Nondiscrimination requirements and Declaration of Compliance Form, Living Wage requirements and Declaration of Compliance Form, Prevailing Wage requirements and Declaration of Compliance Form, Vendor Conflict of Interest Form, Notice of Pre-Bid Conference, General Information, Bid, Bid Forms, Contract, Bond Forms, General Conditions, Standard Specifications, Detailed Specifications, all Addenda, and the Plans (if applicable) and understands them. The Bidder declares that it conducted a full investigation at the site and of the work proposed and is fully informed as to the nature of the work and the conditions relating to the work's performance. The Bidder also declares that it has extensive experience in successfully completing projects similar to this one.

The Bidder acknowledges that it has not received or relied upon any representations or warrants of any nature whatsoever from the City of Ann Arbor, its agents or employees, and that this Bid is based solely upon the Bidder's own independent business judgment.

The undersigned proposes to perform all work shown on the plans or described in the bid documents, including any addenda issued, and to furnish all necessary machinery, tools, apparatus, and other means of construction to do all the work, furnish all the materials, and complete the work in strict accordance with all terms of the Contract of which this Bid is one part.

In accordance with these bid documents, and Addenda numbered _____, the undersigned, as Bidder, proposes to perform at the sites in and/or around Ann Arbor, Michigan, all the work included herein for the amounts set forth in the Bid Forms.

The Bidder declares that it has become fully familiar with the liquidated damage clauses for completion times and for compliance with City Code Chapter 112, understands and agrees that the liquidated damages are for the non-quantifiable aspects of non-compliance and do not cover actual damages that may be shown and agrees that if awarded the Contract, all liquidated damage clauses form part of the Contract.

The Bidder declares that it has become fully familiar with the provisions of Chapter 14, Section 1:320 (Prevailing wages) and Chapter 23 (Living Wage) of the Code of the City of Ann Arbor and that it understands and agrees to comply, to the extent applicable to employees providing services to the City under this Contract, with the wage and reporting requirements stated in the City Code provisions cited. Bidder certifies that the statements contained in the City Prevailing Wage and Living Wage Declaration of Compliance Forms are true and correct. Bidder further agrees that the cited provisions of Chapter 14 and Chapter 23 form a part of this Contract.

The Bidder declares that it has become familiar with the City Conflict of Interest Disclosure Form and certifies that the statement contained therein is true and correct.

The Bidder encloses a certified check or Bid Bond in the amount of 5% of the total of the Bid Price. The Bidder agrees both to contract for the work and to furnish the necessary Bonds and insurance documentation within 10 days after being notified of the acceptance of the Bid.

If this Bid is accepted by the City and the Bidder fails to contract and furnish the required Bonds and insurance documentation within 10 days after being notified of the acceptance of this Bid, then the Bidder shall be considered to have abandoned the Contract and the certified check or Bid Bond accompanying this Bid shall become due and payable to the City.

If the Bidder enters into the Contract in accordance with this Bid, or if this Bid is rejected, then the accompanying check or Bid Bond shall be returned to the Bidder.

In submitting this Bid, it is understood that the right is reserved by the City to accept any Bid, to reject any or all Bids, to waive irregularities and/or informalities in any Bid, and to make the award in any manner the City believes to be in its best interest.

SIGNED THIS _____ DAY OF _____, 202_.

| | |
|---|---|
| _____ | _____ |
| Bidder's Name | Authorized Signature of Bidder |
| _____ | _____ |
| Official Address | (Print Name of Signer Above) |
| _____ | _____ |
| Telephone Number | Email Address for Award Notice |

# ATTACHMENT C
# LEGAL STATUS OF BIDDER

(The bidder shall fill out the appropriate form and strike out the other three.)

Bidder declares that it is:

* A corporation organized and doing business under the laws of the State of _____, for whom _____, bearing the office title of _____, whose signature is affixed to this Bid, is authorized to execute contracts.

**NOTE: If not incorporated in Michigan, please attach the corporation's Certificate of Authority**

• A limited liability company doing business under the laws of the State of _____, whom _____ bearing the title of _____ whose signature is affixed to this proposal, is authorized to execute contract on behalf of the LLC.

* A partnership, organized under the laws of the state of _____ and filed in the county of _____, whose members are (list all members and the street and mailing address of each) (attach separate sheet if necessary):

_____

_____

_____

_____

_____

* An individual, whose signature with address, is affixed to this Bid: __ _____
(initial here)

**Authorized Official**

_____ **Date** _____**,** 202_

(Print) Name _____ Title _____

Company:

_____

Address:

_____

Contact Phone ( ) _____ Fax ( ) _____

Email _____

# ATTACHMENT D
# PREVAILING WAGE DECLARATION OF COMPLIANCE

The "wage and employment requirements" of Section 1:320 of Chapter 14 of Title I of the Ann Arbor City Code mandates that the city not enter any contract, understanding or other arrangement for a public improvement for or on behalf of the city unless the contract provides that all craftsmen, mechanics and laborers employed directly on the site in connection with said improvements, including said employees of subcontractors, shall receive the prevailing wage for the corresponding classes of craftsmen, mechanics and laborers, as determined by statistics for the Ann Arbor area compiled by the United States Department of Labor. Where the contract and the Ann Arbor City Code are silent as to definitions of terms required in determining contract compliance with regard to prevailing wages, the definitions provided in the Davis-Bacon Act as amended (40 U.S.C. 278-a to 276-a-7) for the terms shall be used. Further, to the extent that any employees of the contractor providing services under this contract are not part of the class of craftsmen, mechanics and laborers who receive a prevailing wage in conformance with section 1:320 of Chapter 14 of Title I of the Code of the City of Ann Arbor, employees shall be paid a prescribed minimum level of compensation (i.e. Living Wage) for the time those employees perform work on the contract in conformance with section 1:815 of Chapter 23 of Title I of the Code of the City of Ann Arbor.

At the request of the city, any contractor or subcontractor shall provide satisfactory proof of compliance with this provision.

The Contractor agrees:

(a) To pay each of its employees whose wage level is required to comply with federal, state or local prevailing wage law, for work covered or funded by this contract with the City,

(b) To require each subcontractor performing work covered or funded by this contract with the City to pay each of its employees the applicable prescribed wage level under the conditions stated in subsection (a) or (b) above.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the wage and employment provisions of the Chapter 14 of the Ann Arbor City Code. The undersigned certifies that he/she has read and is familiar with the terms of Section 1:320 of Chapter 14 of the Ann Arbor City Code and by executing this Declaration of Compliance obligates his/her employer and any subcontractor employed by it to perform work on the contract to the wage and employment requirements stated herein. The undersigned further acknowledges and agrees that if it is found to be in violation of the wage and employment requirements of Section 1:320 of the Chapter 14 of the Ann Arbor City Code it shall has be deemed a material breach of the terms of the contract and grounds for termination of same by the City.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email address

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500

# ATTACHMENT E
# LIVING WAGE ORDINANCE DECLARATION OF COMPLIANCE

The Ann Arbor Living Wage Ordinance (Section 1:811-1:821 of Chapter 23 of Title I of the Code) requires that an employer who is (a) a contractor providing services to or for the City for a value greater than $10,000 for any twelve-month contract term, or (b) a recipient of federal, state, or local grant funding administered by the City for a value greater than $10,000, or (c) a recipient of financial assistance awarded by the City for a value greater than $10,000, shall pay its employees a prescribed minimum level of compensation (i.e., Living Wage) for the time those employees perform work on the contract or in connection with the grant or financial assistance. The Living Wage must be paid to these employees for the length of the contract/program.

*Companies employing fewer than 5 persons and non-profits employing fewer than 10 persons are exempt from compliance with the Living Wage Ordinance. If this exemption applies to your company/non-profit agency please check here* [___] *No. of employees__*

The Contractor or Grantee agrees:

(a) To pay each of its employees whose wage level is not required to comply with federal, state or local prevailing wage law, for work covered or funded by a contract with or grant from the City, no less than the Living Wage. The current Living Wage is defined as $17.08/hour for those employers that provide employee health care (as defined in the Ordinance at Section 1:815 Sec. 1 (a)), or no less than $19.04/hour for those employers that do not provide health care. The Contractor or Grantor understands that the Living Wage is adjusted and established annually on April 30 in accordance with the Ordinance and covered employers shall be required to pay the adjusted amount thereafter to be in compliance with Section 1:815(3).

***Check the applicable box below which applies to your workforce***

[___] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage without health benefits

[___] Employees who are assigned to any covered City contract/grant will be paid at or above the applicable living wage with health benefits

(b) To post a notice approved by the City regarding the applicability of the Living Wage Ordinance in every work place or other location in which employees or other persons contracting for employment are working.

(c) To provide to the City payroll records or other documentation within ten (10) business days from the receipt of a request by the City.

(d) To permit access to work sites to City representatives for the purposes of monitoring compliance, and investigating complaints or non-compliance.

(e) To take no action that would reduce the compensation, wages, fringe benefits, or leave available to any employee covered by the Living Wage Ordinance or any person contracted for employment and covered by the Living Wage Ordinance in order to pay the living wage required by the Living Wage Ordinance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services or agrees to accept financial assistance in accordance with the terms of the Living Wage Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Living Wage Ordinance, obligates the Employer/Grantee to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract or grant of financial assistance.

| | |
|---|---|
| _____ | _____ |
| Company Name | Street Address |
| _____ | _____ |
| Signature of Authorized Representative Date | City, State, Zip |
| _____ | _____ |
| Print Name and Title | Phone/Email address |

**Attachment F**

# CITY OF ANN ARBOR
# LIVING WAGE ORDINANCE

## RATE EFFECTIVE APRIL 30, 2025 - ENDING APRIL 29, 2026

**$17.08 per hour**
If the employer provides health care benefits*

**$19.04 per hour**
If the employer does **NOT** provide health care benefits*

Employers providing services to or for the City of Ann Arbor or recipients of grants or financial assistance from the City of Ann Arbor for a value of more than $10,000 in a twelve-month period of time must pay those employees performing work on a City of Ann Arbor contract or grant, the above living wage.

## ENFORCEMENT

The City of Ann Arbor may recover back wages either administratively or through court action for the employees that have been underpaid in violation of the law. Persons denied payment of the living wage have the right to bring a civil action for damages in addition to any action taken by the City.

Violation of this Ordinance is punishable by fines of not more than $500/violation plus costs, with each day being considered a separate violation. Additionally, the City of Ann Arbor has the right to modify, terminate, cancel or suspend a contract in the event of a violation of the Ordinance.

* Health Care benefits include those paid for by the employer or making an employer contribution toward the purchase of health care. The employee contribution must not exceed $.50 an hour for an average work week; and the employer cost or contribution must equal no less than $1/hr for the average work week.

**The Law Requires Employers to Display This Poster Where Employees Can Readily See It.**

**For Additional Information or to File a Complaint contact**
**Colin Spencer at 734/794-6500 or cspencer@a2gov.org**

**ATTACHEMENT G**

# Vendor Conflict of Interest Disclosure Form

All vendors interested in conducting business with the City of Ann Arbor must complete and return the Vendor Conflict of Interest Disclosure Form in order to be eligible to be awarded a contract. Please note that all vendors are subject to comply with the City of Ann Arbor's conflict of interest policies as stated within the certification section below.

If a vendor has a relationship with a City of Ann Arbor official or employee, an immediate family member of a City of Ann Arbor official or employee, the vendor shall disclose the information required below.

1. No City official or employee or City employee's immediate family member has an ownership interest in vendor's company or is deriving personal financial gain from this contract.
2. No retired or separated City official or employee who has been retired or separated from the City for less than one (1) year has an ownership interest in vendor's Company.
3. No City employee is contemporaneously employed or prospectively to be employed with the vendor.
4. Vendor hereby declares it has not and will not provide gifts or hospitality of any dollar value or any other gratuities to any City employee or elected official to obtain or maintain a contract.
5. Please note any exceptions below:

| **Conflict of Interest Disclosure*** | |
|---|---|
| Name of City of Ann Arbor employees, elected officials or immediate family members with whom there may be a potential conflict of interest. | ( ) Relationship to employee<br>_____<br>( ) Interest in vendor's company<br>( ) Other (please describe in box below) |
| | |

*Disclosing a potential conflict of interest does not disqualify vendors. In the event vendors do not disclose potential conflicts of interest and they are detected by the City, vendor will be exempt from doing business with the City.

| **I certify that this Conflict of Interest Disclosure has been examined by me and that its contents are true and correct to my knowledge and belief and I have the authority to so certify on behalf of the Vendor by my signature below:** | | |
|---|---|---|
| | | |
| **Vendor Name** | **Vendor Phone Number** | |
| | | |
| **Signature of Vendor Authorized Representative** | **Date** | **Printed Name of Vendor Authorized Representative** |

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500, procurement@a2gov.org

# ATTACHMENT H

## DECLARATION OF COMPLIANCE

Non-Discrimination Ordinance

The "non discrimination by city contractors" provision of the City of Ann Arbor Non-Discrimination Ordinance (Ann Arbor City Code Chapter 112, Section 9:158) requires all contractors proposing to do business with the City to treat employees in a manner which provides equal employment opportunity and does not discriminate against any of their employees, any City employee working with them, or any applicant for employment on the basis of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight. It also requires that the contractors include a similar provision in all subcontracts that they execute for City work or programs.

In addition the City Non-Discrimination Ordinance requires that all contractors proposing to do business with the City of Ann Arbor must satisfy the contract compliance administrative policy adopted by the City Administrator. A copy of that policy may be obtained from the Purchasing Manager

The Contractor agrees:

(a) To comply with the terms of the City of Ann Arbor's Non-Discrimination Ordinance and contract compliance administrative policy, including but not limited to an acceptable affirmative action program if applicable.

(b) To post the City of Ann Arbor's Non-Discrimination Ordinance Notice in every work place or other location in which employees or other persons are contracted to provide services under a contract with the City.

(c) To provide documentation within the specified time frame in connection with any workforce verification, compliance review or complaint investigation.

(d) To permit access to employees and work sites to City representatives for the purposes of monitoring compliance, or investigating complaints of non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the Ann Arbor Non-Discrimination Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Non-Discrimination Ordinance, obligates the Contractor to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract.

_____
Company Name

_____
Signature of Authorized Representative Date

_____
Print Name and Title

_____
Address, City, State, Zip

_____
Phone/Email Address

**Questions about the Notice or the City Administrative Policy, Please contact:**
Procurement Office of the City of Ann Arbor
(734) 794-6500

# ATTACHMENT I

## CITY OF ANN ARBOR NON-DISCRIMINATION ORDINANCE

Relevant provisions of Chapter 112, Nondiscrimination, of the Ann Arbor City Code are included below. You can review the entire ordinance at www.a2gov.org/humanrights.

**Intent: It is the intent of the city that no individual be denied equal protection of the laws; nor shall any individual be denied the enjoyment of his or her civil or political rights or be discriminated against because of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight.**

**Discriminatory Employment Practices: No person shall discriminate in the hire, employment, compensation, work classifications, conditions or terms, promotion or demotion, or termination of employment of any individual. No person shall discriminate in limiting membership, conditions of membership or termination of membership in any labor union or apprenticeship program.**

**Discriminatory Effects: No person shall adopt, enforce or employ any policy or requirement which has the effect of creating unequal opportunities according to actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight for an individual to obtain housing, employment or public accommodation, except for a bona fide business necessity. Such a necessity does not arise due to a mere inconvenience or because of suspected objection to such a person by neighbors, customers or other persons.**

**Nondiscrimination by City Contractors: All contractors proposing to do business with the City of Ann Arbor shall satisfy the contract compliance administrative policy adopted by the City Administrator in accordance with the guidelines of this section. All city contractors shall ensure that applicants are employed and that employees are treated during employment in a manner which provides equal employment opportunity and tends to eliminate inequality based upon any classification protected by this chapter. All contractors shall agree not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of any applicable protected classification. All contractors shall be required to post a copy of Ann Arbor's Non-Discrimination Ordinance at all work locations where its employees provide services under a contract with the city.**

**Complaint Procedure: If any individual believes there has been a violation of this chapter, he/she may file a complaint with the City's Human Rights Commission. The complaint must be filed within 180 calendar days from the date of the individual's knowledge of the allegedly discriminatory action or 180 calendar days from the date when the individual should have known of the allegedly discriminatory action. A complaint that is not filed within this timeframe cannot be considered by the Human Rights Commission. To file a complaint, first complete the complaint form, which is available at www.a2gov.org/humanrights. Then submit it to the Human Rights Commission by e-mail (hrc@a2gov.org), by mail (Ann Arbor Human Rights Commission, PO Box 8647, Ann Arbor, MI 48107), or in person (City Clerk's Office). For further information, please call the commission at 734-794-6141 or e-mail the commission at hrc@a2gov.org.**

**Private Actions For Damages or Injunctive Relief: To the extent allowed by law, an individual who is the victim of discriminatory action in violation of this chapter may bring a civil action for appropriate injunctive relief or damages or both against the person(s) who acted in violation of this chapter.**

THIS IS AN OFFICIAL GOVERNMENT NOTICE AND
MUST BE DISPLAYED WHERE EMPLOYEES CAN READILY SEE IT.

Michigan Department
Of Transportation
CP-347 (04/10)

# MICHIGAN DEPARTMENT OF TRANSPORTATION

## CERTIFIED PAYROLL

**COMPLETION OF CERTIFIED PAYROLL FORM FULFILLS THE MINIMUM MDOT PREVAILING WAGE REQUIREMENTS**

(1) NAME OF CONTRACTOR / SUBCONTRACTOR (CIRCLE ONE) (2) ADDRESS

(3) PAYROLL NO. (4) FOR WEEK ENDING (5) PROJECT AND LOCATION (6) CONTRACT ID

| (a) EMPLOYEE INFORMATION | (b) WORK CLASSIFICATION | (c) Hour Type | (d) DAY AND DATE — HOURS WORKED ON PROJECT | (e) TOTAL HOURS ON PROJECT | (f) PROJECT RATE OF PAY | (g) PROJECT RATE OF FRINGE PAY | (h) GROSS PROJECT EARNED / GROSS WEEKLY EARNED | (i) TOTAL WEEKLY HOURS WORKED ALL JOBS | (j) DEDUCTIONS: FICA | FEDERAL | STATE | | OTHER | TOTAL DEDUCT | (k) TOTAL WEEKLY WAGES PAID FOR ALL JOBS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NAME: | | | | 0 | | | $0.00 | | | | | | | $0.00 | $0.00 |
| ETH/GEN: ID #: | GROUP/CLASS #: | S | | 0 | | | | | | | | | | | |
| NAME: | | | | 0 | | | $0.00 | | | | | | | $0.00 | $0.00 |
| ETH/GEN: ID #: | GROUP/CLASS #: | S | | 0 | | | | | | | | | | | |
| NAME: | | | | 0 | | | $0.00 | | | | | | | $0.00 | $0.00 |
| ETH/GEN: ID #: | GROUP/CLASS #: | S | | 0 | | | | | | | | | | | |
| NAME: | | | | 0 | | | $0.00 | | | | | | | $0.00 | $0.00 |
| ETH/GEN: ID #: | GROUP/CLASS #: | S | | 0 | | | | | | | | | | | |
| NAME: | | | | 0 | | | $0.00 | | | | | | | $0.00 | $0.00 |
| ETH/GEN: ID #: | GROUP/CLASS #: | S | | 0 | | | | | | | | | | | |
| NAME: | | | | 0 | | | $0.00 | | | | | | | $0.00 | $0.00 |
| ETH/GEN: ID #: | GROUP/CLASS #: | S | | 0 | | | | | | | | | | | |
| NAME: | | | | 0 | | | $0.00 | | | | | | | $0.00 | $0.00 |
| ETH/GEN: ID #: | GROUP/CLASS #: | S | | 0 | | | | | | | | | | | |
| NAME: | | | | 0 | | | $0.00 | | | | | | | $0.00 | $0.00 |
| ETH/GEN: ID #: | GROUP/CLASS #: | S | | 0 | | | | | | | | | | | |
| NAME: | | | | 0 | | | $0.00 | | | | | | | $0.00 | $0.00 |
| ETH/GEN: ID #: | GROUP/CLASS #: | S | | 0 | | | | | | | | | | | |

Date _____

I, _____ _____
(Name of Signatory Party) (Title)

do hereby state:

(1) That I pay or supervise the payment of the persons employed by

_____ on the
(Contractor or Subcontractor)

_____; that during the payroll period commencing on the
(Building or Work)

_____ day of _____, _____, and ending the _____ day of _____, _____,

all persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said

_____ from the full
(Contractor or Subcontractor)

weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 C.F.R. Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948, 63 Start. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. § 3145), and described below:

_____

_____

_____

_____

(2) That any payrolls otherwise under this contract required to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained therein are not less than the applicable wage rates contained in any wage determination incorporated into the contract; that the classifications set forth therein for each laborer or mechanic conform with the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE FRINGE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

☐ – in addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, except as noted in section 4(c) below.

(b) WHERE FRINGE BENEFITS ARE PAID IN CASH

☐ – Each laborer or mechanic listed in the above referenced payroll has been paid, as indicated on the payroll, an amount not less than the sum of the applicable basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in section 4(c) below.

(c) EXCEPTIONS

| EXCEPTION (CRAFT) | EXPLANATION |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

REMARKS:

| NAME AND TITLE | SIGNATURE |
|---|---|
| | |

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION. SEE SECTION 1001 OF TITLE 18 AND SECTION 231 OF TITLE 31 OF THE UNITED STATES CODE.