PUBLIC IMPROVEMENT REQUEST FOR PROPOSAL

RFP# 24-03

BARTON DAM
RIGHT EMBANKMENT REMEDIATION
Federal Energy Regulatory Commission ID # 3142

City of Ann Arbor
Water Treatment Department

Due Date: February 29, 2024 by 3:00 p.m. (local time)

Issued By:

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

TABLE OF CONTENTS

SECTION I - GENERAL INFORMATION

A. OBJECTIVE

The City of Ann Arbor is soliciting bids from qualified contractors to construct a downstream stabilization berm on the right embankment of Barton Dam to address uncontrolled seepage in the embankment. The project must comply with requirements from the Federal Energy Regulatory Commission. The project's major construction features include earthwork for a stabilization berm, mineral drain and collector ditch (consisting of approximately 21,000 cubic yards of fill) and grading (to construct the berm), relocation of a drainage ditch, removal of an existing reverse filter, filing of an existing pond, installation of modular retaining wall systems, construction of an access path to the dam's right embankment, replacement of wooden stairs, and a canopy over the pedestrian walkway beneath a railroad bridge.

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 February 6, 2024 at 5:00 p.m. (local time), and should be addressed as follows:

Scope of Work/Proposal Content questions shall be e-mailed to the Engineer, Mr. Steve McManus, P.E., SMcManus@nthconsultants.com with a cc email to Mr. Paul Malocha, P.E., Paul.Malocha@stantec.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 pre-proposal conference for this project will be held on January 30, 2024, at 1:00 pm at the City of Ann Arbor Water Treatment Plant conference room. The Water Plant is located at 919 Sunset Road, Ann Arbor, Michigan 48103. Attendance at the pre-proposal conference by prospective bidders is not required but is highly recommended. 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. Following the proposal meeting, a site visit will be available for those interested in participating.

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 determined by 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, 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 February 29, 2024 by 3:00 p.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**
- **three (3) additional proposal copies**
- **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. 24-03–Barton Dam Right Embankment Remediation** 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 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 this 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.

The City is currently seeking federal funds for the Barton Dam Right Embankment Stabilization Project. If Federal funds are obtained, proposing contractors will be required to meet Federal wage contracting requirements including Davis-Bacon prevailing wages. Copies of the most recent Davis-Bacon federal prevailing wage forms are included herewith as Attachment J as well as other federal contracting forms

such as DBE Participation, Federal Debarment Certification and Federal Good Faith Efforts.

If Federal Funding for the project is not obtained, 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.wdol.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 be 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 agencies. Submission is also agreement that the City will be notified of any changes in this status. A debarment form is included in the appendix and must be completed and submitted with a Contractor's bid.

O. PROPOSAL PROTEST

All proposal protests must be in writing and filed with the City's 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	January 30, 2024, 1:00 p.m. (Local Time)
Written Question Deadline	February 6, 2024, 5:00 p.m. (Local Time)
Addenda Published (if needed)	Week of February 12, 2024
Proposal Due Date	February 29, 2024, 3:00 p.m. (Local Time)
Selection/Negotiations	March/April 2024
Expected City Council Authorizations	May/June 2024
Expected Notice to Proceed	July 1, 2024

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. IDLE FREE 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 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 encourages potential vendors to bring forward emerging and progressive products and services that are best suited to the City's environmental principles.

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 A-2, Article III(C) 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

The proposed Barton Dam right embankment remediation shall consist of constructing a downstream stabilization berm with an integrated mineral drain and granular filter to remedy ongoing seepage issues and improve the overall stability of the right embankment. The full-height portion of the berm shall extend from approximately Toe Drain (TD) 22 to TD 46. The existing collector ditch pond, in the vicinity of the outlets from TD 1 through TD 9, shall be backfilled with engineered fill and the existing collector ditch shall be relocated to accommodate the stabilization berm and elimination of the collector ditch pond. The dam stability improvements shall also include removal of the existing reverse filter that is located downstream of the existing collector ditch generally between TD-33 and 45.

The City has requested additional improvements to the area to facilitate the proposed construction and improve access. These include providing an access path to the right embankment, widening of the existing access path beneath the railroad bridge over the Huron River, replacement of the existing gabion shoreline system with a new modular retaining wall system, replacement of the protective canopy over the pedestrian pathway, replacement of the access stairs to the dam crest, and the removal of earth along the bank of the Huron River near the canoe launch to compensate for widening the access path in order to maintain the existing floodplain storage capacity.

The Federal Energy Regulatory Commission (FERC) has regulatory authority over this project. Required work elements, sequencing, and work restrictions are detailed in the project plans.

As part of the permitting requirements for the project, the City is purchasing wetlands mitigation credits to offset the project's impacts to wetlands. The Contractor shall purchase the credits from Crandell Environmental of Charlotte, Michigan to satisfy the permit requirements for the Project. Crandell shall issue a certificate acceptable to Michigan's Department of Environment, Great Lakes, and Energy (EGLE) for satisfaction of the permit requirements.

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 provide details for all the information requested below within initial proposals. Backup documentation may be requested at the sole discretion of the City to validate all 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 1:325 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. Evidence of any quality control program used by the bidder and the results of any such program on the bidder's previous projects.

4. 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 a copy of the bidder's safety program, and evidence of a safety-training program for employees addressing potential hazards of the proposed job site. Bidder 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 or 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 proposed use of sustainable products, technologies, or practices for the project, which reduce the impact on human health and the environment, including raw materials acquisition, production, manufacturing, packaging, distribution, reuse, operation, maintenance, and waste management.

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

E. SCHEDULE OF PRICING/COST – 20 POINTS

Barton Dam
Right Embankment Remediation

Base Bid Form

The City of Ann Arbor is issuing this request for Bids to qualified contractors to perform earth work and other improvements associated with the Barton Dam Right Embankment Remediation project. The work area is located between Barton Pond and the Barton Nature Area Parking Area. The proposed project will entail the construction of an earthen buttress on the right embankment as well as other site improvements including widening of the existing underpass access path, replacement of the existing underpass canopy, adding a trail along the toe of the dam's right embankment, replacement of the existing stairway to the dam crest, removal of the existing reverse filter at the site, filling of the existing toe drain pond, and excavation of earth near the canoe launch. This compensatory cut is needed to offset the fill due to widening the pedestrian access and to maintain the storage within the floodplain. Any items required for a complete project that are not included in the following table shall be assumed to be incidental.

Name of Bidder: _____

Item No.	Description	Units	Quantity	Unit Cost	Total Cost
1	General Conditions, Bonds, Insurance.	LS	1		
2	Mobilization and Demobilization	LS	1		
3	Install, Maintain, and Remove SESC	LS	1		
4	Chemical Grouting at TD-23 and TD-43 Subcontractor: _____ (Estimated Quantity for Bidding Purposes)	GAL	50		
5	Install Cementitious Grout Holes at TD-23 and TD-43 Subcontractor: _____ (Estimated Quantity for Bidding Purposes)	EA	80		
6	Cementitious Grouting at TD-23 and TD-43 Subcontractor: _____ (Estimated Quantity for Bidding Purposes)	CF	120		

Item No.	Description	Units	Quantity	Unit Cost	Total Cost
7	Site Preparation: Signage and Traffic Control, Clearing and Grubbing, Install, Maintain, and Remove Temporary Haul Route, Relocation of Emergency Stockpiles of Sand and Gravel. Demolish: Wooden Fence along Huron River, Remnant Collector Ditch Weir Posts, Steel C-Channel Toe Drain ID Posts, Block Wall and Geosynthetic Reinforcing Near TD-39, and Aggregate Ballast Upslope of TD-39, etc.	LS	1		
8	Underpass Widening: Remove Existing Pavement, Canopy, Railing, and Gabions, Prepare Subgrade, Install Modular Block Wall, Place Backfill and Temporary Surface Course on Underpass.	LS	1		
9	Remove and Replace Existing Retaining Wall North of Underpass	LS	1		
10	Strip Topsoil and Raise Grade of the Right Embankment Crest to Elevation 802.0 feet.	CY	630		
11	Reverse Filter Dewatering	LS	1		
12	Remove Reverse Filter and Backfill. Excavation shall be closed on same day it is opened.	TON	1300		
13	Topsoil Stripping at the Stabilization Berm	ACRES	2.1		
14	Excavation to Reach Subgrade of Granular Filter and Removal and Replacement of Unsuitable Soils at the Stabilization Berm, including required cuts to achieve the proposed subgrade elevation at the Stabilization Berm (Estimated Quantity for Bidding Purposes). Excavation shall be closed on same day it is opened.	TON	2000		
15	Dewater the Collector Ditch Pond and Surrounding Ground	LS	1		
16	Remove and Replace Unsuitable Soils from the Collector Ditch Pond (Estimated Quantity for Bidding Purposes)	TON	3200		

Item No.	Description	Units	Quantity	Unit Cost	Total Cost
17	Fill the Collector Ditch Pond with Engineered Fill	LS	1		
18	Realign and Construct the Collector Ditch. Remove, Relocate, and Replace the Existing Culvert. Abandon the existing headwall and construct headwalls for the relocated culvert.	LS	1		
19	Provide dewatering for collector ditch abandonment and general dewatering as necessary	LS	1		
20	Inspect and Abandon Toe Drains TD-12 through TD-59.	LS	1		
21	Place and Compact MDOT 2NS Fine Aggregate for the Stabilization Berm and Granular Filter Above and Below the Mineral Drain	CY	4900		
22	Place and Compact MDOT 17A Coarse Aggregate for the Mineral Drain	CY	4000		
23	Place and Compact MDOT Class II Granular Fill for the Stabilization Berm	CY	6300		
24	Place Topsoil on the Stabilization Berm	CY	1400		
25	Demolish Existing Piezometer Surface Monuments. Raise Existing Piezometers and Install Locking Monuments. Install Overland Discharge of Artesian Flow at PZ-3. Install Underdrain (Perforated and Solid-Wall), Including Cleanouts, T Inspections, and Surface Monuments	LS	1		
26	Construct the Permanent Access Path and Improve Existing Path Areas South of the Underpass and North of the Underpass	LS	1		
27	Remove and Replace Stairway and Guard Railing atop the Adjacent Spillway Retaining Wall	LS	1		
28	Remove Temporary Surface Course and Construct Final Pavement at Underpass. Replace Access Path Canopy and Railing	LS	1		
29	Excavate and dispose of soils for compensatory cut	LS	1		

Item No.	Description	Units	Quantity	Unit Cost	Total Cost
30	Revegetation of the Work Area and Final Site Restoration, including repairs to Border-to-Border Path. Fill Ruts in the Existing Site Access Road and the Barton Nature Area Parking Lot.	LS	1		
31	Miscellaneous Allowance (to be used at the Owner's discretion)	LS	1	$ 75,000.00	$ 75,000.00
32	Permitting and Associated Requirements Allowance (permit fees and other charges paid directly to permitting agencies)	LS	1	$ 95,000.00	$ 95,000.00
33	Allowance for Additional FERC Requirements	LS	1	$ 100,000.00	$ 100,000.00
34	Purchase of Wetland Credits per EGLE	LS	1	$ 225,000.00	$ 225,000.00
35	Project Closeout	LS	1		
36	Administrative Compliance with CWIFP, AIS, Davis Bacon, Certified Payroll and Other Regulatory Reporting.	LS	1		

ADDITIONAL OPTIONAL BID ITEM [1]

Optional Item No.	Description	Units	Quantity	Unit Cost	Total Cost
A1	Between Underpass and Spillway: Remove Existing Gabions, Prepare Subgrade, Install Modular Block Wall, and Place Backfill	FEET	142		

[1] To be executed at the direction of the Owner.

The bid items identified above include the major items of work anticipated for the project. Detailed requirements for each element of the project are presented on the contract drawings.

Total Bid (Items 1 through 36) $_____

Total Bid (Written) _____

Proposed Work Start Date _____

Total bid amount shall be shown in both words and numbers. In case of discrepancies, the amount shown in words shall govern.

Signature of Bidder_____ Date_____

Notice to Bidders:

1. Bids must be for all work elements and must have each blank space of the bid form completed.
2. The Owner reserves the right to waive any informality in any Bid, to reject any Bid, to reject all bids and to delete any part of the above items.
3. The bidder acknowledges that quantities provided are estimates and are not guaranteed and are solely for the purpose of bid comparison. Final payment for all unit price items will be based on the actual quantities. No minimum or maximum quantities are guaranteed by the Owner.
4. The Contractor is responsible for verification of all Bid quantities and to report to the Owner's Representative any discrepancies found prior to ordering materials or equipment for construction.
5. The bidder hereby certifies it has carefully examined the contract documents (including geotechnical data) provided by the Owner for bidding purposes and finds them compatible with the work requirements.
6. The bidder declares it has familiarized itself with the location of the proposed work and site conditions.
7. The foregoing unit prices shall include all applicable Federal, State and Local Taxes.

Bidder must sign below that he/she has read and understood all addendums related to this project. Failure to acknowledge any addendum issued may disqualify the Bidder.

Addendum No.	Addendum Date	Signature of Bidder

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.

Authorized Negotiator

Name: _____

Title: _____

Phone Number: _____

Email Address: _____

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.

Proposed Substitutions

Items	Description	Price Differential
1		
2		
3		

If the Bidder takes exception to the time stipulated in Article III of the Contract, Time of Completion, page A-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. PROPOSAL SUBMISSION ATTACHMENTS

Sample Standard Contract (Attachment A), General Declaration (Attachment B), Legal Status of Bidder (Attachment C), Prevailing Wage Compliance Form (Attachment D), Living Wage Declaration of Compliance Form (Attachment E), City of Ann Arbor Living Wage Ordinance (Attachment F), Vendor Conflict of Interest Disclosure Form (Attachment G), Non-Discrimination Ordinance Declaration of Compliance Form (Attachment H), City of Ann Arbor Non-Discrimination Ordinance Poster (Attachment I), Davis Bacon Related Prevailing Federal Wages (Attachment J), Federal Disadvantaged Business Enterprise (DBE) Requirements (Attachment K), Federal Debarment Certification Form (Attachment L), the Six Good Faith Efforts and Contract Administration Requirements (Attachment M), and the MDOT Certified Payroll Form (Attachment N). 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.

<u>The City reserves the right to waive the interview process and evaluate the bidder based on the submitted proposal and pricing schedules alone.</u>

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 he/she is 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: 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

SECTION V: DETAILED SPECIFICATIONS

TABLE OF CONTENTS
FOR
BARTON DAM
RIGHT EMBANKMENT REMEDIATION
ANN ARBOR, MICHIGAN
PROJECT NUMBER RFP: 24-03

Division 31 – Earthwork

Division 32 – Exterior Improvements

Division 33 – Subdrainage

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 10 00
SUMMARY OF WORK

PART 1 GENERAL

1.1 GENERAL DESCRIPTION

A. Furnish all labor, materials, and equipment to complete in every detail and leave in working order all items of work called for herein or shown on the accompanying drawings entitled “Barton Dam, Right Embankment Remediation”.

B. Principal items of work for the Barton Dam, Right Embankment Remediation include the following:

1. Grouting of Toe Drains (TDs) TD-23 and TD-43.
2. Site clearing and grubbing.
3. Installation, maintenance, and removal of erosion protection and stormwater management.
4. Installation, maintenance, and removal of temporary construction fencing, haul roads, and signage.
5. Demolition of the existing block wall, gabion baskets and mattress, as well as stairway, underpass slab, and canopy structure.
6. Underpass widening including construction of a modular block wall within the Huron River and temporary surfacing.
7. Removal of existing retaining wall north of underpass and replacement with modular block wall.
8. Removal and replacement of the existing railing and fencing from the underpass, between the underpass and the spillway, and the tip of the spillway abutment wall.
9. Grading on crest of right embankment within City property to EL. 802.
10. Implementation of groundwater controls.
11. Removal of the existing reverse filter and replacement with engineered fill.
12. Removal of the existing block retaining wall and aggregate ballast in the vicinity of TD-40.
13. Removal of existing collector ditch lining and abandonment of toe drains TD-12 thought TD-59.
14. Construction of the realigned collector ditch.
15. Filling of the existing collector ditch pond.
16. Construction of proposed stabilization berm, including mineral drain and underdrain with cleanouts and T inspections.
17. Removal of existing gabions between the underpass and the spillway. (Alternate bid item to be completed at the discretion of the Owner.).
18. Construction of the modular block wall between the underpass and the spillway. (Alternate bid item to be completed at the discretion of the Owner.)
19. Construction of stairway improvements.
20. Construction of new permanent access path and improvement to existing access path.
21. Extension and modification of existing piezometer risers and covers.

22. Removal of temporary surfacing and construction of the concrete slab at the underpass.
23. Excavation and disposal of soils associated with the compensatory cut.
24. Site restoration and closeout.

C. Work considered under this Contract is located on land owned by the City of Ann Arbor, Michigan. The construction site address is:

Barton Nature Area
1010 W. Huron Drive
Ann Arbor, Michigan 48103

D. Unless otherwise noted herein, all work shall conform to the 2020 edition of the State of Michigan Department of Transportation Standard Specifications for Construction (MDOT-SSC) (only where specified), the Contract Drawings, and Detailed Specifications. Pay items, units of measure, and quantities shall be in accordance with the contract Drawings, Detailed Specifications, Engineers Estimate, and Bid Schedule for the project.

E. The existing structures, utilities, and physical conditions are approximately as indicated on the Drawings, but the dimensions and locations of the existing structures, utilities, the nature of materials and the stability of beds or banks are not guaranteed. Prospective bidders shall visit the site and satisfy themselves as to the working conditions, as well as to the character of the work to be performed. It is mutually agreed that submission of a proposal, by the Contractor, shall be prima facie evidence that he has made an investigation of the site and has placed his own interpretations upon said conditions. Contractor shall verify all work-critical dimensions prior to performing any work or ordering materials.

1.2 DRAWINGS

The work shall conform to drawings entitled “Barton Dam, Right Embankment Remediation” as indicated below, which form a part of these specifications. The work shall also conform to such other drawings in explanation of details or minor modifications as the Project Representative may consider necessary on account of conditions found during prosecution of the work. The Contractor shall check all drawings and shall immediately report any and all discrepancies to the Project Representative. Parts and details not fully shown on the drawings shall be executed by the Contractor in accordance with the best-established industry and construction practices.

Sheet Name	**Sheet ID**
Cover Sheet	1
General Information	2
Overall Existing Site Plan	3
Partial Existing Site Plans	4-8
Ex. Collector Ditch Plan and Profile	9
SESC Plan	10
SESC Details	11
Site Preparation	12
Site Preparation Details	13

Regional Detour Plan	14
Site Detour Plan	15
Demolition Plan	16
Demolition Details	17-19
Control Point Tables	20-21
Proposed Work Index	22
Overall Proposed Site Plan	23
Partial Proposed Site Plans	24-27
Proposed Access Path Plan and Profile	28
Proposed Collector Ditch Plan and Profile	29
Typical Cross Section Collector Ditch Detail	30-31
Proposed Cross Sections	32-38
Toe Drain Grouting and Abandonment	39
Underpass Improvements	40
Retaining Wall Realignment Plan and Sections	41
Proposed Culvert Plan, Profile, Cross Section, and Details	42
Stairway Improvements	43
Miscellaneous Details	44-46
Site Restoration Plan	47
Estimated Project Quantities	48

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 01 14 00
WORK RESTRICTIONS

PART 1 GENERAL

1.1 SUMMARY

A. The Contractor has the option of providing temporary facilities that can eliminate a constraint, provided it is done with the consent of the Owner and without cost to the Owner and provided that all requirements of these Specifications are fulfilled. Work not specifically covered in the following paragraphs may, in general, be done at any time during the contract period, subject to the operating requirements and constraints and construction requirements outlined hereinafter. All references to days in this Section shall be consecutive calendar days.

B. The proposed construction activities required for this project will interfere with public access to Barton Dam, Barton Pond, the Huron River, and the Border-to-Border trail. Safety of the public must be taken into consideration and duly addressed during all construction activities.

1.2 GENERAL CONSTRAINTS

A. The Contractor shall give Owner advance notice of proposed shutdowns of any roads or existing site access. Shutdowns shall be fully coordinated with the Owner at least 72 hours before the scheduled shutdown.

B. The Contractor shall submit a proposed written plan of work, with a request to schedule shutdown work for Owner and Engineer approval. Work plan shall include sequence of events, needs for coordination with City of Ann Arbor staff.

C. Any temporary work, facilities, roads, walks, protection of existing structures, etc. that may be required within the Contractor's work limits to maintain continuous and dependable plant operation shall be furnished by the Contractor at the direction of the Owner or Engineer at no extra cost to the Owner.

D. The Owner shall have the authority to order work stopped or prohibited that would, in his opinion, unreasonably result in interrupting the necessary functions of the existing pump station plant at the dam site.

E. If the Contractor impairs performance or operation of the existing pump station plant as a result of not complying with specified provisions for maintaining plant pump station operations, then the Contractor shall immediately make all repairs or replacements and do all work necessary to restore the plant to operation to the satisfaction of the Owner and Engineer. Such work shall progress continuously to completion 24 hours per day and seven workdays per week.

F. After any damage to the existing facilities by the Contractor’s Work that, in the opinion of the Owner, constitutes an emergency, the Contractor shall be immediately available

and provide immediate services for the repair of damage and mitigation of the emergency.

G. Shutdowns shall be scheduled between Monday and Friday, unless there are extenuating circumstances approved by the Engineer.

1.3 ACCESS TO SITE, ROADWAYS, AND PARKING AREAS

A. An unobstructed traffic route to all pump station areas shall be maintained at all times for the Owner's operations personnel and maintenance equipment. The Contractor shall be responsible for providing access to the construction area and for preparing and maintaining temporary access road, fence, and gate.

B. An unobstructed traffic route around the pump station plant site shall be maintained at all times for the Owner's operations personnel, maintenance equipment, and delivery vehicles.

C. The Contractor shall provide temporary measures to protect the existing pavement by filling over with temporary asphalt or supplying other measures acceptable to the Engineer, and he shall repair any damage to existing paved surfaces that occurs during the construction period. Any areas disturbed along the shoulders of the access road and interior roads and elsewhere inside and outside of the site shall be repaired, graded, seeded, etc. as necessary to match preconstruction conditions.

D. The Contractor shall not undertake the restoration/construction of new roadway (paved, gravel, or asphalt overlay) shown on the Contract Drawings, until all other work on the dam improvements have been completed.

E. It shall be the responsibility of the Contractor to obtain any permits required from the Washtenaw County Road Commission and City of Ann Arbor and to pay all associated fees with documentation of payment provided to the Engineer.

F. The Contractor shall be responsible for removal of snow in areas of the Contractor’s work.

G. The Contractor will not disturb the maintenance of pump station operations without a written plan that is approved by the Owner and Engineer.

H. City personnel shall have access to all areas that remain in operation throughout the construction period. The Contractor shall locate stored material, dispose of construction debris and trash, provide temporary walkways, provide temporary lighting, and other such work as directed by the Engineer to maintain personnel access to areas in operation. Access and adequate parking areas for plant personnel must be maintained throughout construction.

1.4 SPECIFIC OPERATIONAL CONSTRAINTS AND CONSTRUCTION SCHEDULE ACTIVITIES

A. The Contractor shall schedule the work for the following tasks based on the constraints given in such a manner as to maintain the pump station operation. At a minimum, the Construction Schedule shall indicate a proposed start date and duration for each of the items listed in this section. No construction shall begin on any of the items listed in this section until the proposed schedule has been approved. Tasks to be included are:

1. Install SESC measures.
2. Perform grouting of TD-23 and TD-43.
3. Perform site preparation and prepare laydown area including fencing, crossing, signage, temporary haul road as well as necessary clearing and grubbing.
4. Remove underpass canopy, railing, pavement, and gabions. Install modular block wall system for underpass widening, place backfill, place temporary working surface course.
5. Remove existing retaining wall north of underpass and replace with modular block wall.
6. Clear and grub the proposed work area.
7. Regrade the embankment crest to Elevation 802.0 feet.
8. Relocate emergency stockpiles of sand and gravel.
9. Install reverse filter dewatering system, remove existing reverse filter and unsuitable soils, and backfill to original grade.
10. Collector ditch pond filling - install dewatering system, remove unsuitable material, prepare subgrade, backfill collector ditch pond and place fill along existing embankment upslope of the collector ditch pond.
11. Construct proposed collector ditch.
12. Install surface water controls and dewatering system for the existing collector ditch.
13. Remove existing block retaining wall, aggregate ballast, concrete-filled posts, and steel c-channel posts for TD-12 through TD-59.
14. Abandon existing toe drains TD-12 through TD-59. Remove lining from existing collector ditch and backfill ditch.
15. Strip topsoil and remove unsuitable soils within the footprint of the proposed stabilization berm. Perform the work in “strips” and place backfill to original grade same workday.
16. Place stabilization berm with granular filter, mineral drain, and perforated underdrain.
17. Raise existing piezometers and install locking monuments.
18. Remove, relocate, and replace existing culvert.
19. Alternate Bid Work Item: Remove existing gabions between underpass and spillway and replace with modular block wall.
20. Excavate compensatory cut and dispose of spoils off site.
21. Revegetate stabilization berm and working areas.
22. Construct proposed permanent access path and improvements to existing access path.
23. Remove and replace existing stairs, railing along Huron River, and fence atop the spillway abutment wall.
24. Remove temporary wearing course at underpass and replace with permanent slab. Construct underpass canopy and railing.
25. Remove temporary haul road, SESC measures, and complete final site restoration.
26. Reverse Filter Removal

27. Berm Construction
28. Gabion Basket Removal
29. Underpass Extension Modular Block Wall Construction

B. Unless otherwise approved by the Engineer, the Contractor shall complete the grouting program at Toe Drains (TDs) 23 and 43 (as shown on Sheet 39 of the Drawings) within 60 days of receiving notice to proceed from the Owner or be subject to the liquidated damages specified in the contract.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 01 20 00
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 GENERAL DESCRIPTION

A. The following subsections describe the method of measurement and basis of payment for the work to be done under the items listed in the BID PROPOSAL.

1. Each unit or lump sum price stated in the BID PROPOSAL shall constitute full compensation as herein specified for each item of work completed in accordance with the drawings and specifications. Provide all labor, material, tools, equipment and services required to complete the work specified herein and indicated on the Drawings. Items included in the Specifications and on the project Drawings, but not shown in this section, are considered incidental to the project.

2. The Contractor is responsible for surveying of project works such that the lines and grades noted on the project drawings are met. In addition, the Owner intends to retain an independent surveyor for the project for the purposes of verifying the contractor's lines and grades, as well as to verify quantities of those bid items that require measurement of volume associated with payment. For purposes of volume verification, the contractor shall provide safe access to the Surveyor to the work areas where volume measurements are required. Further, if the Contractor identifies areas that require Owner verification, he must notify the Owner's Surveyor at least 24 hours in advance such that there will be no project delays.

3. Owner's surveyor is herewith designated as the surveyor retained by the owner and will be responsible for as-built information, unit price measurements for payment, and performing certification survey necessary to verify lines and grades, and layer thickness are in accordance with the contract drawings and Quality Control Inspection Program (QCIP).

4. Measured material for payment will be by the ton (2,000 pounds) to the nearest 0.1 ton (200 pounds). The contractor shall submit manifests and weight tickets from the disposal site as evidence of quantity for each truckload of material disposed of off-site. The load for payment must be weighed on approved scales of sufficient length to permit simultaneous weighing all axle loads. Scales must be inspected, tested, and sealed as directed to assure accuracy with 0.5 percent throughout the range of the scales. Scales shall be checked and certified before hauling and rechecked and recertified whenever a variance is suspected.

1.2 MEASUREMENT AND PAYMENT

Item No. 1 – General Conditions, Bonds, Insurance

1. Payment for this lump sum item will be paid in full after proof of bonds and insurance is provided to the Engineer.

Item No. 2 – Mobilization and Demobilization

1. Half of the lump sum price for Mobilization and Demobilization will be for mobilization of all labor, materials, and equipment necessary for all preparatory work and operations to include:

   a. Movement of personnel, equipment, supplies, and incidentals to the project site.

   b. Establishment of the Contractor's and the Engineer field offices, and other facilities necessary to undertake the work on the project in accordance with Specification Section 01 35 13 "General Provisions".

   c. Other work and operations which must be performed, or for expenses incurred, prior to beginning work on the various contract items on the project site.

   d. Preconstruction costs, exclusive of bidding costs, which are necessary direct costs to the project, are expenditures required to prosecute the work on site, and are of a general nature rather than directly attributable to other pay items under the contract.

   e. Preparation of staging areas for equipment and materials, that will include, but is not limited to, all excavation, dewatering, tree removal, site grading, wetlands protection and restoration, soil erosion and sedimentation control, and all other items necessary to make the site usable, whether specifically mentioned or implied.

   f. Payment for mobilization shall constitute full payment for all labor, materials, and equipment necessary and will not exceed the following schedule:

Completion of Task	**Percentage of Bid Price for Mobilization and Demobilization Allowed**
Movement of Personnel, Equipment and Supplies	15
Establishment of Contractor's and City Engineer's Field Offices	10
Preparation of Staging Areas and Protection of Wetlands	25

2. The remaining half of the lump sum price for Mobilization and Demobilization will be for demobilization of all labor, materials, and equipment to include:

3. Restoration of staging areas, final site grading, and all other items necessary to complete the project according to the plans and specifications, whether specifically mentioned or implied.

a. Removal of the Contractor's and the Engineer field offices, and other facilities required for construction.

b. Removal of all equipment, supplies, personnel, and incidentals from the project site.

c. Other work and operations which must be performed, or for expenses incurred, prior to completion of work on the various contract items on the project site.

d. Any costs associated with repair of any road damage or sidewalk damage caused by heavy hauling shall be included with this item.

e. Payment for demobilization shall constitute full payment for all labor, materials, and equipment necessary and will not exceed the following schedule:

Completion of Task	**Percentage of Bid Price for Mobilization and Demobilization Allowed**
Restoration of Staging Areas, and Repair of Roads and Sidewalks	25
Removal of Contractor's and City Engineer's Field Offices	15
Removal of Personnel, Equipment, and all Non-Permanent Features	10

Item No. 3 – Install, Maintain and Remove SESC

1. Payment for installing, maintaining, and removing the Soil Erosion and Sedimentation Control (SESC) shall constitute full payment for all labor, materials, and equipment necessary and will follow the following schedule:

Completion of Task	**Percentage of Bid Price Allowed**
Installing SESC Features	25
Maintaining SESC	5 per month up to 65
Removal of SESC Features	10

Item No. 4 – Chemical Grouting at TD-23 and TD-43

1. Payment for this item shall constitute full payment for all labor, materials, and equipment necessary and will be paid in full per gallon of chemical grout injected after the work is completed, inspected, and approved by the Engineer. Grout in hoses and wasted grout will not be paid for.

Item No. 5 – Install Cementitious Grout Holes at TD-23 and TD-43

1. Payment for each of the grout holes shall constitute full payment for all labor, materials, and equipment necessary and will be paid in full after they are completed, inspected, and approved by the Engineer.

Item No. 6 – Cementitious Grouting at TD-23 and TD-43

1. Measurement: Payment shall be based on the volume (in cubic feet) of grout placed.

2. The contract unit price for mixing and placing the cementitious grout shall constitute full payment for all labor, materials, and equipment necessary to perform the work in accordance with the drawings and specifications.

3. Payment will occur after being inspected and approved by the Engineer.

Item No. 7 – Site Preparation. Signage and Traffic Control, Clearing and Grubbing, Install, Maintain and Remove Temporary Haul Route, Relocation of Emergency Stockpiles of Sand and Gravel. Demolish: Wooden Fence along Huron River, Remnant Collector Ditch Weir Posts, Steel C-Channel Toe Drain ID Posts, Block Wall and geosynthetic reinforcing Near TD-39, and Gravel Surfacing Upslope of TD-39, and all other items necessary whether specifically mentioned or not.

1. Payment for this item shall constitute full payment for all labor, materials, and equipment necessary and will be paid according to the following tasks upon completion, inspection, and approval by the Engineer of each task.

Task	% of Bid Item No. 7
a. Signage and Traffic Control	10
b. Clearing and Grubbing	25
c. Install Temporary Haul Route	20
d. Remove Temporary Haul Route	10
e. Relocation of Emergency Stockpiles of Sand and Gravel.	5
f. Demolish Wooden Fence along Huron River	5
g. Demolish Remnant Collector Ditch Weir Posts	5
h. Demolish Steel C-Channel Toe Drain ID Posts	5
i. Demolish Block Wall and Reinforcement Near TD-39	5
j. Remove Aggregate Ballast Upslope of TD-39	10

Item No. 8 – Underpass Widening. Remove Existing Pavement, Canopy, Railing, and Gabions, Prepare Subgrade, Install Modular Block Wall, Place Backfill and Temporary Surface Course on Underpass and all other items necessary whether specifically mentioned or not.

1. Payment for this lump sum item shall constitute full payment for all labor, materials, and equipment necessary and will be paid according to the following tasks upon completion, inspection, and approval by the Engineer of each task.

Task	% of Bid Item No. 8
a. Remove Existing Pavement	10
b. Remove Canopy	5
c. Remove Railing	5
d. Remove Gabions	30
e. Prepare Subgrade	20
f. Install Modular Block Wall	20
g. Place Backfill and Temporary Surface	10

Item No. 9 – Remove and Replace Existing Retaining Wall North of Underpass

1. Payment for this lump sum item shall constitute full payment for all labor, materials, and equipment necessary to remove and replace the existing retaining wall and will be paid in full after the new retaining wall is completed, inspected, and approved by the Engineer.

Item No. 10 – Strip Topsoil and Raise Grade of Embankment Crest to Elevation 802.0 feet from Station -2+38 to 2+25 and 12+60 to 14+33.

1. Measurement: The total quantity of fill material for which payment will be made will be based on the volume (in cubic yards) between the between the underlying ground surface and the upper surface of the material at elevation 802.0 feet, as determined by topographic survey. No allowance will be made for additional material placed above or outside the required slope lines unless authorized.

2. The contract unit price for removing the topsoil and raising the grade of the embankment with engineered fill shall constitute full payment for all labor, materials, and equipment necessary to perform the work in accordance with the drawings and specifications.

3. Payment will occur after being inspected and approved by the Engineer.

Item No. 11 – Reverse Filter Dewatering

1. Payment for this lump sum item shall constitute full payment for all labor, materials, and equipment necessary to perform the work in accordance with the Contract requirements and will be paid in full after the reverse filter is removed, backfilled, and the Engineer has approved cessation of dewatering.

Item No. 12 – Remove Reverse Filter and Backfill

1. Measurement: Material disposed of off-site will be measured for payment by the ton (2,000 pounds) to the nearest 0.1 ton (200 pounds). The contractor shall submit manifests and weight tickets from the disposal site as evidence of quantity for each truckload of material disposed of off-site.

2. The contract unit price for reverse filter material removed and backfill material placed shall constitute full payment for all labor, materials, and equipment necessary to remove the filter material, underlying unsuitable soils, and replace backfill in accordance with the drawings and specifications. Excavation shall be closed on same day it is opened. Excluded from this pay item is any excavation and backfill associated with the work outside of the footprint of the Reverse Filter.

3. The contract unit price for removing the reverse filter and backfilling shall constitute full payment for all labor, materials, and equipment necessary in accordance with the drawings and specifications. Payment will occur after being inspected and approved by the Engineer.

Item No. 13 – Topsoil Stripping at the Stabilization Berm

1. Measurement: Payment shall be based on the area (in acres) of topsoil removed.

2. The contract unit price for Topsoil Removed shall constitute full payment for all labor, materials, and equipment necessary to remove the topsoil in accordance with the drawings and specifications.

3. Payment will occur after being inspected and approved by the Engineer.

Item No. 14 – Excavation to Reach Subgrade of Granular Filter and Removal and Replacement of Unsuitable Soils at the Stabilization Berm

1. Measurement: Material disposed of off-site will be measured for payment by the ton (2,000 pounds) to the nearest 0.1 ton (200 pounds). Payment shall be based on the weight (in tons) of soils removed in the excavation to reach the subgrade of granular filter and unsuitable soils removed and properly disposed of off-site. The contractor shall submit manifests and weight tickets from the disposal site as evidence of quantity for each truckload of material disposed of off-site.

2. Removal of unsuitable soils shall include those materials below the existing topsoil that require removal to achieve the stabilization berm proposed subgrade elevation. Excavation shall be closed on same day it is opened.

3. The contract unit price for Excavation to Reach Subgrade of Granular Filter and Removal and Replacement of Unsuitable Soils at the Stabilization Berm shall constitute full payment for all labor, materials, and equipment necessary to remove the Unsuitable Soils and backfill the resulting excavation in accordance with the drawings and specifications. Excluded from this pay item is any material removed and backfilled within the footprint of the reverse filter as included in Item No. 12. Payment will occur after being inspected and approved by the Engineer.

Item No. 15 – Dewater the Collector Ditch Pond and Surrounding Ground

1. The lump sum price for dewatering the pond and surrounding ground shall constitute full payment for all labor, materials, and equipment required to dewater the collector ditch pond as needed to facilitate removal of existing sediments and backfilling of the pond as indicated on the drawings. This item shall include all required equipment to perform the work and payment for this item will be paid in full after unsuitable soils are removed from the pond, the pond is backfilled, and the Engineer has approved cessation of dewatering.

Item No. 16 – Remove and Replace Unsuitable Soils from the Collector Ditch Pond

1. Measurement: Material disposed of off-site will be measured for payment by the ton (2,000 pounds) to the nearest 0.1 ton (200 pounds). The contractor shall submit manifests and weight tickets from the disposal site as evidence of quantity for each truckload of material disposed of off-site. Excavation shall be closed on same day it is opened.

2. Removal of unsuitable soils from the pond shall include those materials below the existing pond bottom that require removal to allow proper backfill according to the plans and specifications.

3. The contract unit price for Unsuitable Soils shall constitute full payment for all labor, materials, and equipment necessary to remove the Unsuitable Soils and backfill the resulting excavation in accordance with the drawings and specifications. Payment will occur after being inspected and approved by the Engineer.

Item No. 17 – Fill the Collector Ditch Pond with Engineered Fill

1. The lump sum price for filling the collector ditch pond shall constitute full payment for all labor, materials, and equipment required to fill the pond with engineered fill and place additional fill on the downstream slope of the dam adjacent to the pond as indicated on the drawings. Payment for this item will be paid in full after the work is completed, inspected, and approved by the Engineer.

Item No. 18 – Realign and Construct the Collector Ditch. Remove, Relocate, and Replace the Existing Culvert. Abandon the existing headwall and construct new headwalls for the relocated culvert as indicated on the drawings. Provide General Dewatering, as necessary, to facilitate performing the work.

1. The lump sum price shall constitute full payment for labor, materials, and equipment required for realigning and constructing the collector ditch including removing any lining materials and sediments along the length of the existing collector ditch alignment, dewatering as necessary, filling the existing collector ditch with engineered fill, removal of unsuitable soils along the proposed collector ditch alignment, excavating/grading for proposed collector ditch alignment, placing lining materials in the proposed collector ditch (2NS Fine Aggregate, 17A Coarse Aggregate, and 3x1 Coarse Aggregate), removing and replacing the existing culvert, and removing the

existing headwall and constructing the new headwall for the relocated culvert as indicated on the drawings. Excluded from this pay item is any material removed and backfilled within the footprint of the reverse filter as included in Item No. 12. Payment for this item will be paid in full after the work is completed, inspected, and approved by the Engineer.

Item No. 19 – Provide Dewatering for Collector Ditch Abandonment and General Dewatering.

1. Payment for this lump sum item shall constitute payment for all labor, materials, and equipment necessary to dewater the existing collector ditch during the abandonment process as well as any dewatering required to control groundwater migration into excavations associated with the removal of unsuitable soils following removal of the existing topsoil with the stabilization berm construction limits. This item will be paid in full after the collector ditch is abandoned, backfilled, and the Engineer has approved cessation of dewatering.

Item No. 20 – Inspect and Abandon Toe Drains TD-12 through TD-59.

1. Payment for this lump sum item shall constitute full payment for all labor, materials, and equipment necessary to inspect and abandon the Toe Drains per Contract Requirements and will be paid following abandonment of TD-12 through TD-59 and inspected and approved by the Engineer.

Item No. 21 - Place and Compact MDOT 2NS Fine Aggregate for the Stabilization Berm and Granular Filter Above and Below the Mineral Drain.

1. Measurement: Payment shall be based on the volume (in cubic yards) of 2NS Fine Aggregate Filter Material placed and compacted.

2. The contract unit price for 2NS Fine Aggregate shall constitute full payment for all labor, materials, and equipment necessary to place and compact the Fine Aggregate in accordance with the drawings and specifications.

3. Payment will occur after being inspected and approved by the Engineer.

Item No. 22 - Place and Compact MDOT 17A Coarse Aggregate for the Mineral Drain.

1. Measurement: Payment shall be based on the volume (in cubic yards) of Coarse Aggregate Filter Material placed and compacted.

2. The contract unit price for 17A Coarse Aggregate shall constitute full payment for all labor, materials, and equipment necessary to place and compact the Coarse Aggregate in accordance with the drawings and specifications.

3. Payment will occur after being inspected and approved by the Engineer.

Item No. 23 - Place and Compact MDOT Class II Granular Fill for the Stabilization Berm

1. Measurement: Payment shall be based on the volume (in cubic yards) of Granular Fill Material placed and compacted.

2. The contract unit price for Class II Granular Fill shall constitute full payment for all labor, materials, and equipment necessary to place and compact the Granular Fill in accordance with the drawings and specifications.

3. Payment will occur after being inspected and approved by the Engineer.

Item No. 24 - Place Topsoil on the Stabilization Berm

1. Measurement: Payment shall be based on the volume (in cubic yards) of Topsoil placed.

2. The contract unit price for Topsoil shall constitute full payment for all labor, materials, and equipment necessary to place the Topsoil in accordance with the drawings and specifications.

3. Payment will occur after being inspected and approved by the Engineer.

Item No. 25 - Demolish Existing Piezometer Surface Monuments. Raise Existing Piezometers and Install Locking Monuments. Install Overland Discharge of Artesian Flow at PZ-3. Install Underdrain system (Perforated and Solid-Wall), Including Cleanouts, T Inspections, and Surface Monuments

1. Payment for this lump sum item shall constitute full payment for all labor, materials, and equipment necessary to perform the work in accordance with the drawings and specifications and will be paid following completion of all work and after being inspected and approved by the Engineer.

Item No. 26 - Construct the Permanent Access Path and Improve Existing Path Areas South of the Underpass and North of the Underpass as Shown on Sheets 22-28, 32-38, 41, and 45.

1. Payment for this lump sum item shall constitute full payment for all labor, materials, and equipment necessary and will be paid following completion of all work and after being inspected and approved by the Engineer.

Item No. 27 - Remove, Dispose of, and Replace Stairway and Guard Railing Atop the Adjacent Spillway Retaining Wall

1. Payment for this lump sum item shall constitute full payment for all labor, materials, and equipment necessary in accordance with the drawings and specifications and will

be paid following completion of all work and after being inspected and approved by the Engineer.

Item No. 28 - Remove and Dispose of Temporary Surface Course and Construct Final Pavement at Underpass. Replace Access Path Canopy and Railing

1. Payment for this lump sum item shall constitute full payment for all labor, materials, and equipment necessary to perform the work in accordance with the drawings and specifications and will be paid following completion of all work and after being inspected and approved by the Engineer.

Item No 29 – Excavate and Dispose of Soils for Compensatory Flood Plain Cut (as Shown on Sheet 27).

1. Payment for this lump sum item shall constitute full payment for all labor, materials, and equipment necessary to perform the work in accordance with the drawings and specifications and will be paid following completion of all work and after being inspected and approved by the Engineer.

Item No. 30 - Revegetation of the Work Area and Final Site Restoration, including repairs to Border-to-Border Path. Fill Ruts in the Existing Site Access Road and the Barton Nature Area Parking Lot.

1. Payment for this lump sum item shall constitute full payment for all labor, materials, and equipment necessary to perform the work in accordance with the drawings and specifications and will be paid following completion of all work and after being inspected and approved by the Engineer.

Item No. 31 – Allowance for Owner/Engineer Directed Work

1. This item is related to Discretionary allowance for Owner/ Engineer directed changes to the Contract sum resulting from additions, alterations, and administrative adjustments in the Contract Work.

2. This item includes payment for various items of Owner/Engineer directed additional Work, Work that is changed or altered by the Engineer or Project Owner, will be addressed under this Line Item and use of this line item will be entirely at the Owner's sole discretion. The conditions for payment will be in accordance with the General Conditions of the Contract.

Item No. 32 - Allowance for Permitting and Associated Requirements

1. Fees will be reimbursements in full for applicable permit fees and inspection fees incurred by the Contractor toward obtaining applicable permits and inspection fees from government agencies and municipalities to facilitate performing the scope of work required in the Contract Documents.

2. Payment for permits will be paid following proof of payment of each permit by the contractor and approval by the Engineer.

Item No. 33 - Allowance for Additional FERC Requirements

1. Fees will be reimbursements in full for any additional FERC requirements incurred by the Contractor to facilitate performing the scope of work required in the Contract Documents.

2. Payment for these requirements will be paid following proof of payment of each requirement by the contractor and approval by the Engineer.

Item No. 34 - Allowance for Purchase of Wetland Credits per EGLE Requirements

1. Fees will be reimbursements in full for the purchase of wetland credits required by EGLE and incurred by the Contractor to facilitate performing the scope of work required in the Contract Documents.

2. Payment for wetland credits will be paid following proof of payment by the contractor from the wetland bank (Crandall/Krummrey) and EGLE.

Item No. 35 - Project Closeout

1. Payment for this lump sum item will be paid following completion of all work per Contract requirements and after approval by the Engineer.

Item No. 36 - Administrative Compliance with CWIFP, AIS, Davis Bacon, Certified Payroll and Other Regulatory Reporting.

1. Payment for this lump sum item will be paid following completion of all work per Contract requirements and after approval by the Engineer.

Alternate Item No. 1 – Remove Existing Gabions Between Underpass and Spillway and Construct Modular Block Wall Between Underpass and Spillway, Including Associated Backfill

1. Payment for this lump sum item will be paid following completion of all work associated with this alternate item in accordance with the drawings and after being inspected and approved by the Engineer.

PART 2 MATERIALS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Schedule of Values.

B. Initial Application of Payment

C. Application for Payment

D. Application for Payment at Substantial Completion

E. Final Payment Application

1.2 RELATED SECTIONS

A. Section 01 33 00 - Submittal Procedures

1.3 SCHEDULE OF VALUES

A. Submit typed schedule for review and approval. The approved schedule of values will be used to prepare future Applications for Payment.

B. Submit Schedule of Values in PDF format to the Engineer within 15 days after date of Owner-Contractor Agreement.

C. Format: Identify each line item with number and title of the major specification Section.

D. Include within each line item, a direct proportional amount of Contractor's overhead and profit.

E. Revise schedule to list approved Change Orders, with each Application for Payment.

F. Include the following Project Identification on the Schedule of Values:

1. Project Name and Location

2. Name of Engineer

3. Project Number

4. Contractor's Name and Address

5. Date of Submittal

G. Arrange Schedule of Values in a tabular form with separate rows for each Specification Section and separate columns for each major structure of area of Work. Additionally, separate line items for the following shall be included:

1. Mobilization (Maximum 5% of Contract Total)

2. Bonds & Insurance

3. Allowances

4. Project Close-Out

H. Provide a breakdown of the Contract Price in sufficient detail to facilitate continued evaluation of Application for Payment and progress reports. Break principal subcontract amounts down into several line items.

1.4 INITIAL APPLICATION FOR PAYMENT

A. Administrative actions and submittals that must precede submittal of the first Application for Payment include the following:

1. List of Subcontractors

2. List of Principal Suppliers and Fabricators

3. Schedule of Values

4. Contractor's Construction Schedule (preliminary, if not final)

5. Submittal Schedule (preliminary if not final)

1.5 APPLICATIONS FOR PAYMENT

A. Submit each pay application in electronic PDF format.

B. Content and Format: Utilize Schedule of Values and Change Orders for listing items in Application for Payment.

C. Payment Period: Payments made according to the schedule described in the General Conditions and or in accordance with the Owner's requirements.

D. With each copy of the applications submit Waiver of Lien from all subcontractors or suppliers for work included in Application for Payment, other than the first pay application.

E. Submit a completed Contractor's Declaration with each Application for Payment.

F. A copy of the current Project Schedule Update as returned by Engineer with “No Exceptions”.

1.6 APPLICATION FOR PAYMENT AT SUBSTANTIAL COMPLETION

A. Following issuance of Certificate of Substantial Completion, submit an Application for Payment.

B. Administrative action and submittals that shall proceed or coincide with this application include:

1. Occupancy permits and similar approvals.

2. Warranties (guarantees) and maintenance agreements..

3. Test/adjust/balance records.

4. Changeover information related to Owner’s occupancy, use, operation and maintenance.

5. Final cleaning.

6. Application for reduction of retainage, and consent of surety.

7. Advice on shifting insurance coverage.

8. List of incomplete work, recognized as exceptions to Engineer’s Certificate of Substantial Completion.

9. As-Built Drawings.

1.7 FINAL PAYMENT APPLICATION

A. Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:

1. Completion of Project Closeout requirements.

2. Completion of items specified for completion after Substantial Completion.

3. Assurance that unsettled claims will be settled.

4. Assurance that work not complete and accepted will be completed without undue delay.

5. Proof that taxes, fees, and similar obligations have been paid.

6. Removal of temporary facilities and services.

7. Removal of surplus materials, rubbish, and similar elements.
8. Change of door locks to Owner's access.
9. Contractor's waivers of liens for project.
10. Written description of how all punch list items were addressed.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project Superintendence

B. Coordination and project conditions.

C. Field engineering.

D. Pre-Construction Conference.

E. Site Mobilization Meeting.

F. Progress meetings.

G. Preinstallation meetings.

1.2 PROJECT SUPERINTENDENCE

A. Contractor's superintendent shall be on site whenever active construction activities are ongoing. The assigned superintendent will have functional authority over construction activities for the duration of the project.

1.3 COORDINATION AND PROJECT CONDITIONS

A. Coordinate with utility companies for construction of utilities to the construction site.

B. Coordinate with Owner/Engineer to request Owner-supplied surveying. The Owner-supplied Surveyor will provide a quality control check of the Contractor's lines and grades as contained in the project drawings. The Owner-supplied Surveyor will also verify excavation and fill volumes where payment is based on the actual volume of materials removed or placed during construction, such as compensatory cut excavation and placement of the granular filter. For payment verification purposes, the Contractor must provide safe access to the area requiring survey throughout the project. Further, if the Contractor identifies areas that require Owner verification, he must notify the Owner's Surveyor at least 24 hours in advance of the anticipated survey need.

C. Coordinate with other contractors to complete connections to other work.

D. Coordinate construction operations included under different Section of the Specifications that are dependent upon each other for proper installation, connection, and operation. Where installation of one part of the work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results. Where availability of space is limited,

coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair. Make adequate provisions to accommodate items scheduled for later installation.

E. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at Site in accordance with Laws or Regulations. Contractor shall train Contractor's employees on use of these sheets and shall keep a master copy on hand at site.

F. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:

    1. Preparation of Schedules

    2. Installation and removal of temporary facilities.

    3. Delivery and processing of submittals.

    4. Progress meetings.

    5. Request of information.

    6. Project closeout activities.

G. Coordinate scheduling, submittals, and Work of the various sections of the Contract Documents to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

H. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

I. Coordinate activities and laydown areas with other contractors that may be on site to perform other work, such as construction of the Border to Border Trail.

1.4 FIELD ENGINEERING

The Contractor shall be responsible for the following:

A. Protect survey control and reference points. Promptly notify Engineer of any discrepancies discovered.

B. Control datum for survey is shown on Drawings.

C. Field-verify all dimensions and measurements.

D. Verify setbacks and easements; confirm drawing dimensions and elevations.

E. Provide field-engineering/survey services as needed to perform tasks utilizing recognized engineering survey practices - establish elevations, lines, and levels, etc.

F. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

G. Promptly report to Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

H. Replace dislocated survey control points based on original survey control. Make no changes without prior written Notice to Engineer.

I. Protect all existing open standpipe and vibrating wire piezometers at the site. Notify the Engineer immediately if any are damaged and promptly facilitate repairs.

J. The Contractor shall have an independent utility locating firm mark the alignment of all underground utilities at the site, including all buried utilities that enter or leave the existing pump station at the site.

1.5 PRE-CONSTRUCTION CONFERENCE

A. Owner will schedule a pre-construction conference and organizational meeting at the site or other convenient location prior to commencement of construction activities to review responsibilities and personnel assignments.

B. Attendees: Owner, Engineer and Engineer's consultants, Contractor and its project manager and superintendent, major subcontractors, manufacturers, suppliers, utility companies, and other concerned parties shall be represented at the conference by persons familiar with, and authorized to conclude, matters relating to the work.

C. Agenda: Discuss items of significance that could affect progress including such topics as:

1. Site Access and Badging
2. Mobilization Schedule
3. Tentative Construction Schedule.
4. Critical Work Sequencing.
5. Designation of Responsible Personnel.
6. Coordination with Other Construction Work and Other Contractors.
7. Procedures for Processing Field Decisions and Change Orders.
8. Procedures for Processing Applications for Payment.
9. Distribution of Contract Documents.
10. Submittal of Shop Drawings, Product Data, Samples and Schedule.

11. Preparation of Record Documents.

12. Use of the Premises.

13. Office, Work, and Storage Areas.

14. Equipment Deliveries and Priorities.

15. Contractor's Quality Assurance Plan.

16. Safety Procedures.

17. First Aid

18. Security.

19. Housekeeping.

20. Working Hours.

21. Stormwater Management and Soil Erosion Control Provisions.

22. Utility Contacts.

D. In addition to the Pre-Construction Conference, the Engineer may also require a Pre-Excavation, Concrete Pre-Pour Conference, and/or other critical activity conferences. Contractor and Subcontractors performing excavation work on site shall describe their plans for shoring, dewatering, disposal of spoils, and any other particulars of the excavation process, including the technical basis for their selection of the means and methods to be employed.

1.6 SITE SAFETY MEETING

A. The Contractor will schedule a conference at the project site prior to the Contractor's occupancy.

B. Attendance should include the Owner, Engineer, Contractor's Superintendent, Contractor's Safety Officer(s), and all subcontractors.

C. Agenda:

1. Safety Procedures.

2. First Aid

3. Security

1.7 PROGRESS MEETINGS

The Contractor shall:

A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record and distribute the minutes.

C. Attendance Required: job superintendent, major subcontractors and suppliers, Owner, and Engineer as appropriate to agenda topics for each meeting.

D. Prepare an agenda to include the following items as appropriate per meeting:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of RFIs.
   7. Review of off-site fabrication and delivery schedules.
   8. Maintenance of progress schedule.
   9. Corrective measures to regain projected schedules.
   10. Planned progress during succeeding work period.
   11. Coordination of projected progress.
   12. Maintenance of quality and work standards.
   13. Effect of proposed changes on progress schedule and coordination.
   14. Other business relating to Work.

E. Record minutes and distributes copies within two days after meeting to participants, with copies to Engineer, Owner, participants, and those affected by decisions made.

F. Submit updated construction schedule to the Owner/Engineer for review two days before each progress meeting.

G. Revise construction schedule as needed after each progress meeting and resubmit to the Owner/Engineer with the meeting minutes.

1.8 PREINSTALLATION COORDINATION MEETING

A. When required in individual specification sections, or as deemed necessary by the Contractor, Engineer, or Owner, the Contractor shall convene a preinstallation coordination meeting at the site prior to commencing work and shall:
   1. Require attendance of parties directly affecting, or affected by, work of the specific section.
   2. Notify Owner/Engineer five working days in advance of meeting date.
   3. Prepare agenda and preside at meeting:
   4. Review conditions of shutdown, installation, preparation, and installation procedures.
   5. Review coordination with related work.

6. Record minutes and distribute copies within two days after meeting to participants, with copies to Engineer/Owner participants, and those affected by decisions made.

1.9 FINAL INSPECTION MEETING

A. When the Contractor has provided written notice that the project is complete, a final inspection meeting shall be scheduled with the Contractor, Engineer, and Owner.

B. Engineer will notify the Contractor in writing of all items which this inspection reveals to be incomplete or defective.

C. Contractor shall immediately take all necessary measures to remedy such deficiencies. A written description of how each item has been addressed shall be submitted to the Engineer and Owner.

1.10 CLOSEOUT/WARRANTY MEETING

A. Prior to final application for payment, a closeout/warranty meeting shall be scheduled with the Contractor, Engineer, and Owner.

B. Meeting agenda shall include:
   1. Project record document review.
   2. Verify receipt of spare parts and maintenance products.
   3. Review preventative maintenance schedule.
   4. Review submitted warranties and bonds.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal Procedures

B. Certifications

C. Shop Drawings

D. Product Data

E. Samples

F. Manufacturers' Instructions

G. Manufacturers' Field Reports

H. Construction Schedule

I. Submittal Schedule

1.2 SUBMITTAL PROCEDURES

A. Bundle each submittal into a single PDF document, which shall include a cover sheet/transmittal prepared by the Contractor. Submittals where the cover sheet/transmittal is separate from the content will be rejected. Transmit each submittal from Contractor to Engineer using email. Submittals received from sources other than Contractor will be returned without action. Items from different specification sections shall be bundled individually. Number each submittal consecutively. Resubmittals should have the same number as the original, plus a letter designation for each Resubmittal (i.e., 7-A, 7-B)

B. Indicate on the cover sheet/transmittal relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements. On Resubmittal, all changes shall be clearly identified for ease of review. Resubmittals shall be reviewed for the clearly identified changes only. Any changes not clearly identified will not be reviewed and original submittal shall govern.

C. Include the following information on the cover sheet/transmittal for processing and recording action taken.

1. Project name.

2. Date.

3. Submittal number.

4. Name and email of Engineer.

5. Name, street address and email of Contractor.

6. Index of contents (This may be included on a separate sheet following the cover/transmittal.)

7. Name and address of subcontractor, as applicable. (May be included in the body of the submittal.)

8. Name and address of supplier, as applicable. (May be included in the body of the submittal.)

9. Name of manufacturer, as applicable. (May be included in the body of the submittal.)

10. Number and title of appropriate specification sections.

11. Drawing number and detail references, as appropriate.

12. Contractor's approval of the contained submittal for compliance with the Drawings and Specifications.

D. Schedule submittals to expedite the Project and deliver to Engineer at business address. Coordinate submission of related items. Coordinate related activities that require sequential activity.

E. Submit a schedule of shop drawing submittals.

F. Review and approve shop drawings, project data, and samples before submitting them.

G. Verify field measurements, field construction criteria, catalog numbers, and similar data. Indicate on the submission exactly what was verified.

H. Any markings done by Contractor shall be done in a color other than red. Red is reserved for Engineer's marking.

I. Coordinate each submittal with the requirements of the Contract Documents.

J. Provide space for Contractor and Engineer review stamps.

K. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

L. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

M. No claim will be allowed for damages or extension of time because of delays in the work resulting from rejection of material or from revision and resubmittal of shop drawings, project data, or samples.

N. No extension of contract time will be authorized because of failure to transmit submittals to Engineer sufficiently in advance of the work to permit processing.

O. Engineer reserves the right to withhold action on a submittal required coordination with other submittals until related submittals are received.

P. Do not install materials or equipment which requires submittals until the submittals are returned with Engineer's/Owner's stamp and initials or signature indicating approval. The Owner shall have final approval authority.

Q. Contractor's responsibility of errors, omissions, and deviations from requirements of Contract Documents in submittals is not relieved by the Engineer's review.

R. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with requirements.

S. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

T. Submittals not requested in conformance with this Specification will not be recognized or processed.

U. Revise and resubmit as required, identify all changes made since the previous submittal.

V. In the event that more than two re-submittals of any submittal are necessary to achieve conformance to the contract requirements, Contractor shall be charged for excess engineering. The Owner shall deduct these charges from the Contractor's final payment. Charges will be $150.00/hr. minimum 4 hours, for each additional submittal of an item. A tabulated record of such charges will be provided for the Contractor’s review prior to the processing of the final payment.

W. Submit new project data and samples when the initial submittal is returned disapproved.

1.3 CERTIFICATIONS

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Engineer, in quantities specified for Product Data.

B. Indicate that the material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certifications may be recent or previous test results of the material but must be acceptable to Engineer.

1.4 SHOP DRAWINGS

A. Shop Drawings: Submit to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Produce copies and distribute them in accordance with Paragraph 1.2 - Submittal Procedures.

B. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of shop drawings. Standard information prepared without specific reference to the project is not considered shop drawings.

C. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings. Include the following information:

1. Dimension.
2. Identification of products and materials included.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurements.

D. Nameplate data for equipment including electric motors shall be included on shop drawings. Electric motor data shall state the manufacturer, horsepower, service factor, voltage, enclosure type, oversize wiring box, etc.

E. Shop drawings shall indicate shop painting requirements to include type of paint and manufacturer.

F. Standard manufactured items in the form of catalog work sheets showing illustrated cuts of the items to be furnished, scale details, sizes, dimensions, quantity, and all other pertinent information should be submitted and approved in a similar manner.

G. Measurements given on shop drawings or standard catalog sheets, as established from contract drawings, and as approved by the Engineer, shall be followed. When it is necessary to verify field measurements, they shall be checked and established by Contractor. The field measurements so established shall be followed by Contractor and by all affected trades.

H. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.5 PRODUCT DATA

A. Product Data: Submit to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. Produce copies and distribute in accordance with Paragraph 1.2 - Submittal Procedures.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.6 SAMPLES

A. Submit full-size, fully fabricated samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers or materials, color range sets, and swatches showing color, texture, and pattern.

B. Mount, display, or package samples in the manner specified to facilitate review of qualities indicated. Prepare samples to match Engineer’s sample. Include the following:

1. Generic description of the sample.
2. Sample source.
3. Product name or name of manufacturer.
4. Compliance with recognized standards.
5. Availability and delivery time.

C. Submit samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

D. Refer to other specifications sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

E. Preliminary Submittals: Where samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit a full set of choices for the material or product. Preliminary Submittals will be reviewed and returned with Engineer’s mark indicating selection and other action.

F. Except for samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 3 sets. One will be returned marked with the action taken.

G. Maintain sets of samples, as returned, at the site, for quality comparisons throughout the course of construction.

H. Unless noncompliance with Contract Document provisions is observed the submittal may serve as the final submittal.

I. Sample sets may be used to obtain final acceptance of the construction associated with each set.

1.7 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.8 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the Owner.

B. Submit report in duplicate, within 7 days of observation, to Engineer and Owner for Information.

C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.9 CONSTRUCTION SCHEDULE

A. Bar Chart Schedule:

1. Prepare a fully developed, horizontal bar chart type construction schedule. Schedule shall be prepared electronically in Microsoft Project with critical path and links shown. Submit a PDF of the schedule within 30 days of the date established for commencement of the work.

2. Provide a separate item bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the work as indicated on schedule of values.

3. Prepare schedule of sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for entire construction period.

4. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on schedule with other construction activities; include minor elements involved in the sequence of the work. Show each activity

in proper sequence. Indicate graphically sequences necessary for completion of related portions of the work.

5. Coordinate construction schedule with schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other schedules.

6. Indicate completion in advance of the date established for substantial completion. Indicate substantial completion of schedule to allow time for Engineer's procedures necessary for certification of substantial completion.

7. Contractor's schedule shall indicate that the grouting program at TD-23 and TD-43 be completed within 60 days of contract execution.

B. Schedule Updating: Provide an updated construction schedule at each progress meeting. Color copies of the updated schedule shall be prepared for all attendees. The current revision date shall appear on each page of all submitted schedules.

1.10 SUBMITTAL SCHEDULE

A. After development and acceptance of the construction schedule, prepare a complete schedule of submittals. Submit schedule within 10 days of the date required for establishment of construction schedule.

B. Coordinate submittal schedule with the list of subcontracts, schedule of values, and the list of products as well as construction schedule.

C. Prepare schedule in chronological order; include submittals required during the first 90 days Provide the following information:

1. Scheduled date for the first submittal.
2. Related section number.
3. Submittal category.
4. Name of subcontractor.
5. Description of the part of the work covered.
6. Scheduled date for Resubmittal.
7. Scheduled date for Engineer's final release or approval.

D. The submittal schedule shall reflect critical path shop drawings that must be expedited.

E. Following response to initial submittal, print and distribute copies to Engineer, Owner, subcontractors, and other parities required to comply with submittal dates indicated. Post copies in the project meeting room and field office.

F. When revisions are made, distribute to the same parities and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in construction activities.

G. Schedule Updating: Provide an updated submittal schedule at each progress meeting.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

3.1 ENGINEER'S ACTION

A. Except for submittals for record, information, or similar purposes, where action and return are required or requested, Engineer will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is Contractor's responsibility.

B. Action Stamp: Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. Final Unrestricted Release: Where submittals are marked "No Exceptions Taken" that part of the work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents; final acceptance will depend upon the compliance.

2. Final-But-Restricted Release: When submittals are marked "Make Corrections Noted" that part of the work covered by the submittal may proceed, provided it complies with notation or correction on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

3. Returned for Resubmittal: When submittal is marked "Rejected" or "Revise and Resubmit" do not proceed with the part of the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

    a. Do not permit submittals marked "Rejected" or "Revise and Resubmit" to be used at site, or elsewhere where work is in progress.

4. Additional Information Needed: When submittal is marked "Submit Specified Item" Contractor shall submit requested information.

5. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Acknowledge Receipt".

6. The approval of Engineer shall not relieve Contractor of responsibility for errors on drawings or submittals as Engineer's checking is intended to cover compliance with drawings and specifications and not enter into every detail of the shop work.

END OF SECTION

SECTION 01 35 13
GENERAL PROVISIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Requirements stated in Division 1 of these Specifications shall apply to all work in this Section.

PART 2 MATERIALS

(Not Used)

PART 3 EXECUTION

3.1 CONSTRUCTION DOCUMENTS

A. The work shall conform to the drawings and specifications entitled “Barton Dam, Right Embankment Remediation”.

B. The parts and details not fully shown on the drawings shall be executed by the Contractor with the best-established industry and construction practices and as directed by the City Project Representative.

C. The Contractor will be furnished four (4) sets of plans and specifications without charge. Additional plans and specifications will be furnished upon written request at the cost of reproduction.

3.2 LIMITATIONS OF OPERATIONS

A. The Contractor shall limit his operations to cause as little disturbance as possible to areas outside the Construction Work Limits.

B. Access to the site shall be off West Huron River Drive via the passage under the railroad bridge, and within the Construction Work Limits only. However, no equipment or materials shall be stored outside of the property owned by the City. Access to the site is also permitted via boat and floating plant (see Item D below). Access to the site will not be permitted from other locations including unauthorized crossings of the existing railroad right of way.

C. Working hours shall be restricted to Monday through Friday, 7:00 am until 6:00 pm, excluding State and Federal recognized holidays, unless authorized otherwise by the City. In addition, power-operated construction-type devices and equipment shall not be operated at any time in such a manner that the noise created substantially exceeds the noise customarily and necessarily attendant to the reasonable and efficient performance of such devices and equipment.

D. The Contractor shall perform his work in such a manner, and maintain the site in such a condition, that unfettered access to the site is maintained for City personnel and equipment at all times.

E. The Contractor shall review all drawings, soil boring logs, gradation results, and laboratory testing results from the soil borings performed at the site (attached), and site conditions as required to be familiar with the subsurface conditions, groundwater seepage potential, and potential dewatering requirements. The soil boring logs, gradation results, and laboratory testing results are provided for information only and are not a guarantee of actual site conditions.

F. The Contractor shall provide a full-time flagger at the site to facilitate safe coordination between construction traffic, private vehicles, and pedestrians.

G. During topsoil stripping and site preparation operations on the existing dam, the contractor will be limited to working in strips no wider than 100 feet, as measured perpendicular to the axis of the dam. Concurrent working strips may not be located closer than 200 feet from each other (edge-to-edge). For each strip in which topsoil is removed, the surface grade must be returned to its original elevation prior to the completion of work for each day. As such, the contractor must plan daily activities to meet this project requirement.

H. The Contractor will be required to construct access haul routes as noted on the contract drawings. Further, at no time will the contractor be allowed to use the existing dam crest as a haul route other than for the placement of fill at specific locations on the crest as noted on the Drawings.

I. The Contactor shall abide by the construction loading limitations presented on the Drawings unless approved in writing by the Engineer. Upon request, the Contractor shall provide the Engineer with dimensions, payloads, and other equipment specifications necessary to evaluate the loading associated with the equipment to be used. If the Engineer finds the loading to be in excess of the permissible limits, the Contractor shall not use the unacceptable equipment.

3.3 USE OF PREMISES

A. The Contractor shall contact the City prior to beginning work regarding any specific regulations concerning the use of premises.

B. Should the contractor desire to utilize any space within the enclosed pump station area, the Contractor shall “daisy chain” their locks onto the existing gates so as not to impair pump station access for City personnel and to maintain security of the property.

3.4 CONSTRUCTION EMPLOYEE PARKING AREAS

A. Construction employee parking areas shall be designated by the City prior to beginning work.

3.5 CONSTRUCTION LAYOUT

A. The Contractor shall be responsible for establishing the construction base lines in the field from the information given on the drawings and any additional survey and construction layout as required. No separate payment will be made for this work. The cost shall be included in other items of work.

B. Prior to the start of construction, the contractor will be responsible for delineating all wetland boundaries within the contractor's work area. Delineation requires the placement high visibility stakes or fencing to identify all wetland boundaries.

3.6 CONTRACTOR'S FIELD OFFICE

A. A field office is required for this project in accordance with Section 809 of the MDOT Standard Specifications for Construction (SSC). The field office shall be located within the laydown area or the fenced pump station area identified in the contract drawings. The field office shall include restroom facilities as well as secure Wi-Fi internet access. The field office shall include furnished working space for all the City's Project Representatives including on-site engineering and surveying staff.

3.7 REFERENCE TO MDOT SPECIFICATIONS

A. Whenever reference is made to the State of Michigan, Department of Transportation, Standard Specifications for Constructions (MDOT-SSC), the section or item number will be referred to and such reference, except for pay items, units of measure, and quantities, shall govern the conduct of the work herein, and have the same force and effect as though transcribed into these Specifications. The 2020 issue of the MDOT-SSC shall govern this project and shall be referred to throughout these Specifications as "MDOT". Pay items, units of measure, and quantities shall be in accordance with the contract Drawings, Detailed Specifications, Engineers Estimate, and Bid Schedule for the project.

3.8 WETLAND CREDITS

A. The Contractor shall purchase wetland mitigation credits from Crandell Environmental of Charlotte, Michigan to satisfy the permit requirements for the project. Crandell shall issue a certificate acceptable to EGLE for satisfaction of the permit. The City will then forward the certificate to EGLE for issuance of the finalized permit. The designated allowance in these specifications shall be used for purchasing the credits.

3.9 OVERHEAD AND PROFIT MARK-UP

A. On direct subcontractor change order work, the Contractor is limited to a maximum of 10% mark-up to cover the costs of overhead and profit.

3.10 SHOP DRAWINGS, SUBMITTALS, AND CERTIFICATIONS REQUIRED

A. See Section 01 33 00, Part 1, of the General Specifications for submittal procedures. The following is a list of shop drawings, submittals, and certifications required and shall be reviewed and approved by the Engineer prior to the Contractor ordering equipment or materials for that work activity.

1. Excavation and Grading Plans – Equipment uses, quality control and verification measures, understanding of site excavation restrictions.

2. Backfill and Compaction Plans – Equipment planned, lift thicknesses and density compliance testing.

3. Removal of Unsuitable Material Plan – Site limitations/restrictions of excavation, dewatering requirements and procedures, disposal requirements.

4. Proposed Stabilization Berm and Pond Infill Materials – Material and supplier data.

5. Proposed Collector Ditch Materials – Material and supplier data.

6. Soil Erosion and Sediment Control Plans – SESC methods and implementation, street sweeping plans, maintenance, and inspection plans.

7. Grouting Work Plan – Subcontractor, experience, onsite supervision, equipment, mix design, pressure gauges, drilling methods and equipment.

8. Instrumentation Protection Plan – Details, materials, and procedures to protect existing and new instruments, including but not limited to piezometers and survey points.

9. Abandonment Plan for Existing Toe Drains – Procedures, equipment, and materials.

10. Culvert Abandonment and Backfill – Procedures, equipment, and materials. measures. Reference Section 31 23 23, “Flowable Fill”.

11. Handrailing Shop Drawings – Materials and installation methods.

12. Fill Materials – MDOT pre-qualified supplier and gradations.

13. Seed Mixture – Supplier and seed mix makeup.

14. Geotextile Separation Fabric – Manufacturer, catalog cut sheet, installation procedures.

15. Geogrid – Manufacturer, catalog cut sheet, installation procedures.

16. Dewatering Plan for Reverse Filter Removal - Well point installation method, suction pipe configuration, water conveyance and disposal, drawdown measurement, backup systems planned.

17. Dewatering Plan for Collector Ditch Pond Cleanout and Filling – Well point installation method, suction pipe configuration, water conveyance and disposal, drawdown measurement, backup systems planned.

18. Dewatering Plan for Collector Ditch Removal and Backfilling - Well point installation method, suction pipe configuration, water conveyance and disposal, drawdown measurement, backup systems planned.

19. Pipes, Pipe Couplings, Caps, Cleanouts, and Accessories – Product details and installation procedures.

20. Modular Block Wall Product Specifications and Shop Drawings, Including Wall Layout Plans for Each Wall – Material color, mix design, base preparation procedures and equipment, installation techniques and equipment planned, backfill procedures, and installation plans.

21. Canopy Plans and Product Data – Fabrication shop drawings, materials planned, shop erection, planned site erection and field welding / bolting.

22. Stairway Materials – Material supplier and material certifications, installation procedures, field construction methods and contractor experience.

23. Canoe and Kayak Launch Access Plan – Routes and methods to maintain safe access to and from the existing canoe and kayak launch on the Huron River.

3.11 CHECK SURVEYS

A. The Contractor will be required to perform check surveys prior to and following work operations to determine excavation and in-place backfill quantities. Costs involved in this work shall be included in other items of work; no separate or additional payments will be made.

B. In addition, the Owner's provided Surveyor will verify all excavation volumes associated with pay quantities that require verification.

3.12 DAMAGES

A. The Contractor shall be solely responsible for any and all damages on City-owned and private properties that are a result of the Contractor's construction activities. These construction activities will include, but not be limited to; demolition activities; clearing and grubbing operations; grading and other earthwork activities; dewatering; cut slope instabilities; support of excavation instabilities; construction traffic; or other construction operations or activities. Any damages on City-owned or private properties that are a result of the Contractor's construction activities shall be repaired by the Contractor at no cost to the City.

B. Any mitigations or other construction techniques necessary to reduce the potential for damage on City-owned and private properties shall be presented in the appropriate shop drawing submittal. The costs for these mitigations or techniques shall also be included in the bid price for the respective elements of work.

C. The work consists of the improvements to an existing infrastructure element where existing features are critical to the safe operation of the existing facility. The Contractor shall take extreme care to avoid damaging existing features of the projects that are not to be demolished. Any existing features that are damaged by the Contractor shall be promptly repaired at no cost to the City.

D. The Contractor shall be responsible for protecting any exposed surfaces on the dam or other structures during non-work periods, including during winter months when extended periods of non-work may occur. This protection will include but not be limited to potential erosion or damage to the dam from flood events or water seepage.

3.13 RECORDS AND REPORTS

A. The Contractor shall maintain daily records of construction activities; various bid item quantities completed along with other relevant information and provide copies of such records to the Project Representative upon request.

B. Within five days following the end of each calendar month, submit to the Project Representative a typed report summarizing the construction activities, various bid item quantities completed along with other relevant information for that month.

3.14 LAKE AND RIVER OPERATIONS

A. The pool level of Barton Pond shall not be lowered beyond those levels established by the City. The City does not anticipate any pool drawdown during the course of this project.

B. The water level of the Huron River is not to be lowered beyond those levels established by the City. However, the City does not anticipate any river level drawdown during the course of this project.

3.15 PROJECT COMPLETION

A. The substantial completion date for construction is expected to be ***September 15, 2025***, with final completion being ***November 30, 2025.***

END OF SECTION

SECTION 01 57 13
SOIL EROSION AND SEDIMENTATION CONTROL

PART 1 DESCRIPTION

1.1 SUMMARY

A. This work consists of installing and maintaining erosion and sedimentation controls to minimize soil erosion and control sediment from leaving the work site and affecting water resources of the State of Michigan and adjacent properties. Complete this work in accordance with this section and the City of Ann Arbor's SESC Manual. The Department considers the terms "stabilization" and "erosion control measures" as defined in the SESC Manual. The Contractor is responsible for obtaining the SESC permit from the City of Ann Arbor.

B. Failure to install and maintain soil erosion controls may result in project shutdown, fines from EGLE, or both. The Contractor is responsible for obtaining applicable federal, state, and local permits when disturbing areas outside the project work area.

PART 2 MATERIALS

2.1 Materials in accordance with the following MDOT sections:

Geosynthetics (Silt Fence Fabric) ……	910
Turbidity Curtain ……...	916

PART 3 EXECUTION

3.1 AREA LIMITATIONS

A. Limit the area of earth disturbance to approximately 1.6 acres during clearing and grading. The Engineer may change the limits of exposed surface area based on the Contractor's ability to minimize erosion and prevent offsite sedimentation.

B. Do not disturb lands and waters outside the project limits of earth disturbance without prior approval from the Engineer. Restore Contractor-disturbed areas beyond the plan or Engineer-approved limits at no additional cost to the Department.

C. Obtain and give the Engineer copies of local, state, or federally required permits before disturbing sites outside the right-of-way, such as borrow, waste or disposal areas, haul roads, or storage sites. Provide temporary and permanent erosion and sedimentation controls in accordance with the permits.

3.2 TIME LIMITATIONS

J. Clearing and grubbing of the work area shall be performed in strips no wider than 100 feet, as measured perpendicular to the axis of the dam. Concurrent working strips may not be located closer than 200 feet from each other (edge-to-edge). During this portion of the work, any exposed unsuitable materials must be locally excavated, removed, and replaced

with engineered fill. Excavations to remove and replace unsuitable materials must be limited to 250 square feet, as measured at the original ground surface. If the unsuitable materials extend beyond the 250-square-feet limit, the excavation shall be staged to excavate and backfill the initial 250 square feet prior to moving to the adjacent area. Excavations required for removal of unsuitable materials must at all times conform to MIOSHA requirements.

A. At all times, any surficial excavation associated with removing existing topsoil or uncovered materials that are unsuitable for the final embankment construction must be backfilled to the original grade prior to the competition of work for the day. Absolutely no excavated areas shall be left over night without their original grade being restored.

B. Following revetment and relocated toe ditch construction. Complete topsoil placement and stabilize slopes, channels, ditches, and other disturbed areas within 5 calendar days after final earth grade with permanent soil erosion control measures. Permanently restore and place topsoil on slopes and ditches within 150 feet of lakes, streams, or wetlands within 24 hours of achieving final earth grade using permanent soil erosion control measures.

C. Do not prolong trimming, finishing final earth grade, or both, to permanently stabilize the project at one time.

3.3 CONSTRUCTION AND MAINTENANCE OF EROSION AND SEDIMENTATION CONTROLS

A. Construct temporary or permanent erosion and sedimentation controls in accordance with the City of Ann Arbor SESC Manual, details shown on the plans, or as directed by the Engineer. In case of a discrepancy, the City of Ann Arbor Manual governs.

B. Maintain temporary erosion and sedimentation controls as necessary to ensure their effectiveness until permanent stabilization of the disturbed area has occurred. Dispose of sediment and debris removed from temporary sedimentation control devices in accordance with MDOT 205.03.P subsection.

C. Maintain permanent erosion controls as necessary to ensure their effectiveness until project completion and acceptance. Repair damaged areas, replace lost devices, and remove sediment as required. Dispose of sediment and debris removed from permanent sedimentation control devices in accordance with MDOT 205.03.P subsection.

D. Throughout the course of the project, roads in the project vicinity that are used for active truck access to the site shall be power swept a minimum of three times per week and more frequently if road conditions require or as directed by the Engineer.

    1. Check Dams: Install, maintain, and remove check dams across ditches.

    2. Silt Fence: Provide, install, maintain, remove, and dispose of silt fence consisting of woven geotextile fabric stapled to and supported by posts. Place material removed from trenching in the silt fence on the upslope side of the silt fence. In areas where water ponds behind the silt fence, provide a stone filter to channel away the water and prevent failure. Silt fence may remain in place after the required period if directed by the Engineer.

3. Construction Entrance: Provide, place, maintain, remove, and dispose of materials used to construct the construction entrances to the project site. Do not remove the construction entrances at the end of construction until directed by the City. The contractor shall power sweep West Huron River Drive a minimum of three times per week or more if required as a result of truck traffic entering and leaving the site.

4. Turbidity Curtain: Provide, install, maintain, remove, and dispose of shallow or deep turbidity curtain. Use shallow turbidity curtain when the water is no greater than 2 feet deep. Use deep turbidity curtain when the water is greater than 2 feet deep. Provide a floating or staked turbidity curtain. During removal, minimize sediment loss.

3.4 REMOVAL OF EROSION AND SEDIMENTATION CONTROL FACILITIES

A. Remove or obliterate temporary erosion and sedimentation controls when the permanent controls are complete and approved unless otherwise directed by the Engineer. Do not remove temporary controls next to lakes, watercourses, or wetlands until the establishment of turf on the adjacent slopes. Before placing topsoil, permanent seed, and fertilizer, remove or incorporate mulch placed for temporary erosion control into the slope.

B. Minimize erosion and sedimentation into watercourses during removal of erosion controls. Repair damage caused during the removal of erosion controls at no additional cost to the City.

END OF SECTION

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Substantial Completion

B. Final Inspection

C. Request for Final Payment

1.2 SUBSTANTIAL COMPLETION

A. Substantial completion shall be the date as certified by the Engineer when the construction of the Project, or a specified part thereof, is sufficiently completed, in accordance with the Contract Documents, so that the Project, or specified part, can be fully utilized for the purposes for which it was intended.

B. Before requesting inspection for Certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the work claimed as substantially complete. Include supporting documents for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the contract price.

2. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the work is not complete.

3. Advise Owner of pending insurance changeover requirements.

4. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.

5. Obtain and submit releases enabling Owner unrestricted use of the work and access to services and utilities; include occupancy permits, operating certificate, and similar releases.

6. Complete final cleanup requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

7. Provide all required demonstration and training sessions.

C. Inspection Procedures: On receipt of a request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements.

1. Engineer will prepare the Certificate of Substantial Completion following inspection or advise Contractor of construction that must be completed or corrected before the certificate will be issued.

2. Engineer will repeat inspection when requested and assured that the work has been substantially completed.

3. Results of completed inspection will be for the basis of requirements for final acceptance.

4. Date of Substantial Completion will begin the warranty period unless noted otherwise.

1.3 FINAL ACCEPTANCE

A. Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

2. Submit an updated final statement, accounting for final additional changes to the contract price.

3. Submit a copy of Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance. The list shall be endorsed and dated by the Engineer.

4. Submit consent of surety to final payment.

5. Submit a final liquidated damages settlement statement.

6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

7. Submit record drawings, maintenance manuals, damage or settlement survey, property survey, and similar final record information.

8. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.

B. Reinspection Procedure: Engineer will inspect the work upon receipt of notice that work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Engineer.

1. Upon completion of reinspection, Engineer will prepare a certificate of final acceptance or advise Contractor of work that is incomplete or of obligations that have not been fulfilled bet are required for final acceptance.

2. If necessary, reinspection will be repeated.

1.4 REQUEST FOR FINAL PAYMENT

A. Submit request for final payment in accordance with the Agreement and General Conditions, as may be modified by the Supplementary Conditions, using procedure specified in Section 01 29 00, Payment Procedures.

B. Request for final payment shall include:

1. Documents required for progress payments in Section 01 29 00, Payment Procedures.

2. Documents required in the General Conditions, as may be modified by the Supplementary Conditions.

3. Releases or Waivers of Lien Rights:

a. When submitting releases or waivers of Lien rights, provide release or waiver by Contractor and each subcontractor and supplier that provided Contractor with labor, material, or equipment.

b. Provide list of subcontractors and suppliers for which release or waiver of Lien is required.

c. Each release or waiver of Lien shall be signed by an authorized representative of entity submitting release or waiver to Contractor and shall include subcontractor's or supplier's corporate seal if applicable.

d. Release or waiver of Lien may be conditional upon receipt of final payment.

4. Consent of Surety.

5. Documentation that all punch list items are complete.

6. Warranties.

7. Record Drawings being maintained by the Contractor.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

(Not Used)

END OF SECTION

DIVISION 02 – EXISTING CONDITIONS

SECTION 02 30 00
UNDERGROUND UTILITY LOCATOR SERVICE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Means by which the contractor is to verify underground utility locations prior to start of any excavations, regrading of the ground surface, and penetrations of the ground surface. For the project, Utility Quality Level B as defined below will be required.

1.2 RELATED SECTIONS

A. Section 01 10 00 – Summary of Work
B. Section 31 10 00 – Clearing and Grubbing
C. Section 31 23 00 – Excavation, Backfill, and Compaction

1.3 REFERENCE STANDARDS

A. American Public Works Association, Uniform Color Code.
B. American Society of Civil Engineers, CI/ASCE 38-02, “Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.”

1.4 SUBMITTALS

A. Quality Control Submittals
B. Investigative Report

1.5 DEFINITIONS

A. Utility Quality Level B: Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of subsurface utilities. Quality level B data should be reproducible by surface geophysics at any point of their depiction. This information is surveyed to applicable tolerances defined by the project and reduced onto plan documents.

1. Retain an independent utility locator service company to field locate and mark existing underground utilities and service connections. The word "independent" as used above means a person not in the regular employment of the Contractor or having any vested interest in the Contractor's business.

2. Level B locator service shall be performed in all project areas where excavations, regrading of the ground surface, and penetrations of the ground surface are to be performed.

3. In heavy metal areas, such as near perimeter fences, ground penetrating radar shall be used to determine the location of underground utilities. The use of equipment that induce a tracing signal along the utility path (such as a Metrotech unit) can cause false readings, shall not be used within five feet of fences.

B. The Level B investigation shall be performed as follows:

   b. The locator service shall field locate and mark underground utilities and service connections prior to excavation.

   c. The contractor shall be responsible for coordinating the extent of the areas of subsurface investigation required to locate all underground utilities and service connections in the areas of excavation.

   d. All costs associated with the repair of underground utilities and service connections hit/damaged during the investigative work shall be the responsibility of the contractor.

C. Utility location services shall be in accordance with the provisions of CIASCE 38-02, “Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data.”

D. Quality Control Submittals: Submit detailed experience and qualification information about the underground utility locator service company and the persons that will be performing the work. Detailed experience and qualification information shall include:

   1. Personnel with minimum of five (5) years of experience in field locating, marking, and staking out of existing underground utilities and service connections.

   2. Project information of 5 similar projects, which the locator service company, had worked on during the past 5 years. Information shall include for each project:

      a. Name and address of project.

      b. Dates worked on project.

      c. Name and telephone number of contact person at the project site for which the locator service was performed.

      d. Description of types of utility locator equipment (investigation equipment) that company will utilize to perform the underground utility investigation.

      e. Names of persons that the persons that will be performing the work, including the number of years of experience and training that the persons have in the use of the equipment. Include copy of training certificates for locator equipment proving the person performing the locator service are trained on the equipment being used.

   3. Submit Quality Control Submittals within 10 days of contract award.

   4. Investigative Report

      a. Submit detailed written report and scaled drawings of the subsurface investigation, documenting all underground utilities and service connections located and identified.

      b. All documentation shall be referenced to existing data (horizontal and vertical) previously established.

c. Provide one (1) paper copy and one (1) PDF electronic copy of detailed written report and drawings.

E. Submit Investigative Report at least one week prior to advancing construction within the scheduled areas of excavation within the project site.

1. Coordinate the work to determine the extent of the areas of subsurface investigation required to locate all underground utilities and service connections in the areas of excavation.

2. Coordinate the work with the City's Engineer to minimize utility disruptions and facility operations. Provide a schedule for the Work required to the City's Engineer for approval. Upon approval of the schedule, notify the City's Engineer a minimum of three (3) working days prior to performing the work.

3. Within the areas of excavation, all underground utilities and service connections shall be field located, and their locations marked at least one (1) week prior to the performance of the required excavation work.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

3.1 WORK AREAS AND PERFORMANCE

A. If any underground utilities and service connections are hit or damaged during the Work, immediately inform the Engineer for directions on how to proceed.

B. The utility locator service investigative work, field location and marking of underground utilities and service connections and submission of the investigative report must be completed before any excavation work can begin.

C. Contractor shall maintain markings throughout the contract duration or until a time when directed (in writing) by the Engineer that maintaining of the markings are no longer required.

D. Provide subsurface investigation information, detailed written report, and drawings of the subsurface investigation, documenting all underground utilities and service connections located and identified, prior to the performance of the required excavation work.

E. If during the Level B investigations, unknown underground utilities are discovered, the City's Engineer shall be notified as soon as possible or before the close of that business day.

F. Field Marking of underground utilities shall follow the American Public Works Association (APWA) uniform color code:

1. White: Proposed Excavation.
2. Pink: Temporary Survey Markings.
3. Red: Electric power lines, cables, conduit, and lighting cables.
4. Yellow: Gas, oil, steam, petroleum, and gaseous material.
5. Orange: Communications, alarm, signal lines, cables, or conduit.
6. Blue: Potable water.
7. Purple: Reclaimed water, irrigation, and slurry lines.
8. Green: Sewer and drain lines.

END OF SECTION

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Demolition and removal of selected site elements.

B. Related Requirements:
   1. Section 01 10 00 "Summary of Work" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
   2. Section 31 10 00 "Clearing and Grubbing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.
   3. Section 31 23 00 “Excavation, Backfill and Compaction”

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor and must be properly disposed of off-site. The contractor shall maintain records of all disposed materials for review by the City, if requested.

1.4 SUBMITTALS

A. Before start of demolition, submit demolition plans to Engineer for review, describing proposed sequence, methods, and equipment for demolition and disposal of each structure.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

3.1 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

C. Blasting will not be permitted. Perform demolition work in accordance with all applicable laws and ordinances.

D. Wet down work during demolition operations to minimize dust.

E. Demolition to include removal of existing ditch weir posts.

3.2 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site.

B. Do not allow demolished materials to accumulate on-site.

C. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

D. Properly dispose demolished material in accordance with all applicable laws and regulations.

E. Maintain accurate records of all disposal quantities and locations of disposal for review by the City, if requested.

END OF SECTION

DIVISION 03 – CONCRETE

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Form facing material for cast-in-place concrete.
   2. Shoring, bracing, and anchoring.

B. Related Requirements:
   1. Section 03 20 00 “Concrete Reinforcing” for steel reinforcing bars.
   2. Section 03 30 00 “Cast-in-Place Concrete” for concrete materials, mix design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site and review the following:
   1. Special inspection and testing and inspecting agency procedures for field quality control.
   2. Construction, movement, contraction, and isolation joints.
   3. Forms and form-removal limitations.
   4. Shoring and reshoring procedures.
   5. Anchor rod and anchorage device installation tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Detailing fabrication, assembly, and support of forms.
   1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
   2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
   3. Location of construction joints is subject to approval of the Engineer.
   4. Indicate location of water stops.
   5. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.

1.6 INFORMATION SUBMITTALS

A. Qualification Data: For testing and inspection agency.

B. Minutes of preinstallation conference.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS SUBMITTALS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
   1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
   2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

2.2 FORM FACING MATERIALS

A. As-Cast Surface Form-Facing Material:
   1. Provide continuous, true, and smooth concrete surfaces.
   2. Furnish in largest practicable sizes to minimize number of joints.
   3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete, and as follows:
      a. Plywood, metal, or other approved panel materials.
      b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
         1. APA HDO (high-density overlay).
         2. APA HDO (medium -density overlay); mill-release agent treated, and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.
   1. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces not exceeding specified formwork surface class.
   1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

2.3 RELATED MATERIALS

A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4-inch by 3/4-inch, minimum.

B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
   1. Form Release Agent must be potable water approved in accordance with NSF/ANSI 61.
   2. Formulate form-release agent with rust inhibitor for steel form-facing materials.

C. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that leave no corrodible metal closer than 1-1/2” inch to the plane of exposed concrete surface.
   2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates to walls indicated to receive damp proofing or waterproofing.

PART 3 EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:
   1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
   2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
   3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.
   1. Minimize joints.
   2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
   1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
   2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
   1. Provide and secure units to support screed strips.
   2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
   1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
   2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
   1. Determines sizes and locations from trades providing such items.
   2. Obtain written approval of Engineer prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:
   1. Construct joints true to line with faces perpendicular to surface plane of concrete.
   2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.
   3. Place joints perpendicular to main reinforcement.
   4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
   5. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   6. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   7. Space vertical joints in walls as indicated on Drawings.
   8. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
   1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
   2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.
   1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
   3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
   5. Clean embedded items immediately prior to concrete placement.

3.3 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete must be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
   1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
   2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.
   1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
   2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
   1. Align and secure joints to avoid offsets.
   2. Do not use patched forms for exposed concrete surfaces unless approved by the Engineer.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

B. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

C. Plan sequence of removal of shores and re-shore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Steel reinforcement bars.
   2. Welded-wire reinforcement.

B. Related Requirements
   1. Section 03 10 00 “Concrete Forming and Accessories” for form-facing material and concrete accessories.
   2. Section 03 30 00 “Cast-in-Place Concrete” for concrete materials, mix designs, placement procedures, and finishes.
   3. Section 32 13 13 "Concrete Paving" for reinforcing related to concrete pavement and walks.

1.3 PREINSTALLATION MEETINGS

B. Preinstallation Conference: Conduct conference at Project site.
   1. Review the following:
      a. Special inspection and testing and inspecting agency procedures for field quality control.
      b. Construction contraction and isolation joints.
      c. Steel-reinforcement installation.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Comply with ACI SP-066:
   1. Include placing drawings that detail fabrication, bending, and placement.
   2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

B. Construction Joint Layout:
   1. Indicate proposed construction joints required to build the structure.
   2. Location of construction joints is subject to approval of the Engineer.

1.5 INFORMATIONAL SUBMITTALS

A. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement:
   1. Deliver, store, and handle steel reinforcement to prevent bending and damage. and to avoid damaging coatings on steel reinforcement.
   2. Store reinforcement to avoid contact with earth.

PART 2 PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing bars used in the underpass slab must be epoxy coated.
B. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
C. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.
D. Epoxy-Coated Reinforcing Bars: ASTM A775, Grade 60, deformed.
E. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
F. Epoxy Coating: ASTM A775/A775M or ASTM A934/A934M with less than 2 percent damaged coating in each 12-inch bar length.
G. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

B. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view, where legs of wire bar support contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
   2. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
   3. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
   4. Finish: Galvanized.
   5. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement and complying with ASTM A775A775M.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:
   1. Do not cut or puncture vapor retarder.
   2. Repair damage and reseal vapor retarder before placing concrete.
   3. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
B. Accurately position, support, and secure reinforcement against displacement.
C. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
D. Do not tack weld crossing reinforcing bars.
E. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
F. Provide concrete coverage in accordance with ACI 318.
G. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
H. Splices: Lap splices as indicated on Drawings for epoxy-coated bars.
I. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
J. Stagger splices in accordance with ACI 318.
K. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
L. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.
M. Install structural thermal break insulated connection system in accordance with manufacturer's instructions.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Engineer.
B. Place joints perpendicular to main reinforcement.
C. Continue reinforcement across construction joints unless otherwise indicated.
D. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:
   1. Section 03 10 00 "Concrete Forming and Accessories".
   2. Section 03 20 00 "Concrete Reinforcing".
   3. Section 31 23 00 “Excavation, Backfill, and Compaction".

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor’s superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete Subcontractor.
      e. Special concrete finish Subcontractor.

   2. Review the following:
      a. Special inspection and testing and inspecting agency procedures for field quality control.
      b. Construction joints, control joints, isolation joints, and joint-filler strips.
      c. Semirigid joint fillers.
      d. Vapor-retarder installation.
      e. Anchor rod and anchorage device installation tolerances.
      f. Cold and hot weather concreting procedures.
      g. Concrete finishes and finishing.
      h. Curing procedures.
      i. Forms and form-removal limitations.
      j. Methods for achieving specified floor and slab flatness and levelness.
      k. Floor and slab flatness and levelness measurements.

l. Concrete repair procedures.
m. Concrete protection.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following.
1. Vapor retarders.
2. Liquid floor treatments.
3. Curing materials - include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
4. Joint fillers.
5. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:
1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Relevant test data, no more than 6 months old, matching each mix design to be utilized, substantiating the stated mix design parameters.
4. Durability exposure class.
5. Maximum w/cm.
6. Calculated equilibrium unit weight, for lightweight concrete.
7. Admixture dosage rates:
a. Slump.
b. Air content.
c. Seven-day compressive strength.
d. 28-day compressive strength.
8. Slump limit.
9. Air content.
10. Nominal maximum aggregate size.
11. Synthetic fiber content.
12. Intended placement method.
13. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:
1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure. Location of construction joints is subject to approval of the Engineer.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:
   1. Installer: Include copies of applicable ACI certificates.
   2. Ready-mixed concrete manufacturer.
   3. Testing agency: Include copies of applicable ACI certificates.

B. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

C. Research Reports: For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.

D. Preconstruction Test Reports: For each mix design for each class of concrete no older than 6 months utilizing materials that will be used for batching of concrete for this project.

E. Minutes of preinstallation conference.

F. Structural Inspection Quality Assurance Plan and written statement of responsibility.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
   1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.8 CONSTRUCTION TESTING

A. The concrete mix design is to be developed by the Contractor and approved by the Engineer.

B. Construction Testing Service: If supplier does not have current mix data including slump, air content, and strength break history, engage a qualified testing agency to perform construction testing on each concrete mix at the supplier's plant.
   1. Include the following information in each test report:
      a. Slump.
      b. Air content.
      c. Seven-day compressive strength.
      d. 28-day compressive strength.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.10 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
   1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

3. Do not use frozen materials or materials containing ice or snow.

4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.

5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
   1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.

   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301.

2.2 CONCRETE MATERIALS

A. Source Limitations:
   1. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
   2. Obtain aggregate from single source.
   3. Obtain each type of admixture from single source from single manufacturer.
   4. Cementitious Materials.

B. Portland Cement: ASTM C150/C150M, Type I or I/II or ASTM C595 Type IL.

C. Fly Ash: ASTM C618, Class C or F.

D. Slag Cement: ASTM C989/C989M, Grade 100 or 120.

E. Fiber-Reinforced: ASTM C1116/C1116M-10a.

F. Silica Fume: ASTM C1240 amorphous silica.

G. Blended Hydraulic Cement: ASTM C595/C595M, Type IL, Portland-limestone cement.

H. Normal-Weight Aggregates: ASTM C33/C33M, Class 4S coarse aggregate or better, graded. Provide aggregates from a single source.

I. Alkali-Silica Reaction: Comply with one of the following:
   1. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.

   2. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.

   3. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

J. Maximum Coarse-Aggregate Size: ¾-inch nominal.

K. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

L. Air-Entraining Admixture: ASTM C260/C260M.

M. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

N. Water-Reducing Admixture: ASTM C494/C494M, Type A.

O. Retarding Admixture: ASTM C494/C494M, Type B.

P. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.

Q. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.

R. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.

S. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

T. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

D. Color:
   1. Ambient Temperature Below 50 deg F: Black.
   2. Ambient Temperature between 50 deg F and 85 deg F: Any color.
   3. Ambient Temperature Above 85 deg F: White.

E. Curing Paper: Eight-feet-wide, natural colored polypropylene non-woven fabric with white polyethylene coating applied to one side with ultraviolet light stabilizers able to provide moisture retention for at least seven (7) days.

F. Basis of design product: Armorlon Transguard 4000 by Reef Industries.

G. Water: Potable or complying with ASTM C1602/C1602M.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.6 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

B. Cement Binder: ASTM C150/C150M Portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.

C. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

D. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.

E. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

F. Repair Overlayment: cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

G. Cement Binder: ASTM C150/C150M Portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.

H. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

I. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.

J. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.7 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

B. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

C. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
   1. Fly Ash or Other Pozzolans: 25 percent by mass.

   2. Slag Cement: 50 percent by mass.

   3. Silica Fume: 10 percent by mass.

   4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

   5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

D. Cast-in-place concrete placed as indicated in the plans for the existing underpass improvements and underpass improvements shall meet the requirements for glass-fiber reinforcement per ASTM C1116/C116M-10a.

E. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

F. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

G. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

H. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, and concrete with a w/cm below 0.50.

2.8 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for exterior slabs and pavements, foundation walls, footings, grade beams, and tie beams.
   1. Exposure Class: ACI 318 F2 S0 W0 C1.
   2. Minimum Compressive Strength: 4000 psi at 28 days.
   3. Maximum w/cm: 0.45.

4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Air Content:
   a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
7. Aggregate to be crushed limestone.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish batch ticket information.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
   2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete. All anchors are to be stainless steel or galvanized steel.

B. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

C. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

D. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
   1. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

B. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Engineer.

C. Place joints perpendicular to main reinforcement.

D. Continue reinforcement across construction joints unless otherwise indicated.

E. Do not continue reinforcement through sides of strip placements of floors and slabs.

F. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

G. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

H. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

I. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.

J. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

K. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

   2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

   3. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

L. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.

M. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.

N. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

O. Doweled Joints:
   1. Install dowel bars and support assemblies at joints where indicated on Drawings.

   2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items, are complete and that required inspections are completed.

B. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.

C. Notify Engineer and testing and inspection agencies 24 hours prior to commencement of concrete placement.

D. Do not add water to concrete during delivery, at Project site, or during placement.

E. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

F. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

G. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

H. If a section cannot be placed continuously, provide construction joints as indicated.

I. Deposit concrete to avoid segregation.

J. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

K. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

L. Do not use vibrators to transport concrete inside forms.

M. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.

N. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.

O. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

P. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

Q. Do not place concrete floors and slabs in a checkerboard sequence.

R. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

S. Maintain reinforcement in position on chairs during concrete placement.

T. Screed slab surfaces with a straightedge and strike off to correct elevations.

U. Level concrete, cut high areas, and fill low areas.

V. Slope surfaces uniformly to drains where required.

W. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.

X. Do not further disturb slab surfaces before starting finishing operations.

3.6 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes: Apply to concrete surfaces not exposed to public view.
   1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
      a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
      b. Remove projections larger than 1 inch.
      c. Tie holes do not require patching.
      d. Surface Tolerance: ACI 117 Class D.

   2. ACI 301 Surface Finish SF-3.0: Apply to concrete surfaces exposed to public view including the edge of the slab that faces the Huron River, to surfaces to receive a rubbed finish, or to surfaces to be covered with a coating or covering material applied directly to concrete.
      a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
      b. Remove projections larger than 1/8 inch.
      c. Patch tie holes.
      d. Surface Tolerance: ACI 117 Class A.

B. Rubbed Finish: Apply the following to as-cast surface finishes exposed to view.
   1. Grout-Cleaned Rubbed Finish:
      a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
      b. Do not clean concrete surfaces as Work progresses.
      c. Mix 1 part Portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white Portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
      d. Wet concrete surfaces.
      e. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.

C. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.

2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Broom Finish: Apply a broom finish to exterior concrete platforms, walkways, steps, ramps, and locations indicated on Drawings.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

   2. Coordinate required final finish with Engineer before application.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:
   1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.

   2. Mix, place, and cure concrete, as specified, to blend with in-place construction.

   3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

   4. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

B. Equipment Bases and Foundations:
   1. Coordinate sizes and locations of concrete bases with actual equipment provided.

   2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.

   3. Minimum Compressive Strength: 4000 psi at 28 days.

   4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

   5. Prior to pouring concrete, place, and secure anchorage devices.

   6. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

7. Cast anchor-bolt insert into bases.

8. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
   1. Cast-in inserts and accessories, as shown on Drawings.

   2. Screed, tamp, and trowel finish concrete surfaces.

3.9 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.

C. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

D. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply in accordance with manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

E. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
   1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
   2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
   3. If forms remain during curing period, moist cure after loosening forms.
   4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

      a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.

      b. Continuous Sprinkling: Maintain concrete surface continuously wet.

      c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

      d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.

F. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
   1. Begin curing immediately after finishing concrete.

   2. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

a. Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
   i. Lap edges and ends of absorptive cover not less than 12-inches.
   ii. Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

b. Moisture-Retaining-Cover or Curing Paper Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
   i. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
   ii. Cure all concrete slabs for not less than seven days.
   iii. Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
   iv. Water.
   v. Continuous water-fog spray.

c. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
   i. Curing Paper Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
   ii. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
   iii. Cure for not less than seven days.
   iv. Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
   v. Water.
   vi. Continuous water-fog spray.

3.10 TOLERANCES

A. Conform to ACI 117.

3.11 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

B. Defer joint filling until concrete has aged at least one month(s).

C. Do not fill joints until construction traffic has permanently ceased.

D. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

E. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

F. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete:
   1. Repair and patch defective areas when approved by Engineer.

   2. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

   3. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

   4. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

   5. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

   6. Limit cut depth to 3/4 inch.

   7. Make edges of cuts perpendicular to concrete surface.

   8. Clean, dampen with water, and brush-coat holes and voids with bonding agent.

   9. Fill and compact with patching mortar before bonding agent has dried.

   10. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

   11. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement, so that, when dry, patching mortar matches surrounding color.

   12. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.

   13. Compact mortar in place and strike off slightly higher than surrounding surface.

   14. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by the Engineer.

B. Repairing Unformed Surfaces:
   1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

2. Correct low and high areas.

3. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

4. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

5. After concrete has cured at least 14 days, correct high areas by grinding.

6. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
7. Finish repaired areas to blend into adjacent concrete.

8. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

9. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

10. Feather edges to match adjacent floor elevations.

11. Correct other low areas scheduled to remain exposed with repair topping.

12. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.

13. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

14. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

15. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.

16. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.

17. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.

18. Place, compact, and finish to blend with adjacent finished concrete.

19. Cure in same manner as adjacent concrete.

20. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

21. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.

22. Dampen cleaned concrete surfaces and apply bonding agent.

23. Place patching mortar before bonding agent has dried.

24. Compact patching mortar and finish to match adjacent concrete.

25. Keep patched area continuously moist for at least 72 hours.

26. Perform structural repairs of concrete, subject to Engineer’s approval, using epoxy adhesive and patching mortar.

C. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.14 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

1. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

2. Testing agency shall immediately report to Engineer, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.

3. Testing agency shall report results of tests and inspections, in writing, to Owner, Engineer, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

B. Test reports shall include reporting requirements of ASTM C31/C31M and ASTM C39/C39M, including the following as applicable to each test and inspection:

1. Project name.

2. Name of testing agency.

3. Names and certification numbers of field and laboratory technicians performing inspections and testing.

4. Name of concrete manufacturer.

5. Date and time of inspection, sampling, and field testing.

6. Date and time of concrete placement.

7. Location in Work of concrete represented by samples.

8. Date and time sample was obtained.

9. Truck and batch ticket numbers.

10. Design compressive strength at 28 days.

11. Concrete mixture designation, proportions, and materials.

12. Field test results.

13. Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.

14. Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:
   1. Headed bolts and studs.

   2. Verification of use of required design mixture.

   3. Concrete placement, including conveying and depositing.

   4. Curing procedures and maintenance of curing temperature.

   5. Verification of concrete strength before removal of shores and forms from beams and slabs.

E. Batch Plant Inspections: On a random basis, as determined by Engineer.

F. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

   1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

      a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

   2. Slump: ASTM C143/C143M:
      a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.

b. Perform additional tests when concrete consistency appears to change.

3. Slump Flow: ASTM C1611/C1611M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.

   b. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete:
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C1064/C1064M:
   a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

6. Compression Test Specimens: ASTM C31/C31M:
   a. Cast and laboratory cure two sets of two 6-inch by 12-inch or two sets of three 4-inch by 8-inch cylinder specimens for each composite sample.

   b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C39/C39M:
   a. Test one set of laboratory-cured specimens at seven days and one set of two specimens at 28 days.

   b. Test one set of field-cured specimens at seven days and one set of two specimens at 28 days.

   c. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

   d. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

   e. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.

   f. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

8. Additional Tests:
    a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer.

    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Engineer.

    c. Acceptance criteria for concrete strength shall be in accordance with ACI 301 section 1.6.6.3.

    d. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

    e. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

    f. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 48 hours of completion of floor finishing and promptly report test results to Engineer.

3.15 PROTECTION

A. Protect concrete surfaces as follows:
    1. Protect from petroleum stains.

    2. Diaper hydraulic equipment used over concrete surfaces.

    3. Prohibit vehicles from interior concrete slabs.

    4. Prohibit use of pipe-cutting machinery over concrete surfaces.

    5. Prohibit placement of steel items on concrete surfaces.

    6. Prohibit use of acids or acidic detergents over concrete surfaces.

    7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

    8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION

DIVISION 05 – METALS

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Miscellaneous framing and supports.

   2. Products furnished, but not installed, under this Section include the following: Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

A. Product Data:
   1. Fasteners.
   2. Shop primers.
   3. Shrinkage-resisting grout.

B. Shop Drawings: show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
   1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
   2. Underpass canopy inspection hatches.
   3. Underpass canopy frame.

C. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

D. Welding certificates.

E. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

F. Research Reports: For post-installed anchors.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding code:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept metal fabrications on site in labeled shipments. Inspect for damage. Protect metal fabrications from damage by exposure to weather and any chemicals that could cause deterioration of stored materials.

PART 2 PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. All steel used in construction of the pedestrian canopy under the railroad bridge is to be hot-dip galvanized.

C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

D. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing

2.2 FASTENERS

A. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

B. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

C. Hot-dip galvanize or provide mechanically deposited, zinc coating on all fasteners.

D. Post-Installed Anchors: chemical anchors.

2.3 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099000 "Painting."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

C. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

H. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

   b. Obtain fusion without undercut or overlap.

   c. Remove welding flux immediately.

   d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated, coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.5 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize bearing and leveling plates.

C. Prime plates with zinc-rich primer.

2.6 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.7 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
   1. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

   2. Shop prime with primers specified in Section 099000 "Painting" unless zinc-rich primer is indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

   2. Obtain fusion without undercut or overlap.

   3. Remove welding flux immediately.

   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
   1. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF LOOSE BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 REPAIRS

A. Touchup Painting:
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

   2. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099000 "Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 05 53 13
BAR GRATINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:.
   1. Metal bar gratings.
   2. Grating frames and supports.

1.2 ACTION SUBMITTALS

A. Product Data:
   1. Clips and anchorage devices for gratings.
   2. Paint products.

B. Shop Drawings:
   1. Include plans, sections, and attachment details.
   2. Signed and sealed by the qualified professional engineer responsible for their preparation.

C. Delegated Design Submittals: For gratings, including manufacturers' published load tables.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.

C. Welding certificates.

1.4 QUALITY ASSURANCE

A. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
   1. AWS D1.1/D1.1M.
   2. AWS D1.2/D1.2M.
   3. AWS D1.3/D1.3M.
   4. AWS D1.6/D1.6M.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00, "Quality Requirements," to design gratings.

B. Structural Performance: Gratings to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
   1. Walkways and Elevated Platforms Other Than Exits: Uniform load of 60 lbf/sq. ft..
   2. Limit deflection to L/360 or 1/4 inch, whichever is less.

C. Seismic Performance: Gratings to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

D. Component Importance Factor: 1.0.

2.2 METAL BAR GRATINGS

A. Metal Bar Grating Standards: Comply with NAAMM MBG 531.
   1. Welded Steel Grating:
   2. Bearing Bar Spacing: 1-3/16 inches o.c.
   3. Bearing Bar Depth: 1.5 inches.
   4. Bearing Bar Thickness: 3/16 inch.
   5. Crossbar Spacing: 4 inches o.c.
   6. Traffic Surface: Plain.
   7. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. of coated surface.

2.3 GRATING FRAMES AND SUPPORTS

A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.

B. Unless otherwise indicated, fabricate from same basic metal as gratings.

C. Equip units indicated to be cast into concrete or built into masonry with integrally welded anchors. Unless otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.

D. Galvanize steel frames and supports.

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners. Select fasteners for type, grade, and class required.

B. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, nuts, and, where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts, Alloy Group 1.

C. Post-Installed Anchors: chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load

imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

D. Material: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.6 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Bars for Bar Gratings: ASTM A36/A36M or steel strip, ASTM A1011/A1011M or ASTM A1018/A1018M.

C. Wire Rod for Bar Grating Crossbars: ASTM A510/A510M.

D. Uncoated Steel Sheet: ASTM A1011/A1011M, structural steel, Grade 30.

E. Galvanized-Steel Sheet: ASTM A653/A653M, structural quality, Grade 33, with G90 coating.

F. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A240/A240M, Type 304.

G. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.

2.7 FABRICATION

A. Shop Assembly: Fabricate grating sections in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Welding: Comply with AWS recommendations and the following:

F. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

G. Obtain fusion without undercut or overlap.

H. Remove welding flux immediately.

I. Provide for anchorage of type indicated, coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.

J. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.

K. Fabricate toeplates for attaching in the field.

L. Toeplate Height: 4 inches unless otherwise indicated.

M. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.

N. Provide no fewer than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.

O. Provide no fewer than four saddle clips for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced 15/16 inch or more o.c., with each clip designed and fabricated to fit over two bearing bars.

P. Provide no fewer than four weld lugs for each grating section containing rectangular bearing bars 3/16 inch or less in thickness and spaced less than 15/16 inch o.c., with each lug shop welded to three or more bearing bars. Interrupt intermediate bearing bars as necessary for fasteners securing grating to supports.

Q. Provide no fewer than four flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-shaped bearing bars.

R. Furnish threaded bolts with nuts and washers for securing grating to supports.

S. Furnish self-drilling fasteners with washers for securing grating to supports.

T. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.

U. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

V. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.

W. Do not notch bearing bars at supports to maintain elevation.

2.8 STEEL FINISHES

A. Finish gratings, frames, and supports after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

C. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

D. Fit exposed connections accurately together to form hairline joints.

E. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

F. Attach toeplates to gratings by welding at locations indicated.

G. Field Welding: Comply with AWS recommendations and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

H. Corrosion Protection: With a heavy coat of bituminous paint, coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals.

3.2 INSTALLATION OF METAL BAR GRATINGS

A. Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 REPAIR

A. Repair of Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood products.
   2. Wood-preservative-treated lumber.
   3. Dimension lumber framing.
   4. Miscellaneous lumber.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. Lumber grading agencies, and abbreviations used to reference them, include the following:
   1. NeLMA: Northeastern Lumber Manufacturers' Association.

   2. NLGA: National Lumber Grades Authority.

   3. SPIB: The Southern Pine Inspection Bureau.

   4. WCLIB: West Coast Lumber Inspection Bureau.

   5. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:
   1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
   2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 PRODUCTS

2.1 WOOD PRODUCTS

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

B. Factory mark each piece of lumber with grade stamp of grading agency.

C. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.

D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.

E. Dress lumber, S4S, unless otherwise indicated.

F. Maximum Moisture Content:
   1. Boards: 15 percent.
   2. Dimension Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1, use categories as follows:
   1. UC2: Interior construction not in contact with ground but may be subject to moisture. Include the following items:
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood floor plates that are installed over concrete slabs-on-grade.

B. UC3B (Commodity Specification A): Uncoated sawn products in exterior construction not in contact with ground, exposed to all weather cycles including intermittent wetting but with sufficient air circulation for wood to dry. Excludes sawn products not in contact with ground but with ground contact-type hazards. Include the following items:
    1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

    2. Wood decking, railings, and joists and beams for decks that are not critical to the performance and safety of the entire system/construction and that are in locations easily accessible for maintenance, repair, or replacement.

C. UC4A (Commodity Specification A): Non-critical sawn products in contact with ground and exposed to all weather cycles including continuous or prolonged wetting, and sawn products not in contact with ground but with ground contact-type hazards or that are critical or hard to replace. Include the following items:
    1. Wood framing members that are less than 6 inches above the ground.

    2. Joists and beams when they are difficult to maintain, repair, or replace and are critical to the performance and safety of the entire system/construction.

D. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
    1. For exposed items indicated to receive a stained or natural finish, chemical formulations are not to require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

E. After treatment, redry lumber to 19 percent maximum moisture content.

F. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

G. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
    1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

H. Application: Treat items indicated on Drawings, and the following:
    1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

    2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

    3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

    4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.

5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Railing: No. 2 grade.
   1. Application: Wood railing system.

   2. Species:
      a. Southern pine or mixed southern pine; SPIB.
      b. Spruce-pine-fir; NLGA.

2.4 FASTENERS

A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.

B. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

C. For redwood, use stainless steel fasteners.

D. Nails, Brads, and Staples: ASTM F1667.

E. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

F. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC58 ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

2.5 METAL FRAMING ANCHORS

A. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch-minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.

B. Materials: Unless otherwise indicated, fabricate from the following materials:

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.
   1. Use for interior locations unless otherwise indicated.

D. Heavy-Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
   1. Use for wood-preservative-treated lumber and where indicated.

E. Stainless steel bars and shapes complying with ASTM A276/A276M, Type 304.
   1. Use for exterior locations and where indicated.

PART 3 EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

F. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

I. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

J. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.

3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.

K. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere

with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

L. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

M. Use inorganic boron for items that are continuously protected from liquid water.

N. Use copper naphthenate for items not continuously protected from liquid water.

O. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

P. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
    1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).

    2. ICC-ES evaluation report for fastener.

Q. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

END OF SECTION

SECTION 06 15 33
WOODEN STAIRS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood decking.
   2. Wood stair treads.
   3. Wood railings.

1.2 DEFINITIONS

A. Boards: Lumber of less than 2 inches nominal (38 mm actual) in thickness and 2 inches nominal (38 mm actual) or greater in width.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) or greater but less than 5 inches nominal (114 mm actual) in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   1. NeLMA: Northeastern Lumber Manufacturers' Association.
   2. NLGA: National Lumber Grades Authority.
   3. SPIB: The Southern Pine Inspection Bureau.
   4. WCLIB: West Coast Lumber Inspection Bureau.
   5. WWPA: Western Wood Products Association.

1.3 SUBMITTALS

A. Product data: For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

B. Material Certificates:
   1. For lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by ALSC's Board of Review.

   2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. (For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.)

C. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.

D. Foundation Installation Technique – Describe the foundation installation procedures to be used to meet the requirements presented on the drawings. Submission should include equipment, materials and procedures that will be used to maintain stability of the foundation installation as well as the dam’s right embankment.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Handle and store plastic lumber to comply with manufacturer's written instructions.

PART 2 PRODUCTS

2.1 LUMBER, GENERAL

A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
    1. Factory mark each item with grade stamp of grading agency.

B. Maximum Moisture Content:
    1. Boards: 15 percent.
    2. Dimension Lumber: 15 percent.

2.2 WOOD DECKING

A. Dimension Lumber Decking:
    1. No. 2 grade of any of the following species:
        a. Southern pine or mixed southern pine; SPIB.
        b. Spruce-pine-fir; NLGA.

2.3 WOOD STAIR TREADS

A. Radius-Edged Board Stair Treads: 3/4-inch actual thickness of any of the following species and grades:
    1. Southern pine, Standard; SPIB.

B. Half-Round or Rounded-Edged Nosing Board Stair Treads: 3/4-inch actual thickness of any of the following species and grades:
    1. Southern pine, B & B stepping; SPIB.

2.4 WOOD RAILINGS

A. Dimension Lumber Railing Members:
    A. No. 2 grade and any of the following species:
        a. Mixed southern pine; SPIB.
        b. Spruce-pine-fir or spruce-pine-fir (South); NLGA.

B. Railing Boards: Any of the following species and grades:
    1. Southern pine, B & B finish; SPIB.

C. Radius-Edged Railing Boards: S4S boards, same grade as decking.

2.5 DIMENSION LUMBER FRAMING

A. Deck and Stair Framing:
    1. Any species and grade with a modulus of elasticity of at least 1,300,000 psi and an extreme fiber stress in bending of at least 1000 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.

2.6 POSTS

A. Dimension Lumber Posts: No. 2 grade and any of the following species:
    1. Mixed southern pine; SPIB.
    2. Spruce-pine-fir or spruce-pine-fir (South); NLGA.

2.7 PRESERVATIVE-TREATED LUMBER

A. Pressure-treat boards and dimension lumber with waterborne preservative in accordance with AWPA U1; Use Category UC3b for exterior construction not in contact with the ground and Use Category UC4a for items in contact with the ground.

B. Pressure treat timber with waterborne preservative in accordance with AWPA U1; Use Category UC4a.

C. Pressure-treat poles with waterborne preservative in accordance with AWPA U1; Use Category UC4a.

D. Preservative Chemicals: Acceptable to authorities having jurisdiction.

E. Do not use chemicals containing arsenic or chromium.

F. Use processes (for boards and dimension lumber) that include water-repellent treatment.

G. Revise options in first paragraph below to eliminate items for which treated kiln-dried wood is not required.

H. After treatment, redry boards and dimension lumber to 19 percent maximum moisture content.

I. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.

J. Application: Treat all wood unless otherwise indicated.

2.8 FASTENERS

A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
    1. Use stainless steel unless otherwise indicated.
    2. For pressure-preservative-treated wood, use stainless steel fasteners.
    3. For wood decking, use stainless steel fasteners.

B. Nails: ASTM F1667.
C. Power-Driven Fasteners: ICC-ES AC70.

D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.

E. Carbon-Steel Bolts: ASTM A307 (ASTM F568M) with ASTM A563 (ASTM A563M) hex nuts and, where indicated, flat washers all hot-dip zinc coated.

F. Stainless Steel Bolts: ASTM F593, Alloy Group 1 or 2 (ASTM F738M, Grade A1 or Grade A4); with ASTM F594, Alloy Group 1 or 2 (ASTM F836M, Grade A1 or Grade A4) hex nuts and, where indicated, flat washers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime wood, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 099000 "Painting."

C. Stain wood, including both faces and edges. Cut to required lengths and stain ends. Comply with requirements in Section 099300 "Staining and Transparent Finishing."

3.3 INSTALLATION, GENERAL

A. Construct concrete foundations. During construction of concrete footings, contractor must protect open holes against caving and possible artesian flows. Protective measures may include, but are not limited to, temporary/sacrificial casings, heavy drilling fluid, and tremie placement of concrete. Other requirements established in the Drilling Program Plan may also apply.

B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.

C. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.

D. Install wood decking (and stair treads) with crown up (bark side down).

E. Install plastic lumber to comply with manufacturer's written instructions.

F. Secure decking to framing with screws.

G. Install metal framing anchors to comply with manufacturer's written instructions.

H. Do not splice structural members between supports unless otherwise indicated.

I. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Apply copper naphthenate field treatment to comply with AWPA M4, to cut surfaces of preservative-treated lumber.

L. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
    1. ICC-ES AC70 for power-driven fasteners.
    2. "Fastening Schedule" in ICC's International Building Code.

3.4 INSTALLATION OF STAIRS

A. Provide stair framing members of size, space, and configuration indicated on the drawings.

B. Stringer Spacing: At least three stringers for each 36-inch clear width of stair.

C. Provide stair framing with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

D. Treads and Risers: Secure by gluing and screwing to carriages. Countersink fastener heads, fill flush, and sand filler. Extend treads over carriages.

3.5 INSTALLATION OF RAILINGS

A. Balusters: Fit to railings, screw in place. Countersink fastener heads, fill flush, and sand filler.

B. Newel Posts: Secure to stringers and risers with lag screws.

C. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts.

END OF SECTION

DIVISION 09 – FINISHES

SECTION 09 90 00
PAINTING

PART 1 GENERAL

1.1 DESCRIPTION

A. It is the intent of this Section that all painting necessary to result in a complete, finished appearing facility be accomplished. As the work of this Section, prepare surfaces that are to be painted and furnish and apply paint materials. Paint schedules follow the text of this Section and define the surface preparation and coating systems required to paint the various types of surfaces that are to be painted. The Paint Application Table below identifies the areas to receive the paint systems specified in the paint schedules. For items or areas not listed in the Paint Application Table, consult the Engineer for the proper system to be used. Exclusion from the Paint Application table does not necessarily mean that an item or area does not require painting.

B. Acceptable manufacturers: Carboline or Tnemec. No substitutions.

C. Paint Applications

Schedule M2: Exterior Metal

Paint all non-submerged metal provided or refurbished for the project including, but not limited to, new metal railings and base plates, piezometer boxes, and field cuts on existing metals.

D. Prime and finish painting, regardless of the location in which the work is performed, shall conform to all requirements of this Section. Coordinate painting with the fabrication of components and with the work of other trades so as to ensure the full and correct application of paint materials.

E. Stainless steel and brass shall not be painted.

1.2 DEFINITIONS

A. For the purposes of this Section, the following definitions apply: "Exposed to View" means all surfaces in the final work that could be seen from any vantage point from any height with the gate dewatered.

B. "Paint" means all pretreatment, prime, intermediate, and final coatings specified herein including clear, translucent, and opaque materials.

1.3 QUALITY ASSURANCE

A. Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces. In the acceptance or rejection of installed painting, no allowance will be made for lack of skill on the part of painters.

B. Apply paints following the recommendations in the "Applications Manual for Paint and Protective Coatings" published by McGraw-Hill.

C. Provide manufacturer warranty for equipment, materials and products specified in this section against defective materials and workmanship. Provide warranty against defects for one year from the date of Substantial Completion and/or as described in the Contract Documents.

1.4 INDEPENDENT INSPECTION

A. The Contractor shall hire an independent, National Association of Corrosion Engineers (NACE) certified, CIP Level 2 paint inspector for the project. Nelson Tank Engineering and Consulting and Dixon Engineering are pre-approved. In-house paint inspector, even if certified, will not be acceptable for this role. Inspector's scope shall include checking the following:

1. Before placing coatings, check: surface preparation for conformance with the Specification; conditions including ambient and surface temperatures, humidity, dew point and other factors that might affect coatings; coating products; blast material and equipment; containment strategy; etc.

2. After coating placement, check dry film thickness (DFT) of all coatings and total DFT, as per SSPC-PA2

3. Upon full cure of final coat for submerged surfaces, perform holiday inspection by voltage spark detection in accordance with NACE SP0188. Areas not passing the spark detection shall be properly repaired then re-tested until passing.

4. Coating surface. Flaws such as holidays, runs, etc., shall be flagged for correction and re-inspected after correction.

5. Findings shall be indicated immediately to the Contractor by verbal or other communication.

B. Inspector shall produce a report for each field visit, indicating findings as noted above and including a list of correction items and status of each item. Reports shall include photographs and other attachments as required. A separate report shall be produced for each day of inspection. A copy of all reports shall be submitted regularly to Contractor and Engineer, at least on a weekly basis.

1.5 SUBMITTALS

A. Prior to ordering and delivering paint materials to the project site, submit the following:

1. Manufacturer literature demonstrating compliance with these Specifications and indicating paint formulation, rate of coverage, recommended uses and recommended application method.

2. Physical color chips or cards for the full range of colors available in each product.

3. Schedule of products and paint systems to be used including the following information:
    a. Surfaces for system to be applied.
    b. Surface preparation method and degree of cleanliness.
    c. Product manufacturer, name, and number.
    d. Method of application.
    e. Dry film thickness per coat of coating to be applied.

1.6 PRODUCT HANDLING

A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store only the approved materials at the job site. Store them in a suitable and designated area restricted to the storage of paint materials and related equipment. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste. Store volatile solvents, rags, and cleaning materials in a well-ventilated area.

B. Use all means necessary to protect paint materials before, during, and after application and to protect the installed work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 PAINT MATERIALS

A. Provide paint materials in accordance with the paint schedules that follow the text of this Section.

B. All paint materials for each paint system shall be the products of a single manufacturer. All paint materials and equipment shall be compatible in use: finish coats shall be compatible with prime coats; prime coats shall be compatible with the surface to be coated; and all tools and equipment shall be compatible with the coating to be applied. Thinners, when used, shall be only those thinners specifically recommended for that purpose by the manufacturer of the material to be thinned.

C. Furnish finish paint in the colors selected by the Owner from the manufacturer's standard available colors (a minimum of 12 colors must be available for each finish paint requiring color choice).

PART 3 EXECUTION

3.1 GENERAL

A. At no time during the work shall open containers of paint, thinners, solvent or cleaners be placed directly over the waterway. Any paint, thinner, solvents or cleaner spilled within the dewatered work area shall be cleaned up immediately. In the event of any discharge of any fuel, chemical, lubricant, paint thinner, solvent, or cleaner into the Huron River, the Owner shall be notified immediately.

B. Prior to beginning the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this application may properly commence. Verify that paint finishes may be applied in strict accordance with all pertinent codes and regulations and the requirements of these Specifications. In the event of discrepancy, immediately notify the Engineer. Do not proceed with application in areas of discrepancy until all such discrepancies have been fully resolved. Application of paint materials shall be deemed to indicate acceptability of the existing surface conditions.

C. Paint inspection shall be in accordance with Section 01810, Testing and Materials Inspection.

D. The Contractor shall seek technical assistance and guidance for surface preparation and application of coating systems from the manufacturer's technical representative as needed. The manufacturer shall have qualified personnel available to consult and make field visits as appropriate.

3.2 REMEDIATION AND CONTAINMENT

A. It is anticipated that the existing gates and related equipment to be painted have lead-based paint on them. The Contractor shall follow the requirements of Section 01370, Lead-Based Paint Remediation.

B. Results of existing lead testing are included in the Appendix of this Specification.

C. As needed during construction, the City will collect additional paint samples and have them tested for lead. Either the City or the Contractor may call for additional testing. The Contractor shall provide at least one week notice in advance of needing additional lead testing.

D. The City's responsibility will be limited to pulling and testing samples from *existing coatings before removal*. The City will not be responsible for environmental/industrial hygiene testing or other health and safety requirements as per Section 01370 of these Specifications.

E. Containment shall include negative ventilation with air filtering/treatment to remediate blast media, dust, and coatings inside the enclosure and prevent them from exiting the enclosure.

F. All abrasive blasting and spray application of coatings require full containment of work areas.

G. Surface preparation and painting done in the field shall be fully contained. Only minor touchups that may be identified after containment is removed may be done without containment, provided that steps are taken to prevent fallout from exiting the work area or entering the water.

H. For all operations, the Contractor shall be required to prevent fallout from coatings or blast media from being dispersed beyond the immediate work area or damaging public or private property.

3.3 SURFACE PREPARATION

A. Prior to beginning surface preparation and painting operations, completely mask, remove, or otherwise adequately protect all hardware, accessories, machined surfaces, plates, lighting fixtures, and all work of other trades that are not to receive the paint coating. Before applying paint, thoroughly clean and prepare all surfaces according to the specified surface preparation method. Schedule all cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Prepare metal surfaces for painting by following the method indicated on the appropriate paint schedule. Preparation methods are referenced to the Steel Structures Painting Council (SSPC) Specifications. Do not prepare metal for painting when the relative humidity is higher than 85% or the metal is less than 5°F above the dew point. After surface preparation, thoroughly clean all surfaces of any remaining dirt, oil and grease and leave it ready to receive prime paint.

C. Except for field touch-ups that may be identified after containment is removed, surface preparation shall be by abrasive blasting, using an appropriate medium per industry standards and environmental requirements. Field touch-ups may be accomplished by mechanical means (e.g., using Bristle-Blaster) that meets the same profile and cleanness standard.

3.4 PAINT APPLICATION

A. Apply paint in accordance with paint schedule requirements, the cited reference, all codes and regulations, and the recommendations of the paint manufacturer. Apply prime paint to metal surfaces within 24-hrs. after surface preparation. Do not apply paint in areas where dust is being generated.

B. Do not apply paint when the surrounding air temperature as measured in the shade is below 40°F or when the temperature of the surface to be painted is below 35°F. Do not apply paint when it is expected that the relative humidity will exceed 85% or that the air temperature will drop below 40°F within 18-hrs. after the application of paint. Dew or moisture condensation should be anticipated and if such conditions are prevalent, delay painting until certain that the surfaces can be kept above the dew point. Follow all additional environmental limitation requirements of the paint manufacturer.

C. Paint material mil thickness and numbers of coats that are indicated in the paint schedules are based on brush or roller application. Spray application of paint materials will be allowed in the field only for areas or surfaces that are very difficult to paint with brush or roller. Field spray application must be approved by the Engineer before its initiation. For areas that are spray painted, apply as many coats as necessary to achieve specified mil thickness.

D. Allow sufficient drying time between coats of paint. During adverse weather, extend length of drying time as recommended by the paint manufacturer.

E. Prior to applying each paint coating after the first, check mil thickness of previously applied coating(s). Correct for insufficient paint thickness by increasing the mil thickness of subsequent applications, if allowed by the paint manufacturer or by applying additional coatings to provide the specified paint thickness.

F. Spot sand between coatings to remove paint defects visible to the unaided eye from a distance of 5-feet.

3.5 CLEAN UP

A. During the progress of the work, do not allow the accumulation of empty containers or other excess items except in areas specifically set aside for that purpose.

B. Following completion of painting in each area, promptly remove all masking and temporary protection. After paint has dried, reinstall all items removed for painting. Upon completion of this portion of the work, visually inspect all surfaces and remove paint and traces of paint from surfaces not scheduled to be painted.

PAINT SCHEDULES FOLLOW

PAINT SCHEDULE M2

SERVICE: EXTERIOR METAL

Surface Preparation: **SSPC-SP10 Near White Metal – Abrasive Blast**

Paint Manufacturer	Application	Product Name	Product Type	No. Of Coats	Dry Mils/ Coat	Comments
Carboline	Primer	Carbozinc 621	Immersible Zinc	One	3 – 5	
Carboline	Intermediate	Carbogard 60	Polymamide Epoxy	One	4 - 6	Color shall contrast with Finish Coat color
Carboline	Stripe*	Carbothane 134	Polyurethane	One		
Carboline	Finish	Carbothane 134	Polyurethane	Two	2 – 3	
		TOTAL SYSTEM THICKNESS			**11 – 17***	
Tnemec	Primer	Series 90-97	Immersible Zinc	One	2.5-3.5	
Tnemec	Intermediate	Series 66HS	Polymamide Epoxy	One	4 - 6	Color shall contrast with Finish Coat color
Tnemec	Stripe*	Series 1074	Polyurethane	One		
Tnemec	Finish	Series 1074	Polyurethane	Two	2 – 3	
		TOTAL SYSTEM THICKNESS			**10.5-15.5***	

*Note: All edges and corners shall be stripe coated. Specified millage does not include stripe coating.

END OF SECTION

DIVISION 31 – EARTHWORK

SECTION 31 09 13
CONSTRUCTION INSTRUMENTATION AND MONITORING

PART 1 GENERAL

1.1 SUMMARY

A. The monitoring of all existing and new instruments at the project site will be in accordance with the Construction Dam Safety Surveillance and Monitoring Plan (CDSSMP) document which is included herewith as Attachment W. The CDSSMP provides details on monitoring responsibilities, frequencies and requirements associated with repair if required during the construction period.

B. The Work specified in this Section includes extending risers, covers, and instrumentation wiring and removing or decommissioning geotechnical instrumentation to measure and monitor groundwater levels as required under the Contract Documents.

C. Extend the height of the protective covers of the existing open standpipe piezometers and vibrating wire piezometers installed by others as shown on Sheet 45 of the Drawings. The height of the covers shall be 3’-0” (+/-1”) above the existing or proposed grade, whichever is higher in elevation.

D. The purpose of the geotechnical instrumentation program is to provide baseline data from monitoring wells, vibrating wire piezometers and ground monitoring points to monitor ground water levels and embankment stability throughout the construction period and beyond.

E. Locations of the existing instrumentation are shown on the Drawings.

F. All new and existing instruments are to be protected during all construction activities. The contractor will be responsible to replace or restore any existing or new instruments that are disturbed during the construction period. Instruments or monitoring points that are disturbed at any point during the project must be immediately replaced and re-baselined upon disturbance. Once the disturbance is noted, all work within 200 feet of the instrument or monitoring point will be suspended until the instrument is replaced or repaired and re-baselined.

1.2 REFERENCES

A. Reference Standards:

1. ASTM C778, Standard Specification for Standard Sand.

2. Construction Instrumentation and Monitoring Plan, Section 31 09 13.

3. Painting Section 09 90 00.

1.3 DEFINITIONS

A. Open Standpipe Piezometer (OSP): In soil deposits, consist of a slotted PVC well screen and a PVC riser pipe.

B. Vibrating Wire Piezometer (VWP): VWPs consist of single or multi-level pressure sensors capable of providing automatic, continuous measurement of groundwater levels with an electronic data logger.

C. Above Ground Cover: Metal riser that is used to cover the PVC riser pipe that extends above the ground surface a distance of at least 24-inches.

D. Flush Cover: Metal protector that is used to cover the PVC riser pipe with a lid installed flush to the ground surface.

E. All covers installed as part of the project will have lockable covers with keys provided to the City.

1.4 SUBMITTALS

A. Qualifications:

1. Submit proof that the Contractor has experience extending metal covers or similar work.

2. Personal Qualifications for Instrument Installation: Employ qualified technicians with a minimum of two (2) years of experience in the installation or decommissioning/abandonment of geotechnical instrumentation similar to that specified herein.

B. Shop Drawings: Submit the Shop Drawings showing locations of all instrumentation that will require extended wiring, PVC risers, or new above ground covers. Provide detailed procedures (text and exhibits) on how the existing instruments will be extended to accommodate the increased ground surface elevation within the footprint of the stabilization berm.

C. Instrumentation Installation Work Plan:

1. Schedule: Submit the proposed schedule for extending the existing covers and installing the instrumentation extensions (wiring and/or PVC risers) with reference to project construction activities.

2. Methods and equipment to be used for extending the existing covers.

D. Instrumentation Decommissioning Work Plan: Provide plans, anticipated schedule, sequence, and details for decommissioning piezometers, as applicable.

E. Product Data: Submit all applicable manufacturer's literature describing the geotechnical instrumentation, manufacturer’s recommendations and instruction for installation, post-installation acceptance testing, monitoring, operation, and maintenance procedures for the geotechnical instrumentation, that are specified in this Section and as shown on the Drawings, including readout units, sensors, cables, and probes as applicable. Provide manufacturer's brochures on each product and all related equipment and accessories as applicable.

1.5 QUALITY ASSURANCE

A. Each material required for extending the instrumentation height, including the cover, shall be the product of an acceptable manufacturer.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: All instrumentation materials, including readout units and cables, shall remain the property of the Owner following completion of the Work.

B. Extended Existing Above Ground Piezometer Covers:

1. Provide 2” nominal diameter Schedule 40 PVC riser pipe with a vented cap to attach to the existing 2” nominal PVC riser.

2. Provide 2” solvent joining coupler.

3. Coarse sand: Conform to ASTM C778.

4. Provide low-strength lean concrete for a 24”L x 24”W x 24”D concrete pad.

5. Provide protective cover: Global Drilling Supply #GDS PC 4x7 or approved equal. The cover must be lockable.

6. Reference Painting Section 09 90 00.

C. Extended Existing Flush Piezometer Covers:

1. Provide 2” nominal diameter Schedule 40 PVC riser pipe with a vented cap to attach to the existing 2” nominal PVC riser.

2. Provide 2” solvent joining coupler.

3. Coarse sand: Conform to ASTM C778.

4. Provide steel rebar pins.

5. Provide low-strength lean concrete for a 24”L x 24”W x18”D concrete collar and 24”L x 24”W x 24”D concrete pad.

6. Provide protective cover: Global Drilling Supply #GDS PC 4x7 or approved equal. The cover must be able to be bolted to the collar.

7. Reference Painting Section 09 90 00.

D. Extended Height Vibrating Wire Piezometers (VWPs):

1. Provide materials needed to extend the wiring of the existing VWP’s to the top of the proposed above ground cover height. Each VWP re-installation shall accommodate the same number of sensors as the existing installation. Protect each VWP sensor from damage during re-installation.

E. Identification Tags: Label all instrumentation with tags as shown on the Drawings, as applicable.

2.2 MIXES

A. Concrete mix shall be in accordance with MDOT Section 901. Concrete mix design shall be submitted to the Engineer for review and approval.

PART 3 EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. General requirements associated with instrumentation are presented in the Construction Dam Safety Surveillance and Monitoring Plan document included herewith as Attachment W.

2. The installation of ground monitoring points (GMPs) are planned for the dam crest. The frequency is anticipated to be every 100-feet but the exact spacing will be included in the CDSSMP upon approval by FERC.

3. Install VWP wiring extensions in accordance with each respective manufacturer's recommendations, as applicable, at the locations shown on the Drawings. Instruments shall be installed in accordance with the approved Instrument Installation Schedule as required in this Section.

4. Install PVC riser extensions for OSPs and VWPs in the method outlined in the approved Instrumentation Installation Work Plan.

5. Install extended/new above ground covers in the method outlined in the approved Instrumentation Installation Work Plan.

6. All instruments shall be clearly marked, labeled, and protected in the field to avoid being covered, obstructed, or otherwise damaged by construction operations or vandalized by the public. Protective covers shall be marked.

3.2 PROTECTION

A. Protect the instruments from damage. Replace or repair damaged instruments prior to continuing work, or as required by the Engineer at no additional cost to Owner.

3.3 MONITORING

A. The Owner will retain a third party to monitor the geotechnical instruments throughout the construction process as stated in the Construction Dam Safety Surveillance and Monitoring Plan (CDSSMP) (Attachment W).

B. Review and Alert Levels:

1. The Review and Alert Levels are noted in the Construction Dam Safety Surveillance and Monitoring Plan (CDSSMP) attached hereto and can be adjusted at the request of the Contractor, but subject to the written approval of the Engineer. The Contractor shall stop work and cooperate with the Engineer's investigation of the cause of the exceedance if, at any time, Review and Alert Levels are noted.

2. Regardless of the specified instrumentation and the measured quantities in reference to the established Review and Alert Levels, take immediate actions should observed ground or structural deformation of any kind occur in reaction to the related

construction activities, regardless of its magnitude, and be deemed to cause an unsafe condition by the Contractor or the Engineer.

END OF SECTION

SECTION 31 10 00
CLEARING AND GRUBBING

PART 1 GENERAL

1.1 GENERAL DESCRIPTION

A. Furnish all labor, materials, equipment, and incidentals required to perform all clearing, grubbing, scalping, tree and shrub removal, and vegetative and tree debris piles removal and disposal as specified.

1.2 REGULATORY REQUIREMENTS

A. Codes and Standards:

1. Observe state and local laws and code requirements for the hauling and disposing of trees, shrubs, stumps, roots, rubbish, debris, and other matter. Contractor is responsible for all permits and fees.

1.3 SPECIAL WARRANTY

A. Guarantee that Work performed under this Section will not permanently damage trees, shrubs, turf, or plants designated to remain, or other adjacent work or facilities.

B. Replace items damaged due to the Contractor's operations which appear within one year after completion of the project, at no expense to the City.

PART 2 PRODUCTS

(Not Used)

PART 3 EXECUTION

3.1 PREPARATION

A. Protection:

1. Protect streets, roads, adjacent property, and all other facilities and structures from damage caused by the Contractor's operations.

2. Return to original condition, satisfactory to the City, facilities damaged by the Contractor's operations.

3. Protect trees, shrubs, and grassed areas by using fences, barricades, wrapping, or other methods.

4. Do not stockpile material or equipment beneath trees.

5. Do not remove trees without prior approval from the Resident Project Representative unless shown or specified.

3.2 APPLICATION

A. Clearing and Grubbing:

1. Clearing and Grubbing

a. Tree removal for the project cannot be performed between April 15 and September 30 of any year.

b. Clear and scalp all areas where excavation or fill is to be made. Stripping of topsoil on the existing revetment in preparation for construction of the stabilization berm will be limited to strips that are no wider than 100 feet, as measured perpendicular to the axis of the dam. Concurrent working strips may not be located closer than 200 feet from each other (edge-to-edge). For each strip, the surface grade must be returned to its original elevation prior to the completion of work for each day. As such, the contractor must plan daily activities to meet this project requirement.

c. Scalping includes the removal of material such as brush, roots, sod, grass, residue of agricultural crops, sawdust, and decayed vegetable matter from the surface of the ground. Scalping is not intended to include topsoil.

2. No burning is allowed on job site.

3. Stumps in the embankment should be ground out and stump holes, and other holes from which obstructions are removed, shall be backfilled with suitable material and compacted in accordance with MDOT Section 202.

4. Control air pollution caused by dust and dirt and comply with governing regulations.

B. Topsoil Removal

1. Description of Topsoil:

a. Comply with MDOT Section 917.

2. Stripping Operation:

a. Remove heavy growths of grass from areas before stripping.

b. Strip topsoil to depth encountered, preventing intermingling with the underlying subsoil or other objectionable material.

c. Stripping shall be limited to 100-foot-wide strips at a time, and no more than one strip ahead of the current working area.

d. Following the stripping effort, the exposed subgrade shall be inspected by the site Engineer to identify any exposed unsuitable materials that will require removal and replacement. Excavations associated with the removal of unsuitable soils that are exposed will be limited to 250-feet squared in area at the initial ground surface. If the extent of unsuitable soils extend beyond this limit, then excavate and completely backfill the initial excavation before excavating adjacent soils.

e. Following topsoil stripping and removal and replacement of any unsuitable materials, the strip surface shall be restored to the original grade prior to the completion of work for the day.

3. Storage:

a. Stockpile topsoil in areas designated by the City.

b. Construction storage piles are to allow free drainage of surface water.

c. Stored topsoil in excess of quantities required for construction shall be removed from the site and disposed of in accordance with all local regulations regarding hauling and disposal that apply to this work.

d. Provide temporary siltation control barriers around all stockpiles.

3.3 FIELD QUALITY CONTROL

A. Restore any areas outside the work limit lines where disturbed by the Contractor's operations.

3.4 CLEANING

A. Final Disposal:

1. Remove and properly dispose of all trees, shrubs, stumps, roots, brush, masonry, rubbish, scrap, debris, pavement, curbs, fences, and any miscellaneous items as required to permit construction of the new Work.

END OF SECTION

SECTION 31 23 00
EXCAVATION, BACKFILL, AND COMPACTION

PART 1 GENERAL

1.1 GENERAL DESCRIPTION

A. Furnish all labor, materials, equipment, and incidentals required for excavation, backfill, and compaction as required to complete the work.

1.2 RELATED SECTIONS

A. Section 01 35 13 General Provisions

B. Section 31 10 00 Clearing and Grubbing

C. Section 31 23 19

1.3 SUBMITTALS

A. Submit source - locations and quality - laboratory tests of all fill materials to show compliance with materials specifications.

B. Submit Excavation and Disposal Plan for each excavation operation.

1.4 SITE CONDITIONS

A. Provide and maintain barricades, warning lights, warning signs, and other protection required by applicable laws for safety of persons and property.

B. Protect adjacent structures, utilities, and property during construction operations.

C. Protect excavations by shoring, bracing, or other methods required to prevent soil movement.

D. Engineered fill materials shall only be placed on exposed subgrade soils that have been approved by the Engineer. If any unsuitable soils containing organic matter or that exhibit instability are noted, notify Engineer immediately such that remedial measures can be taken to stabilize the exposed subgrade in preparation for placement of engineered fill.

E. Provide and maintain frost protection. Placement of fills on frozen subgrade or placement of frozen fill material will not be allowed.

F. If any excavation encounters groundwater, immediately stop, backfill the excavation and install a temporary groundwater control system around the excavation perimeter such that groundwater inflows the resulting instability associated with excavation can be eliminated.

PART 2 PRODUCTS

2.1 MATERIALS

A. MDOT Class II Granular Material

Soils used for Class II Granular Fill shall consist of material conforming to MDOT Section 902.

B. MDOT 17A Coarse Aggregate

Soils used for 17A Coarse Aggregate shall consist of material conforming to MDOT Section 902.

C. MDOT 2NS Fine Aggregate

Soils used for Fine Aggregate shall consist of material conforming to MDOT Section 902.

D. MDOT 6A Coarse Aggregate

Soils used for 6A Coarse Aggregate shall consist of material conforming to MDOT Section 902.

E. MDOT 21AA Dense-Graded Aggregate

Soils used for 21AA Dense-Graded Aggregate shall consist of material conforming to MDOT Section 902.

F. MDOT 3x1 Coarse Aggregate

Soils used for 3x1 Coarse Aggregate shall consist of material conforming to MDOT Section 916.

G. MDOT 4G Open-Graded Aggregate

Soils used for 4G Open-Graded Aggregate shall consist of material conforming to MDOT Section 902.

PART 3 EXECUTION

3.1 EXCAVATION

A. All excavations shall maintain a stable slope in accordance with MIOSHA regulations; however, slopes shall be no steeper than 2.0H:1V unless otherwise shown on the plans.

Any excavations that show signs of instability at a slope of 2:1 shall be flattened so that a stable slope configuration is obtained.

B. All excess materials not suitable for reuse will become the property of the Contractor and shall be removed from the limits of the City's property and properly disposed of.

C. All local regulations regarding hauling and disposal apply to this work.

D. Periodically inspect excavations. If any signs of instability are found, promptly notify the Engineer and immediately begin remedial action. Actively retain and brace excavations.

E. Excavate to elevations or depths as shown on the plans.

F. Unless otherwise approved by the Engineer, all excavations must be backfilled before work is completed for any day.

G. See additional excavation requirements and constraints as noted in the Drawings.

3.2 COMPACTION

A. Backfill Material shall be placed in loose lift thickness layers not exceeding 8 inches unless approved by the Engineer. Each layer shall be compacted to 95% of the maximum dry density as determined by ASTM D-1557, Modified Proctor. At time of placement and compaction, the Backfill Material shall have a moisture content within a range extending from 2 percent below optimum moisture content to 2 percent above optimum moisture content as determined by ASTM D1557.

B. All embankments and fills shall be placed and compacted in accordance with MDOT SSC Section 205. Compaction of fill shall be accomplished using a static drum roller. Vibratory compaction is not permitted with the exception of limited and necessary applications, with small equipment (such as jumping jacks) and with prior written approval by the Engineer.

C. Topsoil shall be spread over all disturbed areas to a depth of 6 inches. No compaction of topsoil is required.

D. A compaction test shall be performed by the City or its representative for every 500 sq. yds. of fill placed but at least one compaction test will be performed on each lift, regardless of its size.

E. Fill and backfill materials that fail compaction or moisture content testing shall be reworked, scarified, and moisture adjusted as necessary to obtain required compaction and moisture content.

END OF SECTION

SECTION 31 23 19
DEWATERING

PART 1 GENERAL

1.1 GENERAL DESCRIPTION

A. At locations where proposed construction work is at a lower elevation than the elevation of Barton Pond, the Huron River, or ground water at the time of performing the work, suitable cofferdams (protection dikes, structural coffer boxes, or other such measures) and dewatering systems (including well points and properly designed localized sumps) shall be designed and constructed by the Contractor. The locations and designs of the cofferdams and the dewatering systems shall be the responsibility of the Contractor and presented in a plan submitted to the City for approval. For work elements requiring dewatering, including the reverse filter removal, backfilling the existing collector ditch and collector ditch pond, relocation of the existing collector ditch and where required for removal of any unsuitable soils, ground water shall be drawn down to 24 inches below the lowest level of excavation and maintained at that level for the duration of the construction effort required for each element.

B. The Contractor shall not perform excavations for any coffering or dewatering efforts outside of the limits indicated explicitly on the Contract Documents. Any coffering or dewatering efforts shall comply with all regulatory permit restrictions imposed on the project including the EGLE/USACE Joint Permit Application (JPA), or other applicable permits.

C. The Contractor designing, constructing, or operating cofferdams and dewatering systems shall have a minimum of 5 years of experience in performing the type of work on similar type projects. The Contractors' site superintendent/foreman shall have a minimum of 5 years of experience on similar type projects.

D. Soil boring logs and laboratory test results from soil borings performed at the site are available in ATTACHMENT P.

E. The Contractor shall submit Coffering and Dewatering Plans to the City at least 30 days prior to the start of construction for removal of the existing reverse filter, the cleanout and backfilling of the existing toe ditch pond, as well as abandonment and backfilling of the existing collector ditch. The plan shall be sealed by a professional engineer, registered in the State of Michigan. The plan submitted will require approval by the Engineer and must comply with the requirement of the FERC-approved Drilling Program Plan (DPP). The cofferdam and dewatering plans shall present, at a minimum, the following information:

   1. The locations of cofferdams, if any, and details concerning the cofferdams' materials and method of installation.

   2. Locations and details regarding the dewatering system including, but not limited to, well points, pumps, sumps, ditches, piping, electrical sources, and discharge points.

Sheet piling shall not be permitted as part of any coffering or temporary shoring system.

3. Critical dewatering areas include the reverse filter, the existing collector ditch pond, and the existing collector ditch. If dewatering efforts in these areas are interrupted, it may result in damage to the constructed work, or instability to the existing features of the dam. As such, redundant systems (such as power) should be incorporated into the dewatering plans.

4. The means for monitoring and testing of discharge water to ensure that piping or removal of embankment or foundation materials during dewatering operations is not occurring. If sediments are noted in the discharge at any time, the contractor shall take immediate action to eliminate the discharge of any soil fines.

5. Any Erosion and Sediment Control structures required in accordance with Section 01 57 13.

F. The Contractor shall verify that geotechnical instrumentation baseline readings were obtained prior to initiating the dewatering system.

G. The design, construction, and performance of the cofferdams are the sole responsibility of the Contractor. By designing the cofferdams and submitting the Dewatering Plans for the project, the Contractor has indicated that he has observed the sites, has reviewed the subsurface conditions, and has accounted for those conditions in the design and performance of the cofferdams and the dewatering systems. Any and all damages associated with the installation, performance, or removal of the cofferdams and dewatering systems are the responsibility of the Contractor and shall be repaired by the Contractor at no cost to the City.

H. Hours of operation for power-operated construction-type devices shall be limited to those listed in Section 01 35 13, General Provisions, as well as City of Ann Arbor regulations regarding operation of engines within the city limits. An exception to this restriction is allowed for the case where electrical service to operate a dewatering system becomes unavailable and backup power generating devices (e.g. diesel generators) are required.

I. During critical dewatering operations (if any) the Contractor shall maintain, on-site, backup power generating devices (e.g. diesel generators) as required to operate dewatering pumps in the event that electrical service becomes unavailable (e.g. during power outages). The Contractor shall also have in-place the means, methods, and procedures necessary to switch over to the backup power generating devices in a timely manner as required to prevent damage to the embankment in the event that the dewatering system should fail to operate.

J. Existing monitoring wells and piezometers shall not be used for dewatering purposes.

K. Submittals

1. Submit, for Engineer’s record, a copy of all discharge permits.

2. Submit dewatering plans of the proposed dewatering system, including sediment monitoring method, standby equipment and power supply, groundwater disposal plan, supervisor resume.

3. Submit a quality control/quality assurance plan for the dewatering plan.

PART 2 MATERIALS

A. Provide materials and equipment suitable to meet the design requirements.

PART 3 EXECUTION

(Not Used)

END OF SECTION

SECTION 31 23 23
FLOWABLE FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section includes operations necessary to complete backfilling operations with flowable fill materials indicated on the drawings and as specified herein.

1.2 RELATED REQUIREMENTS

A. Section 02 41 16: Removing/Abandoning Utilities and Structures
B. Section 03 30 00: Cast-In-Place Concrete
C. Section 31 23 00: Excavating, Filling, and Grading
D. Section 31 50 00: Temporary Earth Retention System
E. Section 31 66 16.53: Drilled Piers and Soldier Piles
F. Section 33 11 13 Water Main Services
G. Other sections of the specifications also apply to the extent required for proper performance of this work.

1.3 REFERENCE STANDARDS

A. ASTM (ASTM International
   1. ASTM C138 - Standard Test Method for Density (Unit Weight) Yield, and Air Content (Gravimetric) of Concrete
   2. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete
   3. ASTM C150 - Standard Specification for Portland Cement
   4. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
   5. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars
   6. ASTM D2216 - Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
   7. Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is indicated, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Contract is advertised for Bids shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth in the Specifications or shown on the Drawings will be waived because of any provision of or omission from said standards or requirements.

1.4 SUBMITTALS

A. Submit proposed flowable fill mix design to Engineer for approval.

PART 2 - MATERIALS

2.1 CEMENT

A. Use cement conforming to ASTM C150, Type I or ASTM C150 Type I with ground granulated blast furnace slag.

2.2 FLY ASH

A. Use Class F fly ash that meets the requirements of ASTM C-618 with no limits on the loss on ignition, fineness, or detailed requirements of the specification.

B. The Manufacturer will certify, in writing that the material supplied is non-contaminated in accordance with the current Environmental Protection Agency (EPA) requirements.

C. Do not use type C fly ash without the written authorization of the Engineer.

D. Do not use flowable fill material manufactured with Type C fly ash in any areas that will require excavation as a part of the project.

2.3 GROUND GRANULATED BLAST FURNACE SLAG

A. Use ground granulated blast furnace slag grade 100 or higher, ASTM C989, unless otherwise approved by the Engineer.

2.4 WATER

A. Use potable water or approved equivalent.

2.5 AGGREGATE MATERIAL

A. Use MDOT 2NS Fine Aggregate conforming to MDOT Section 902.

2.5 ADMIXTURE

A. DaraFill Control Low Strength Material Additive (CLSM), or an Engineer approved equivalent, may be used at the option of the Contractor in the preparation of a flowable fill mix design.

B. DaraFill CLSM Additive is manufactured by Grace Construction Products, Cambridge, MA.

2.6 MEASURING AND MIXING

A. Stabilized Fly Ash Mixture

1. Provide mixtures containing 5% of Portland cement based on the dry weight of the fly ash. Occasional batches of the mixture with a cement content of as low as 4% will be

allowed provided immediate action is taken to restore the cement content to the specified range.

2. Measure slump at the point of placement.

   a. The mixture used for general backfill in trenches, against structures etc., will have a slump ranging between 7 and 10 inches.

   b. The mixture used for backfill that is required to stand and not flow laterally, or that which is to be used in water will have a slump ranging between 4 and 6 inches.

3. Mix with temperatures below 50 degrees Fahrenheit, measured at the point of placement, will not be accepted.

B. Controlled Low Strength Mixture

1. Provide mixtures containing a maximum of 100 pounds of Portland cement per cubic yard or incorporate up to a maximum of 50% substitution of ground granulated blast furnace slag for cement.

2. Prepare the mixture design in accordance with the recommendations of the CLSM Additive's manufacturer.

C. Strength Requirement

1. The mixture generally will have a specified unconfined compressive cube strength of 40 psi minimum at 28 days of age and will not exceed a maximum of 75 psi at 365 days of age (excluding Class C Fly ash)

2. In the event that the laboratory strength does not conform to the required 28-day strength, the backfill material supplier must demonstrate that the required strength has been met. This may be done by the use of penetrometer, CBR laboratory test adapted to the field, or an appropriate plate load test.

PART 3 - EXECUTION

3.1 MEASURING OF MATERIALS

A. Submit the method used to measure fly ash and cement for acceptance if a cement stabilized fly ash mixture is used.

B. Base cement content on the dry weight of the fly ash in the mix or as specified for the CLSM mixture.

C. Correct the batched weight of fly ash, if used, for its moisture content and measured in such a way that compliments the type of batch plant being utilized, thus assuring that the percentage of cement based on the dry weight of fly ash is being satisfactorily controlled.

D. Measure water, although its control will be a function of consistency (slump and workability of the mix).

E. A standard unit weight can be determined by use of a standard bucket using ASTM C138 as a guide with the exception that the material not be rodded. When weights of materials are established, the unit weight bucket along with delivery weights can be used as a basis of payment.

3.2 BATCHING AND MIXING

A. The stabilized fly ash can be mixed by a pug mill, central concrete mixer, ready-mix truck, turbine mixer, or other acceptable equipment or method.

B. Central batch the CLSM and add the CLSM Additive at the site.

C. Record the actual batch weights, mixing time, and mix temperature for each slump test and set of test specimens made.

D. Foreign material may be acceptable providing it has no deleterious effect on the mixer, placing procedure, or mixture properties. Generally, occasional lumps of solid material limited to a maximum of 2 inches in diameter can be permitted.

3.3 PLACEMENT

A. Place the material by end or side dumping, chutes, conveyors, or other suitable method. Pumping, if used, must be demonstrated prior to using this method on the project site.

B. Lines and grades will be as shown on the design drawings.

C. Monitor structures for signs of uplift during the placement of the flowable fill material. If any movement is noted, immediately stop the placement of the flowable fill. Allow the flowable fill to sit for a minimum of 24-hours before resuming the placement of the flowable fill material.

D. Protect flowable fill mixtures from freezing temperatures for the initial 24 hours after placement. Protection may consist of earth cover, straw, or a sacrificial layer of the stabilized fly ash mix. Strength gain from the Portland cement will be slow with temperatures of 50 degrees Fahrenheit and lower.

E. The maximum allowable lift thickness is 36 inches.

3.4 TESTING AND INSPECTION

A. Use the moisture content as measured by ASTM D2216 in the mixing process to provide for the moisture correction required for control of production.

B. Perform slump tests in accordance with ASTM C143. Test as required to establish slump for a new application and as a control of continuing usage.

C. Prepare a set of four 3-inch by 6-inch cylinders of CLSM or stabilized fly ash. Provide moisture cure for cylinders.

END OF SECTION

SECTION 31 32 23
GROUTING

PART 1 GENERAL

1.1 SUMMARY

A. This section includes requirements for supplying and placing grout as shown on the Drawings and as specified to complete the Work:

1. Chemical Grouting
2. Low-Pressure Injection Cementitious Grouting

B. The types of grouts included in this section are:

1. Acrylamide Grout
2. Cementitious (Cement-Bentonite) Grout

C. Furnish all labor, materials, equipment, and incidentals needed to complete the Work.

D. Related Sections:

a. Section 01 35 13, General Provisions

b. Section 31 09 13, Construction Instrumentation and Monitoring

c. FERC approved Barton Dam Right Embankment Drilling Program Plan (DPP)

1.2 REFERENCES

A. Reference Standards:

1. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete3. ACI 301, Specification for Structural Concrete
2. API 13A, Drilling Fluids Materials
3. ASTM C94, Standard Specification for Ready-Mixed Concrete
4. ASTM C150, Standard Specification for Portland Cement
5. ASTM C827, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mix
6. ASTM C940, Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory
7. ASTM D6910, Standard Test Method for Marsh Funnel Viscosity of Clay Construction Slurries
8. FERC, Guidelines for Drilling in and Near Embankment Dams and Their Foundations

9. USACE EM 1110-1-3500, Chemical Grouting

10. USACE EM 1110-1-3506, Grouting Technology

11. MDOT, 2020 Standard Specifications for Construction

1.3 DEFINITIONS

A. Admixtures: Any material other than cement, aggregate or water that is used as part of a cement grout mixture.

B. Cementitious Grout: Mixture of cement and bentonite with or without sand, and water with the possible addition of fluidifiers or thixotropic additives, and/or set additives or other grout materials that have a long-term hydraulic conductivity on the order of $1x10^{-4}$.

C. Grouting: Low pressure injection of cementitious grout mixture under controlled pressure through grout pipes or holes placed at locations as required through a zone to fill voids within the embankment.

D. Effective Grouting Pressure: The mean injection pressure measured at the midpoint of a particular stage, while the grout is being pumped. Maximum grouting pressures shall be limited to 1-pound per square inch (psi) per foot of depth.

E. Pressure Gauges: Pressure gauges used shall be capable of reading to 1-psi.

F. Primary Holes: Primary holes are the first grout holes that are drilled in a planned pattern order to start the grouting process.

G. Refusal: The point at which grouting of any single grout hole or array of grout holes is considered complete.

H. Secondary Holes: Secondary holes are grout holes that are drilled and grouted following completion of the primary holes.

I. Water/Cement Ratio: The proportion by volume of cement grout mixture between the amounts of water and loose cement, plus any admixtures.

J. Toe Drain (TD): As numbered sequentially starting near the spillway and as labeled by existing posts and shown on the Drawings.

K. Tertiary Holes: Tertiary holes are grout holes that are drilled and grouted following completion of grouting in the secondary holes.

1.4 SUBMITTALS

A. Qualifications: Grouting will be a critical element of the project that must be conducted by only well experienced contractors. Preapproved grouting contractors are identified below. If the bidder wishes the owner to consider contractors not listed below, at a minimum, the qualifications noted below must be submitted to be considered for approval by the owner.

1. Contractor placing chemical grout must have a minimum of 5 years of experience using acrylamide grout in small-diameter pipe joints.

2. Contractor must have a minimum of 5 years of experience placing cementitious and / or chemical grout, including work on 2H:1V slopes.

3. The following contractors have been prequalified to conduct the grouting operation based on their past project experiences:

    a. Spartan Specialties, Ltd.

    b. DVM Utilities, Inc.

    c. Inland Waters Pollution Control Services, LLC

4. Grout mix design meeting the permeability requirements identified above.

B. Grout Hole Installation Plan

1. The Contractor shall prepare a grout hole installation plan that corresponds to the requirements of the approved Drilling Program Plan presented in Attachment T. Prior to installation, the plan must be approved by the Engineer as well as FERC.

C. Product Data: the following must be submitted to the Engineer for review and approval.

1. Copies of manufacturer's specifications and installation instructions for all proprietary materials.

2. Certification that materials meet specification requirements.

3. Proposed mix design for cementitious grout.

4. Documentation of the proposed cure time for chemical grout.

5. Copies of proposed design mix for cementitious (cement-bentonite) grout.

D. Quality Assurance/Control Submittals: the following must be submitted to the Engineer for review and approval.

1. Grouting Work Plan: At minimum, must include exhibits, material description and application details, and written procedures that will be used to install both the chemical and cementitious (cement-bentonite) grout.

2. Grouting Equipment List: Include manufacturer specifications for the equipment needed to install both the chemical and cementitious (cement-bentonite) grout, including mixing equipment, monitoring gauges, grout ports, and other proposed equipment. Submit pressure gauge calibrations.

3. Training: Submit documentation that the personnel handling the chemical grout have completed the manufacturer required training. Contractor must provide a similar training for the inspection staff monitoring the grout injection.

4. Quality Control Plan, including production control, quality control by laboratory testing per requirements specified herein, and in situ performance assessment to confirm column diameter, drilling tolerances, column strength, and in-situ permeability.

5. Safety Plan: Submit proposed safety plan including emergency coordination, etc.

6. Field Verification Reports:

   A. Cure time of chemical grout.

   B. Mix design of cementitious (cement-bentonite) grout used during installation.

   C. Grout take volume summary for chemical grout and cementitious grout (on daily basis).

   D. Injection pressure summary for cementitious grout installation.

   E. Locations of chemical and cementitious grout installation (exhibits and summary).

   F. Post-grouting inspection reports of TD-22, TD-23, TD-24, and TD-43.

1.5 DELIVERY, STORAGE AND HANDLING

A. Transport, store and handle all materials as prescribed by the manufacturers of the materials in original, unopened containers with the manufacturer's name, product labels, product identification, and as detailed on the accepted data sheets.

B. Protect materials from mechanical and environmental damage.

C. Store grout materials in a dry place and per suppliers' specification. Maintain materials in a clean and undamaged condition. Contractor to be responsible for replacing damaged or destroyed materials at no cost to Owner. Do not use materials beyond their expiration date.

D. Furnish cement either in sacks or in bulk. Use material in chronological order of delivery. If furnished in bulk, supply weighing devices to accurately measure dry cement weight.

E. Screen all cement to remove any and all lumps or foreign matter before introducing it to the mixer.

1.6 PROJECT/SITE CONDITIONS

A. Water Control: Contractor is solely responsible for the control of groundwater and groundwater inflows. Contractor shall comply with all erosion and sedimentation control requirements required either by the Contract Documents and/or by the regulatory agencies. Cleaning of pumps, hoses and other equipment shall be only at locations that comply with these requirements.

B. Prevent grout from entering, clogging, or affecting adjacent toe drains or any other underground utilities.

PART 2 PRODUCTS

2.1 MATERIALS

A. Acrylamide Grout:

1. Use grout, catalyst, accelerator, and tracer dye all from a single manufacturer.

2. Alternative chemical grouts must be approved by the Engineer.

B. Cementitious (Cement-Bentonite) Grout: Prepare design mixes of cement-bentonite grout that meets the requirements of ASTM C827. Mixes are subject to the following limitations:

1. Cement:

a. Portland cement, ASTM C150, Type 1L furnished in 94-lb, moisture-resistant bags.

b. Provide bulk cement with methods of measurement, handling, transporting, and storing that conform to the manufacturer's recommendations. Should cement be furnished in cloth or paper bags, package within plastic or rubber vapor barriers.

c. Grout Mix Properties: Proportioned to provide the required strength when mixed with soil as specified herein, and of mixing consistency as required to perform the work.

d. Do not use cement which has deteriorated because of improper storage or handling.

2. Bentonite:

a. Shall be a commercially processed, powdered montmorillonite clay conforming to API SPEC 13A.

b. Protect bentonite from moisture and contamination both in transit and during storage at the Site.

3. Mixing water shall be potable and meet the requirements of ASTM C94.

4. Fluidifiers: Do not use fluidifiers without written approval of the Engineer.

5. Admixtures: Do not use admixtures without written approval of the Engineer.

6. 2NS Sand must meet the requirements of MDOT SSC, Section 902 2NS fine aggregate.

7. Manchette Tube:

a. Must be PVC or metal pipe.

b. Flexible rubber sleeves must cover the grout ports, allowing the grout to flow out of the tube and restricting grout backflow into the tube.

2.2 MIXES

A. Proportioning and Design of Mixes: Mixes subject to the following limitations:

1. Cementitious (Cement-Bentonite) Grout

    a. Bentonite concentration cannot exceed 5 percent of the weight of the cement in the mix design.

    b. Bentonite must be hydrated for a minimum of 12 hours before mixing.

    c. The following table presents a sample mix design:

Component	Ratio	Weight (lbs)
Cement	1	94
Water	1.09	102.83
Bentonite	3.00%	2.820
Welan Gum	0.10%	0.094
Rheobuild 1000	1.59%	1.50

    d. The Contractor may use the sample mix design included in these specifications or provide a new mix design. The mix design provided by the Contractor must be developed by an Engineer licensed in the State of Michigan. This new mix design must also be submitted to the project Engineer for review and approval.

2. Use an independent testing company acceptable to the Engineer for preparing and reporting proposed mix designs.

3. Proportion mixes by either laboratory trial batch or field experience methods. Comply with ACI 211.1 and report to the Engineer the following data:

    a. Brand, type, and composition of cement

    b. Amounts of water used in trial mixes.

    c. Proportions of each material per cubic yard

    d. Gross weight and yield per cubic yard of trail mixtures

    e. Measured flow time using a Marsh cone. Flow time shall exceed 40 seconds.

    f. Bleed Test results per ASTM C940 using a 250 ml graduated cylinder. Fill the cylinder with grout to the 200 ml mark, and let the cylinder sit undisturbed for one hour before measuring the amount of bleed.

4. Submit written reports of proposed grout mix to the Engineer for review, at least 30 days prior to start of Work. Do not begin grout production until mixes have been reviewed and approved by the Engineer.

5. Admixtures: Do not use any fluidizers, accelerators, or admixtures without written approval of the Engineer.

PART 3 EXECUTION

3.1 GENERAL SEQUENCE

A. Chemical Grouting

1. Locate and mark the locations of TD-22, TD-23, and TD -24 as well as TD-42, TD-43, and TD-44.

2. Pre-construction CCTV Inspection of TD-22, TD-23, TD-24, TD-42, TD-43 as well as TD-42.

3. Install chemical grout based on the detailed procedures included in the approved Grouting Work Plan within TD-23 and TD-43.

4. Perform periodic CCTV inspections of TD-22 and TD-24 as well as TD-42 and TD-44 as directed by the Engineer.

5. Based on grout takes, the Engineer will identify the locations for low-pressure injection grouting of cementitious (cement-bentonite) grout.

B. Low-Pressure Injection Grouting

1. Layout and install primary and secondary grout holes. The need for tertiary grout holes will be field determined and approved by the Engineer. Drilling procedures must adhere to the guidelines included in FERC, “Guidelines for Drilling in and Near Embankment Dams and Their Foundations”.

2. Inject the cementitious (cement-bentonite) grout based on the detailed procedures included in the approved Grouting Work Plan. Maximum grouting pressures for cementitious grout shall be no more than 1-psi per foot of depth.

3. Perform periodic CCTV inspections of TD-22 through TD-24 and TD-42 through TD-44 as directed by the Engineer.

4. Perform post-grouting CCTV inspection of TD-22 through TD-24 and TD-42 through TD-44.

3.2 EXAMINATION

A. Site Verification of Conditions:

1. Examine the areas and conditions under which grout is to be installed.

2. Notify the Engineer of conditions detrimental to the proper and timely completion of the Work.

3. Do not proceed with the Work until unsatisfactory conditions have been remediated.

3.3 INSTALLATION

A. General:

1. Place grout as shown and per manufacturer's instructions. If manufacturer's instructions conflict with the Contract Documents, do not proceed until the Engineer provides clarification.

2. Dry packing will not be permitted.

B. Equipment:

1. Chemical Grouting: inflatable grout packer with integral scrapers or approved alternative.

2. Grout Mixer with pump and circulating line with adequate capacity to mix, stir, and pump required grout continuously, but not less than 60 cubic feet per hour.

3. Pressure Gauges: maximum specified grout pressure must fall in the middle third of the pressure gauge’s range. Contractor must always maintain a minimum of one calibrated and fully equipped pressure gauge as an operable spare. The spare gauge, if of new manufacture, calibrated by the factory, or recently calibrated by an independent agency, may be used as a standard for routine verification of the accuracy of the in-service gauge. Verify the accuracy of the in-service gauge at least once per 100 hours of operation. Pressure gauges shall have the ability to read pressures as low as 0.5 pounds per square inch (psi).

4. Drilling Equipment must adhere to requirements in FERC, “Guidelines for Drilling in and Near Embankment Dams and Their Foundations”.

3.4 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction:

1. Effective grouting pressures not to exceed 1 psi per foot depth below the downstream face of the embankment at the point of placement.

2. Chemical Grouting: Volume of grout injected per joint or crack not to exceed 60 gallons (8 cubic feet) without Engineer approval.

3. Low-Pressure Injection Grouting: Volume of grout injected into any set (isolated row) of grout ports is not exceed 15 cubic feet.

4. Engineer or a designated representative must be present during all grouting operations.

5. Field revisions to the grout mix must be approved by the Engineer.

6. The use of tertiary holes will be at the direction of the Engineer following completion of grouting efforts at the primary and secondary holes.

END OF SECTION

SECTION 31 34 00
GEOSYNTHETICS

PART 1 GENERAL

1.1 SUMMARY

This work consists of providing and installing geosynthetic products on a surface approved by the Engineer.

PART 2 MATERIALS

2.1 GENERAL

Material in accordance with the following MDOT sections:

Non-Woven Geotextile Separator …….	910
Non-Woven Stabilization Geotextile …….	910
Road Grade Biaxial Geogrid …….	910

PART 3 EXECUTION

3.1 GEOTEXTILE PLACEMENT

A. Place or install geotextile separator or stabilization geotextile products in accordance with the manufacturer’s installation guidelines and this subsection.

B. Do not operate equipment that is required to place backfill directly on geotextile products. Eliminate wrinkles or waves that develop during placement. Place the products in direct contact with the soil below before placing backfill on the geotextile products. Do not expose geotextile to ultraviolet degradation for more than 7 days.

C. Shingle-lap longitudinal and transverse joints at least 2 feet or seam the joints in accordance with the manufacturer’s recommendations. Ensure that field or factory seams meet the minimum grab tensile strength for the product application. Do not use nylon thread for geotextile seaming. Place seams facing upward for inspection purposes. Repair tears or damage to the geotextile in accordance with the manufacturer´s recommendations.

3.2 GEOGRID PLACEMENT

A. All areas immediately beneath the installation area for the geogrid must be properly prepared as shown on the plans, as specified, or as directed by the Engineer. Place or install the geogrid in accordance with the manufacturer's installation guidelines and this subsection.

B. To prevent undue exposure or damage to the geogrid, place only the amount of geogrid required for immediately pending work. Do not expose geogrid to ultraviolet degradation for more than 7 days.

C. The geogrid must be unrolled parallel to the centerline of the roadway.

D. Place the geogrid taut prior to placement of subsequent aggregate layer.

E. Anchor the geogrid in position after placement until placement of the subsequent aggregate layer. Overlap adjacent rolls of geogrid 2 feet minimum. Whenever possible, the placement of the subsequent aggregate layer must proceed from the centerline of the geogrid placed out to assist in tensioning the geogrid. Place at least 6 inches of the subsequent aggregate layer over the geogrid before allowing construction vehicles on the geogrid.

3.3 AGGREGATE OR GRANULAR MATERIAL PLACEMENT

A. Spread and shape the subsequent layer of aggregate or granular material after placing geosynthetic to create a stable work platform before compaction. Place additional aggregate or granular material, as required by applicable sections, and compact. Fill ruts with additional aggregate or granular material and compact before placing each subsequent layer.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.1 SUMMARY

Work to include concrete paving (replacing existing concrete paving) at the any portion(s) of the proposed Border-to-Border Trail (by others) that become damaged, as shown on the Drawings. This repair work shall be performed in accordance with the MDOT SSC, Section 602.

1.2 REFERENCE SPECIFICATION

MDOT SSC Section 602 “Concrete Pavement Construction”

PART 2 MATERIALS

2.1 GENERAL

Provide materials in accordance with MDOT SSC Section 602 for Concrete Grade 3500.

PART 3 EXECUTION

3.1 CONSTRUCTION

All concrete paving to be completed in accordance with MDOT SSC Section 602, “Concrete Paving”.

END OF SECTION

SECTION 32 32 16
PRECAST MODULAR BLOCK RETAINING WALL

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes furnishing all materials and labor required for the design and construction of a precast concrete modular block (PMB) retaining wall with or without geosynthetic reinforcement. Precast modular block retaining wall blocks under this section shall be cast utilizing a wet-cast concrete mix and exhibit a final handling weight in excess of 1,000 pounds (450 kg) per unit and may utilize concrete-reinforcing steel.

B. Scope of Work: The work shall consist of furnishing materials, labor, equipment, and supervision for the construction of a precast modular block (PMB) retaining wall structure in accordance with the requirements of this section and in acceptable conformity with the lines, grades, design and dimensions shown in the project site plans.

C. Drawings and General Provisions of the Contract, including General Conditions and Division 03, Division 31, Division 32 and Division 33 also apply to this Section.

1.2 REFERENCES

A. Where the specification and reference documents conflict, the City's designated representative will make the final determination of the applicable document.

B. Definitions:
   1. Precast Modular Block (PMB) Unit – machine-placed, "wet cast" concrete modular block retaining wall facing unit.

   2. Geotextile – a geosynthetic fabric manufactured for use as a separation and filtration medium between dissimilar soil materials.

   3. Geogrid – a geosynthetic material comprised of a regular network of tensile elements manufactured in a mesh-like configuration of consistent aperture openings. When connected to the PMB facing units and placed in horizontal layers in compacted fill, the geogrid prevents lateral deformation of the retaining wall face and provides effective tensile reinforcement to the contiguous reinforced fill material.

   4. Drainage Aggregate – clean, crushed stone placed within and immediately behind the precast modular block units to facilitate drainage and reduce compaction requirements immediately adjacent to and behind the precast modular block units.

5. Unit Core Fill – clean, crushed stone placed within the hollow vertical core of a precast modular block unit. Typically, the same material used for drainage aggregate as defined above.

6. Foundation Zone – soil zone immediately beneath the leveling pad and the reinforced zone.

7. Retained Zone – soil zone immediately behind the drainage aggregate and wall infill for wall sections designed as modular gravity structures. Alternatively, in the case of wall sections designed with geosynthetic soil reinforcement, the retained zone is the soil zone immediately behind the reinforced zone.

8. Reinforced Zone – structural fill zone within which successive horizontal layers of geogrid soil reinforcement have been placed to provide stability for the retaining wall face. The reinforced zone exists only for retaining wall sections that utilize geosynthetic soil reinforcement for stability.

9. Reinforced Fill – structural fill placed within the reinforced zone.

10. Leveling Pad – hard, flat surface upon which the bottom course of precast modular blocks is placed. The leveling pad may be constructed with crushed stone or other material or systems that are approved by the Engineer. A leveling pad is not a structural footing.

11. Wall Infill – the fill material placed and compacted between the drainage aggregate and the excavated soil face in retaining wall sections designed as modular gravity structures.

C. Reference Standards
   1. Design
      a. AASHTO LRFD Bridge Design Specifications, 7th Edition, 2014.
      b. Minimum Design Loads for Buildings and Other Structures – ASCE/SEI 7-10.
      c. International Building Code, 2018 Edition.
      d. FHWA-NHI-10-024 Volume I and GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes.
      e. FHWA-NHI-10-025 Volume II and GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes.
      f. National Concrete Masonry Association (NCMA) Design Manual for Segmental Retaining Walls (ASD), 3rd Edition

   2. Precast Modular Block Units
      a. ACI 201 – Guide to Durable Concrete
      b. ACI 318 – Building Code Requirements for Structural Concrete
      c. ASTM A615 – Steel Bars for Concrete Reinforcement
      d. ASTM A767 – Galvanized Steel Bars for Concrete Reinforcement
      e. ASTM A775 – Epoxy-Coated Steel Reinforcing Bars
      f. ASTM C33 – Standard Specification for Concrete Aggregates
      g. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
      h. ASTM C94 – Standard Specification for Ready-Mixed Concrete.

i. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
j. ASTM C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete.
k. ASTM C150 – Standard Specification for Portland Cement
l. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
m. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
n. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
o. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
p. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
q. ASTM C666 – Standard Test Method for Concrete Resistance to Rapid Freezing and Thawing.
r. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
s. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
t. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
u. ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.
v. ASTM C1157 - Standard Performance Specification for Hydraulic Cement.
w. ASTM C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
x. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
y. ASTM C1611 – Standard Test Method for Slump Flow of Self-Consolidating Concrete.
z. ASTM C1776 – Standard Specification for Wet-Cast Precast Modular Retaining Wall Units.
aa. ASTM D6638 – Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks).
bb. ASTM D6916 – Standard Test Method for Determining Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks).

3. Drainage Pipe
   a. ASTM D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   b. ASTM F2648 – Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preconstruction Meeting. As directed by the City, the Contractor shall schedule a preconstruction meeting at the project site prior to commencement of retaining wall construction. Participation in the preconstruction meeting shall be required of the Contractor, Retaining Wall Design Engineer (RWDE), Retaining Wall Installation Contractor (RWIC), Grading Contractor if different than the Contractor, and Engineer. The Contractor shall provide notification to all parties at least 10 calendar days prior to the meeting.

1. Preconstruction Meeting Agenda:
   a. The RWDE shall explain all aspects of the retaining wall construction drawings.
   b. The RWDE shall explain the required bearing capacity of soil below the retaining wall structure and the shear strength of in-situ soils assumed in the retaining wall design to the Engineer.

   c. The RWDE shall explain the required shear strength of fill soil in the reinforced, retained and foundation zones of the retaining wall to the Engineer.

   d. The RWDE shall explain any measures required for coordination of the installation of utilities or other obstructions in the reinforced or retained fill zones of the retaining wall.

   e. The RWIC shall explain all excavation needs, site access and material staging area requirements to the Contractor or Grading Contractor.

1.4 SUBMITTALS

A. Product Data. At least 14 days prior to construction, the Contractor shall submit the retaining wall product submittal package to the Engineer for review and approval. The submittal package shall include technical specifications and product data from the manufacturer for the following:

1. Precast Modular Block System brochure and proposed block color.

2. Precast Modular Block concrete test results specified in paragraph 2.01, subparagraph B of this section as follows:
   a. 28-day compressive strength
   b. Air content
   c. Slump or Slump Flow (as applicable)

3. Drainage Pipe

4. Geotextile

5. Geosynthetic Soil Reinforcement (if required by the retaining wall design). The Contractor shall provide certified manufacturer test reports for the geosynthetic soil reinforcement material in the manufactured roll width specified. The test report shall list the individual roll numbers for which the certified material properties are valid.

B. Installer Qualification Data. At least 14 days prior to construction, the Contractor shall submit the qualifications of the business entity responsible for installation of the retaining wall, the RWIC, per paragraph 1.07, subparagraph A of this section. The proposed installer shall have related project experience installing wall systems within and adjacent to rivers and streams.

C. Retaining Wall Design Calculations and Construction Shop Drawings. At least 14 days prior to construction, the Contractor shall furnish electronic versions construction shop drawings and the supporting structural calculations report to the City for review and approval. This submittal shall include the following:
   1. Signed, sealed, and dated drawings and engineering calculations prepared by a Professional Engineered registered in the State of Michigan, in accordance with these specifications.

   2. Qualifications Statement by the RWDE summarizing their Experience.

   3. Certificate of Insurance of the RWDE as specified in paragraph 1.06, subparagraph B of this section.

1.5 CONSTRUCTION SHOP DRAWING PREPARATION

A. The Retaining Wall Design Engineer (RWDE) shall coordinate the retaining wall construction shop drawing preparation with the Engineer. The Contractor shall furnish the RWDE the following project information required to prepare the construction shop drawings. This information shall include, but is not limited to, the following:

   1. Current versions of the site, grading, drainage, utility, erosion control, landscape, and irrigation plans,

   2. Electronic CAD file of the civil site plans listed in (1),

   3. Report of geotechnical investigation and all addenda and any supplemental reports,

   4. Recommendations of the Engineer regarding effective stress shear strength and total stress shear strength (when applicable) parameters for in-situ soils in the vicinity of the proposed retaining wall(s) and for any fill soil that may potentially be used as backfill in retained and/or foundation zones of the retaining wall.

B. The RWDE shall provide the Engineer with a certificate of professional liability insurance verifying the minimum coverage limits of $1 million per claim and $1 million aggregate.

C. Design of the precast modular block retaining wall shall satisfy the requirements of this section. Where local, state, or national design or building code requirements exceed these specifications, these requirements shall also be satisfied.

D. The RWDE shall note any exceptions to the requirements of this section by listing them at the bottom right corner of the first page of the construction shop drawings.

E. Approval or rejection of the exceptions taken by the RWDE will be made in writing as directed by the Engineer.

F. The RWDE shall determine the appropriate standard(s) to be utilized, and to which the precast modular block design shall be based upon, except as noted herein. Refer to Part 1.02, Paragraph C, Part 1.

G. In the event that a conflict is discovered between these specifications and a reasonable interpretation of the design specifications and methods referenced in paragraph F above, these specifications shall prevail. If a reasonable interpretation is not possible, the conflict shall be resolved per the requirements in paragraph 1.02, subparagraph A of this section.

H. Soil Shear Parameters. The RWDE shall prepare the construction shop drawings based upon soil shear strength parameters from the available project data and the recommendations of the Engineer. If insufficient data exists to develop the retaining wall design, the RWDE shall communicate the specific deficiency of the project information or data to the Engineer in writing.

I. Allowable bearing pressure requirements for each retaining wall shall be clearly shown on the construction drawings.

J. Global Stability. Overall (global) stability shall be evaluated in accordance with the principals of limit equilibrium analysis as set forth in FHWA-NHI-10-024 Volume I and FHWA-NHI-10-025 Volume II GEC 11 Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, or other methods, as determined by the RWDE, as referenced in Section 1.06, Part F. The minimum factors of safety shall be as follows:

Normal Service (Static)	1.3
Seismic	1.1
Rapid Drawdown (if applicable)	1.2

Note: RWDE to select appropriate FOS

K. Seismic Stability. Seismic loading shall be evaluated in accordance with AASHTO Load and Resistance Factor Design (LRFD) methodology, or NCMA (ASD) methodology as determined by the RWDE as referenced in Section 1.06, Part F.

1.6 QUALITY ASSURANCE

A. RWIC Qualifications. In order to demonstrate basic competence in the construction of precast modular block walls, the RWIC shall possess the following:
   1. Experience.
      a. Construction experience with a minimum of 3,000 square feet (280 square meters) of the proposed precast modular block retaining wall system.
      b. Construction of at least three (3) precast modular block (large block) retaining wall structures within the past three (3) years.
      c. Construction of at least 5,000 square feet (465 square meters) of precast modular block (large block) retaining walls within the past five (5) years.
      d. Experience with wall construction in and adjacent to streams and rivers.

   2. RWIC experience documentation for each qualifying project shall include:
      a. Project name and location.
      b. Date (month and year) of construction completion.
      c. Contact information of City or Contractor.
      d. Type (trade name) of precast modular block system used.
      e. Maximum height of the wall constructed.
      f. Face area of the wall constructed.

   3. In lieu of these specific requirements, the Contractor may submit alternate documentation demonstrating competency in Precast Modular Block retaining wall construction.

B. RWDE Qualifications and Statement of Experience. The RWDE shall submit a written statement affirming that he or she has the following minimum qualifications and experience.
   1. The RWDE shall be licensed to practice in the State of Michigan.

   2. The RWDE shall be independently capable of performing all internal and external stability analyses, including those for seismic loading, compound stability, rapid draw-down and deep-seated, global modes of failure.

   3. The RWDE shall affirm in writing that he or she has personally supervised the design of the retaining walls for the project, that the design considers all the requirements listed in paragraph 1.06 and that he or she accepts responsibility as the design Engineer of record for the retaining walls constructed on the project.

   4. The RWDE shall affirm in writing that he or she has designed a minimum of approximately 3,000 face square feet (280 face square meters) of modular block earth retaining walls within the previous five (5) years.

   5. In lieu of these specific requirements, the Engineer may submit alternate documentation demonstrating competency in Precast Modular Block retaining wall design.

C. The City reserves the right to reject the services of any Engineer, engineering firm, or Contractor who, in the sole opinion of the City, does not possess the requisite experience or qualifications.

1.7 QUALITY CONTROL

A. The City's Representative/Engineer shall review all submittals for materials, design, RWDE qualifications and the RWIC qualifications.

B. The Contractor shall retain the services of an Engineer who is experienced with the construction of precast modular block retaining wall structures to perform inspection and testing. The City or its representative shall inspect the placement of concrete at the plant, and placement of the blocks at the site. The cost of inspection shall be the responsibility of the Contractor. Inspection shall be continuous throughout the construction of the retaining walls.

C. The Engineer shall perform the following duties:
   1. Inspect the construction of the precast modular block structure for conformance with construction shop drawings and the requirements of this specification.

   2. Verify that soil or aggregate fill placed and compacted in the reinforced, retained and foundation zones of the retaining wall conforms with paragraphs 2.04 and 2.05 of this section and exhibits the shear strength parameters specified by the RWDE.

   3. Verify that the shear strength of the in-situ soil assumed by the RWDE is appropriate.

   4. Inspect and document soil compaction in accordance with these specifications:
      a. Required dry unit weight.
      b. Actual dry unit weight.
      c. Allowable moisture content.
      d. Actual moisture content.
      e. Pass/fail assessment.
      f. Test location – wall station number.
      g. Test elevation.
      h. Distance of test location behind the wall face.

   5. Verify that all excavated slopes in the vicinity of the retaining wall are bench-cut as required.

   6. Notify the RWIC of any deficiencies in the retaining wall construction and provide the RWIC a reasonable opportunity to correct the deficiency.

7. Notify the Contractor, City and RWDE of any construction deficiencies that have not been corrected in a timely manner.

8. Document all inspection results and provide reports to City, RWDE, and RWIC.

9. Test compacted density and moisture content of the retained backfill with the following frequency:
   a. At least once every 500 square feet (45 square meters) (in plan) per vertical lift, and
   b. At least once per every 18 inches (460 mm) of vertical wall construction.

D. The Contractor's engagement of the Engineer does not relieve the RWIC of responsibility to construct the proposed retaining wall in accordance with the approved construction shop drawings and these specifications.

E. The RWIC shall inspect the on-site grades and excavations prior to construction and notify the RWDE and Contractor if on-site conditions differ from the elevations, assumptions, and grading conditions depicted in the retaining wall construction shop drawings.

1.8 DELIVERY, STORAGE AND HANDLING

A. The RWIC shall inspect the materials upon delivery to ensure that the proper type, grade and color of materials have been delivered.

B. The RWIC shall store and handle all materials in accordance with the manufacturer's recommendations as specified herein and in a manner that prevents deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, UV exposure or other causes. Damaged materials shall not be incorporated into the work.

C. Geosynthetics
   1. All geosynthetic materials shall be handled in accordance with ASTM D4873. The materials should be stored off the ground and protected from precipitation, sunlight, dirt and physical damage.

D. Precast Modular Blocks
   1. Precast modular blocks shall be stored in an area with positive drainage away from the blocks. Be careful to protect the block from mud and excessive chipping and breakage. Precast modular blocks shall not be stacked more than three (3) units high in the storage area.

E. Drainage Aggregate and Backfill Stockpiles
   1. Drainage aggregate or backfill material shall not be piled over unstable slopes or areas of the project site with buried utilities.

2. Drainage aggregate and/or reinforced fill material shall not be staged where it may become mixed with or contaminated by poor draining fine-grained soils such as clay or silt.

PART 2 MATERIALS

2.1 PRECAST MODULAR BLOCK RETAINING WALL UNITS

A. All units shall be wet-cast precast modular retaining wall units conforming to ASTM C1776.

B. All units for the project shall be obtained from the same manufacturer. The manufacturer shall be licensed and authorized to produce the retaining wall units by the precast modular block system patent holder/licensor and shall document compliance with the published quality control standards of the proprietary precast modular block system licensor for the previous three (3) years or the total time the manufacturer has been licensed, whichever is less.

C. Concrete used in the production of the precast modular block units shall be first-purpose, fresh concrete. It shall not consist of returned, reconstituted, surplus or waste concrete. It shall be an original production mix meeting the requirements of ASTM C94 and exhibit the properties as shown in the following table:

Concrete Mix Properties

Freeze Thaw Exposure Class(1)	**Minimum 28-Day Compressive Strength(2)**	**Maximum Water Cement Ratio**	**Nominal Maximum Aggregate Size**	**Aggregate Class Designation(3)**	**Air Content(4)**
Severe	4,000 psi (27.6 MPa)	0.45	1 inch (25 mm)	3S	6.0% +/- 1.5%
Maximum Water-Soluble Chloride Ion (Cl^-) Content in Concrete, Percent by Weight of Cement(5,6)					0.15
Maximum Chloride as Cl^- Concentration in Mixing Water, Parts Per Million					1000
Maximum Percentage of Total Cementitious Materials By Weight (7,9) (Very Severe Exposure Class Only):					
Fly Ash or Other Pozzolans Conforming to ASTM C618					25
Slag Conforming to ASTM C989					50
Silica Fume Conforming to ASTM C1240					10
Total of Fly Ash or Other Pozzolans, Slag, and Silica Fume(8)					50
Total of Fly Ash or Other Pozzolans and Silica Fume(8)					35
Alkali-Aggregate Reactivity Mitigation per ACI 201					
Slump (Conventional Concrete) per ASTM C143(10)			5 inches +/- 1½ inches (125 mm +/- 40 mm)		
Slump Flow (Self-Consolidating Concrete) per ASTM C1611			18 inches – 32 inches (450 mm – 800 mm)		

(1) Exposure class is as described in ACI 318. “Moderate” describes concrete that is exposed to freezing and thawing cycles and occasional exposure to moisture. “Severe” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture. “Very Severe” describes concrete that is exposed to freezing and thawing cycles and in continuous contact with moisture and exposed to deicing chemicals. Exposure class should be specified by City/purchaser prior to order placement.

(2) Test method ASTM C39.

(3) Defined in ASTM C33 Table 3 *Limits for Deleterious Substances and Physical Property Requirements of Coarse Aggregates for Concrete*.

(4) Test method ASTM C231.

(5) Test method ASTM C1218 at age between 28 and 42 days.

(6) Where used in high sulfate environments or where alkali-silica reactivity is an issue, water soluble chloride shall be limited to no more than trace amounts (from impurities in concrete-making components, not intended constituents.)

(7) The total cementitious material also includes ASTM C150, C595, C845, C1157 cement. The maximum percentages shall include:

(a) Fly ash or other pozzolans in type IP, blended cement, ASTM C595, or ASTM C1157.

(b) Slag used in the manufacture of an IS blended cement, ASTM C595, or ASTM C1157.

(c) Silica fume, ASTM C1240, present in a blended cement.

(8) Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10 percent, respectively, of the total weight of the cementitious materials.

(9) Prescriptive limits shown may be waived for concrete mixes that demonstrate excellent freeze/thaw durability in a detailed and current testing program.

(10) Slump may be increased by a high-range water-reducing admixture.

(11) Alkali Silica Reaction (ASR) Testing shall be conducted using ASTM C1260 and ASTM C1567.

D. Concrete reinforcing steel, when required for the specified block, shall conform to ASTM A615 and have a minimum yield strength of 60,000 psi. When required by the City to be galvanized or epoxy-coated, reinforcing steel shall conform to ASTM A767 or ASTM A775, respectively, and have a minimum yield strength of 60,000 psi.

E. At least 4 inches of concrete cover shall be maintained against the water, and 2 or 3 inches against earth over all reinforcing steel bars.

F. Each concrete block shall be cast in a single continuous pour without cold joints. With the exception of half-block units, corner units and other special application units, the precast modular block units shall conform to the nominal dimensions listed in the table below and be produced to the dimensional tolerances shown.

Block Type	**Dimension**	**Nominal Value**	**Tolerance**

28” (710 mm) Block	Height	18” (457 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	28” (710 mm)	+/- 1/2” (13 mm)
41” (1030 mm) Block	Height	18” (457 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	40-1/2” (1030 mm)	+/- 1/2” (13 mm)
60” (1520 mm) Block	Height	18” (457 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	60” (1520 mm)	+/- 1/2” (13 mm)
52” (1320 mm) XL Block	Height	36” (914 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	60” (1520 mm)	+/- 1/2” (13 mm)
72” (1830 mm) XL Block	Height	36” (914 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	60” (1520 mm)	+/- 1/2” (13 mm)
96” (2440 mm) XL Block	Height	36” (914 mm)	+/- 3/16” (5 mm)
	Length	46-1/8” (1172 mm)	+/- 1/2” (13 mm)
	Width*	60” (1520 mm)	+/- 1/2” (13 mm)

* Block tolerance measurements shall exclude variable face texture

G. With the exception of half-block units, corner units and other special application units, the precast modular block units shall have two (2), circular dome shear knobs that are 10 inches (254 mm), 7.5 inches (190 mm), or 6.75 inches (171 mm) in diameter and 4 inches (102 mm) or 2 inches (51 mm) in height. The shear knobs shall fully index into a continuous semi-cylindrical shear channel in the bottom of the block course above. ThePeak interlock shear between any two (2) vertically stacked precast modular block units, with 10-inch (254 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 6,500 lb/ft (95 kN/m) at a minimum normal load of 500 lb/ft (7kN/m). as well as an ultimate peak interface shear capacity in excess of 11,000 lb/ft (160 kN/m). The peak interlock shear between any two (2) vertically stacked precast modular block units, with 7.5-inch (190 mm) or 6.75-inch (171 mm) diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 1,850 lb/ft (27 kN/m)

at a minimum normal load of 500 lb/ft (7kN/m) as well as an ultimate peak interface shear capacity in excess of 10,000 lb/ft (146 kN/m).Test specimen blocks tested under ASTM D6916 shall be actual, full-scale production blocks of known compressive strength. The interface shear capacity reported shall be corrected for a 4,000 psi (27.6 MPa) concrete compressive strength. Regardless of precast modular block configuration, interface shear testing shall be completed without the inclusion of unit core infill aggregate.

H. The 28-inch (710 mm) and 41-inch (1030 mm) precast modular block units may be cast with a continuous vertical core slot that will permit the insertion of a 12-inch (305 mm) inch wide strip of geogrid reinforcement to pass completely through the block. When installed in this manner, the geogrid reinforcement shall form a non-normal load dependent, positive connection between the block unit and the reinforcement strip. The use of steel for the purposes of creating the geogrid-to-block connection is not acceptable.

I. Without field cutting or special modification, the precast modular block units shall be capable of achieving a minimum radius of 14 ft - 6 in (4.42 m).

J. The precast modular block units shall be manufactured with an integrally cast shear knobs that establishes a standard horizontal set-back for subsequent block courses. The precast modular block system shall be available in the standard horizontal set-back facing batter options listed below:

18-inch High Blocks Horizontal Set-Back/Blk. Course	Max. Facing Batter	36-inch High Blocks Horizontal Set-Back/Blk. Course	Max. Facing Batter
3/8” (10 mm)	1.2˚	3-1/4” (83 mm)	5.2˚
1-5/8” (41 mm)	5.2˚		
9-3/8” (238 mm)	27.5˚		
16-5/8” (422 mm)	42.7˚		

The precast modular block units shall be furnished with the required shear knobs that provide the facing batter required in the construction shop drawings.

K. The precast modular block unit face texture shall be selected by the City from the available range of textures available from the precast modular block manufacturer. Each textured block facing unit shall be a minimum of 5.76 square feet (0.54 square meters) with a unique texture pattern that repeats with a maximum frequency of once in any 15 square feet (1.4 square meters) of wall face.

L. The block color shall be selected by the City from the available range of colors available from the precast modular block manufacturer.

M. All precast modular block units shall be sound and free of cracks or other defects that would interfere with the proper installation of the unit, impair the strength or performance of the constructed wall. PMB units to be used in exposed wall construction shall not exhibit chips or cracks in the exposed face or faces of the unit

that are not otherwise permitted. Chips smaller than 1.5” (38 mm) in its largest dimension and cracks not wider than 0.012” (0.3 mm) and not longer than 25% of the nominal height of the PMB unit shall be permitted. PMB units with bug holes in the exposed architectural face smaller than 0.75” (19 mm) in its largest dimension shall be permitted. Bug holes, water marks, and color variation on non-architectural faces are acceptable. PMB units that exhibit cracks that are continuous through any solid element of the PMB unit shall not be incorporated in the work regardless of the width or length of the crack.

N. Preapproved Manufacturers.
Manufacturers of Redi-Rock Retaining Wall Systems as licensed by Redi-Rock International, LLC, 05481 US 31 South, Charlevoix, MI 49720 USA; telephone (866) 222-8400; website www.redi-rock.com.

O. Substitutions. Technical information demonstrating conformance with the requirements of this specification for an alternative precast modular block retaining wall system must be submitted for preapproval at least 14 calendar days prior to the bid date. Acceptable alternative PMB retaining wall systems, otherwise found to be in conformance with this specification, shall be approved in writing by the City 7 days prior to the bid date. The City’s Representative reserves the right to provide no response to submissions made out of the time requirements of this section or to submissions of block retaining wall systems that are determined to be unacceptable to the City.

P. Value Engineering Alternatives. The City may evaluate and accept systems that meet the requirements of this specification after the bid date that provide a minimum cost savings of 20% to the City. Construction expediency will not be considered as a contributing portion of the cost savings total.

2.2 GEOGRID REINFORCEMENT

A. Geogrid reinforcement shall be a woven or knitted PVC coated geogrid manufactured from high-tenacity PET polyester fiber with an average molecular weight greater than 25,000 (M_n > 25,0000) and a carboxyl end group less than 30 (CEG < 30). The geogrid shall be furnished in prefabricated roll widths of certified tensile strength by the manufacturer. The prefabricated roll width of the geogrid shall be 12” (300 mm) +/- 1/2” (13 mm). No cutting of geogrid reinforcement down to the 12” (300 mm) roll width from a larger commercial roll width will be allowed under any circumstances.

B. The ultimate tensile strength (T_{ult}) of the geogrid reinforcement shall be measured in accordance with ASTM D6637.

C. Geogrid – Soil Friction Properties
1. Friction factor, F*, shall be equal to 2/3 Tan ϕ, where ϕ is the effective angle of internal friction of the reinforced fill soil.

2. Linear Scale Correction Factor, α, shall equal 0.8.

D. Long-Term Tensile Strength (T_{al}) of the geogrid reinforcement shall be calculated in accordance with Section 3.5.2 of FHWA-NHI-10-024 and as provided in this specification.
   1. The creep reduction factor (RF_{CR}) shall be determined in accordance with Appendix D of FHWA-NHI-10-025 for a minimum 75 year design life.

   2. Minimum installation damage reduction factor (RF_{ID}) shall be 1.25. The value of RF_{ID} shall be based upon documented full-scale tests in a soil that is comparable to the material proposed for use as reinforced backfill in accordance with ASTM D5818.

   3. Minimum durability reduction factor (RF_D) shall be 1.3 for a soil pH range of 3 to 9.

E. Connection between the PMB retaining wall unit and the geogrid reinforcement shall be determined from short-term testing per the requirements of FHWA NHI-10-025, Appendix B.4 for a minimum 75-year design life.

F. The minimum value of T_{al} for geogrid used in design of a reinforced precast modular block retaining wall shall be 2,000 lb/ft (29 kN/m) or greater.

G. The minimum length of geogrid reinforcement shall be the greater of the following:
   1. 0.7 times the wall design height, H.
   2. 6 feet (1.83 m).
   3. The length required by design to meet internal stability requirements, soil bearing pressure requirements and constructability requirements.

H. Constructability Requirements. Geogrid design embedment length shall be measured from the back of the precast modular block facing unit and shall be consistent for the entire height of a given retaining wall section.

I. Geogrid shall be positively connected to every precast modular block unit. Design coverage ratio, Rc, as calculated in accordance with AASHTO LRFD Bridge Design Specifications Figure 11.10.6.4.1-2 shall not exceed 0.50.

J. Preapproved Geogrid Reinforcement Products.
   1. Miragrid XT Geogrids as manufactured by TenCate Geosynthetics of Pendergrass, Georgia USA and distributed by Manufacturers of the Redi-Rock Retaining Wall System.

K. Substitutions. No substitutions of geogrid reinforcement products shall be allowed if the pre-approved modular block wall manufacturer is used.

2.3 GEOTEXTILE

A. Nonwoven geotextile fabric shall be placed as indicated on the retaining wall construction shop drawings. Additionally, the nonwoven geotextile fabric shall be placed in the v-shaped joint between adjacent block units on the same course. The nonwoven geotextile fabric shall meet the requirements Class 3 construction survivability in accordance with AASHTO M 288.

B. Preapproved Nonwoven Geotextile Products
   1. Mirafi 140N
   2. Propex Geotex 451
   3. Skaps GT-142
   4. Thrace-Linq 140EX
   5. Carthage Mills FX-40HS
   6. Stratatex ST 142

2.4 DRAINAGE AGGREGATE AND WALL INFILL

Drainage aggregate (and wall infill for retaining walls designed as modular gravity structures) shall be MDOT 6A Coarse Aggregate, conforming to MDOT Section 902.

2.5 REINFORCED FILL

A. Material used as reinforced backfill material in the reinforced zone (if applicable) shall be a granular fill material meeting the requirements of USCS soil type GW, GP, SW or SP per ASTM D2487 or alternatively by AASHTO Group Classification A-1-a or A-3 per AASHTO M 145. The backfill shall exhibit a minimum effective internal angle of friction, ϕ = 34 degrees at a maximum 2% shear strain and meet the following particle-size distribution requirements per ASTM D6913.

U.S. Standard Sieve Size	% Passing
3/4” (19 mm)	100
No. 4 (4.76 mm)	0-100
No. 40 (0.42 mm)	0-60
No. 200 (0.07 mm)	0-15

B. The reinforced backfill material shall be free of sod, peat, roots or other organic or deleterious matter including, but not limited to, ice, snow or frozen soils. Materials passing the No. 40 (0.42 mm) sieve shall have a liquid limit less than 25 and plasticity index less than 6 per ASTM D4318. Organic content in the backfill material shall be less than 1% per AASHTO T-267 and the pH of the backfill material shall be between 5 and 8.

C. Soundness. The reinforced backfill material shall exhibit a magnesium sulfate soundness loss of less than 30% after four (4) cycles, or sodium sulfate soundness loss of less than 15% after five (5) cycles as measured in accordance with AASHTO T-104.

D. Reinforced backfill shall not be comprised of crushed or recycled concrete, recycled asphalt, bottom ash, shale or any other material that may degrade, creep or experience a loss in shear strength or a change in pH over time.

2.6 LEVELING PAD

A. The precast modular block units shall be placed on a leveling pad constructed from crushed stone or unreinforced concrete. The leveling pad shall be constructed to the dimensions and limits shown on the retaining wall design drawings prepared by the RWDE.

B. Crushed stone used for construction of a granular leveling pad shall meet the requirements of the drainage aggregate and wall infill in section 2.4 or a preapproved alternate material.

C. Concrete used for construction of an unreinforced concrete leveling pad shall satisfy the criteria for AASHTO Class B. The concrete should be cured a minimum of 12 hours prior to placement of the precast modular block wall retaining units and exhibit a minimum 28-day compressive strength of 2,500 psi (17.2 MPa).

D. For the precast modular block retaining walls constructed within the Huron River, the contractor's submittal should include a description of the proposed construction means and methods including the proposed equipment to be used to construct the leveling pad within the river.

2.7 DRAINAGE

A. Drainage Pipe
   1. Drainage collection pipe shall be a 4" (100 mm) diameter, 3-hole perforated, HDPE pipe with a minimum pipe stiffness of 22 psi (152 kPa) per ASTM D2412.

   2. The drainage pipe shall be manufactured in accordance with ASTM D1248 for HDPE pipe and fittings.

B. Preapproved Drainage Pipe Products
   1. ADS 3000 Triple Wall pipe as manufactured by Advanced Drainage Systems, or Equal.

PART 3 EXECUTION

3.1 GENERAL

A. All work shall be performed in accordance with OSHA/MIOSHA safety standards, state and local building codes and manufacturer's requirements.

B. The Contractor is responsible for the location and protection of all existing underground utilities. Any new utilities proposed for installation in the vicinity of the retaining wall, shall be installed concurrent with retaining wall construction. The Contractor shall coordinate the work of subcontractors affected by this requirement.

C. New utilities installed below the retaining wall shall be backfilled and compacted to a minimum of 98% maximum dry density per ASTM D698 standard proctor.

D. The Contractor is responsible to ensure that safe excavations and embankments are maintained throughout the course of the project.

E. All work shall be inspected by the Engineer as directed by the City.

3.2 EXAMINATION

A. Prior to construction, the Contractor, Grading Contractor if different than the Contractor, RWIC and Engineer shall examine the areas in which the retaining wall will be constructed to evaluate compliance with the requirements for installation tolerances, worker safety and any site conditions affecting performance of the completed structure. Installation shall proceed only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Where applicable, remove existing gabions, gabion mattresses, and/or existing retaining wall as detailed in the contract documents.

B. Fill Soil.
   1. The Engineer shall verify that reinforced backfill placed in the reinforced soil zone satisfies the criteria of this section.

   2. The Engineer shall verify that any fill soil installed in the foundation and retained soil zones of the retaining wall satisfies the specification of the RWDE as shown on the construction drawings.

C. Excavation.
   1. The Contractor or Grading Contractor shall excavate to the lines and grades required for construction of the precast modular block retaining wall as shown on the construction drawings. The Contractor or Grading Contractor shall minimize over-excavation. Excavation support, if required, shall be the responsibility of the Contractor or Grading Contractor.

   2. Over-excavated soil shall be replaced with compacted fill in conformance with the specifications of the RWDE and Division 31, Section 31 23 00 – “Excavation, Backfill and Compaction”, of these project specifications.

   3. Embankment excavations shall be bench cut as directed by the project Geotechnical Engineer and inspected by the Engineer for compliance.

D. Foundation Preparation.
   1. Prior to construction of the precast modular block retaining wall, the leveling pad area and undercut zone (if applicable) shall be cleared and grubbed. All topsoil, brush, frozen soil, and organic material shall be removed. Additional foundation soils found to be unsatisfactory beyond the specified undercut limits shall be undercut and replaced with approved fill as directed by the project Geotechnical Engineer. The Engineer shall ensure that the undercut limits are consistent with

the requirements of the project Geotechnical Engineer and that all soil fill material is properly compacted in accordance with project specifications. The Engineer shall document the volume of undercut and replacement.

2. Following excavation for the leveling pad and undercut zone (if applicable), the Engineer shall evaluate the in-situ soil in the foundation and retained soil zones.
   a. The Engineer shall verify that the shear strength of the in-situ soil assumed by the RWDE is appropriate. The Engineer shall immediately stop work and notify the City if the in-situ shear strength is found to be inconsistent with the retaining wall design assumptions.

   b. The Engineer shall verify that the foundation soil exhibits sufficient ultimate bearing capacity to satisfy the requirements indicated on the retaining wall construction shop drawings per paragraph 1.06 I of this section.

E. Leveling Pad.
   1. The leveling pad shall be constructed to provide a level, hard surface on which to place the first course of precast modular block units. The leveling pad shall be placed in the dimensions shown on the retaining wall construction drawings and extend to the limits indicated.

   2. Crushed Stone Leveling Pad. Crushed stone shall be placed in uniform maximum lifts of 6” (150 mm). The crushed stone shall be compacted by a minimum of 3 passes of a vibratory compactor capable of exerting 2,000 lb (8.9 kN) of centrifugal force and to the satisfaction of the Engineer.

   3. Unreinforced Concrete Leveling Pad. The concrete shall be placed in the same dimensions as those required for the crushed stone leveling pad. The RWIC shall erect proper forms as required to ensure the accurate placement of the concrete leveling pad according to the retaining wall construction drawings.

3.4 PRECAST MODULAR BLOCK WALL SYSTEM INSTALLATION

A. The precast modular block structure shall be constructed in accordance with the construction drawings, these specifications and the recommendations of the retaining wall system component manufacturers. Where conflicts exist between the manufacturer’s recommendations and these specifications, these specifications shall prevail.

B. Drainage components. Pipe, geotextile, and drainage aggregate shall be installed as shown on the construction shop drawings.

C. Precast Modular Block Installation
   1. The first course of block units shall be placed with the front face edges tightly abutted together on the prepared leveling pad at the locations and elevations shown on the construction drawings. The RWIC shall take special care to ensure that the bottom course of block units is in full contact with the leveling pad, are set level and true and are properly aligned according to the locations shown on the construction drawings.

2. Backfill shall be placed in front of the bottom course of blocks prior to placement of subsequent block courses. Nonwoven geotextile fabric shall be placed in the V-shaped joints between adjacent blocks. Drainage aggregate shall be placed in the V-shaped joints between adjacent blocks to a minimum distance of 12” (300 mm) behind the block unit. If stone infill of hollow core blocks exceeds 45% of the block design volume, drainage aggregate will not be required to extend beyond the back of the blocks, with the approval of the RWDE.

3. Drainage aggregate shall be placed in 9-inch maximum lifts and compacted by a minimum of three (3) passes of a vibratory plate compactor capable exerting a minimum of 2,000 lb (8.9 kN) of centrifugal force.

4. Unit core fill shall be placed in the precast modular block unit vertical core slot. The core fill shall completely fill the slot to the level of the top of the block unit. The top of the block unit shall be broom-cleaned prior to placement of subsequent block courses. No additional courses of precast modular blocks may be stacked before the unit core fill is installed in the blocks on the course below.

5. Base course blocks for gravity wall designs (without geosynthetic soil reinforcement) may be furnished without vertical core slots. If so, disregard item 4 above, for the base course blocks in this application.
6. Nonwoven geotextile fabric shall be placed between the drainage aggregate and the retained soil (gravity wall design) or between the drainage aggregate and the reinforced fill (reinforced wall design) as required on the retaining wall construction drawings.

7. Subsequent courses of block units shall be installed with a running bond (half block horizontal course-to-course offset). With the exception of 90-degree corner units, the shear channel of the upper block shall be fully engaged with the shear knobs of the block course below. The upper block course shall be pushed forward to fully engage the interface shear key between the blocks and to ensure consistent face batter and wall alignment. Geogrid, drainage aggregate, unit core fill, geotextile and properly compacted backfill shall be complete and in-place for each course of block units before the next course of blocks is stacked.

8. The elevation of retained soil fill shall not be less than 1 block course (18 inches (457 mm)) below the elevation of the reinforced backfill throughout the construction of the retaining wall.

9. If included as part of the precast modular block wall design, cap units shall be secured with an adhesive in accordance with the precast modular block manufacturer’s recommendation.

D. Geogrid Reinforcement Installation (if required)
1. Geogrid reinforcement shall be installed at the locations and elevations shown on the construction drawings on level fill compacted to the requirements of this specification.

2. Continuous 12” (300 mm) wide strips of geogrid reinforcement shall be passed completely through the vertical core slot of the precast modular block unit and

extended to the embedment length shown on the construction plans. The strips shall be staked or anchored as necessary to maintain a taut condition.

3. Reinforcement length (L) of the geogrid reinforcement is measured from the back of the precast modular block unit. The cut length (L_c) is two times the reinforcement length plus additional length through the block facing unit. The cut length is calculated as follows:

L_c = 2*L + 3 ft (2*L + 0.9 m) (28" (710 mm) block unit)
L_c = 2*L + 5 ft (2*L + 1.5 m) (41" (1030 mm) block unit)

4. The geogrid strip shall be continuous throughout its entire length and may not be spliced. The geogrid shall be furnished in nominal, prefabricated roll widths of 12" (300 mm)+/- ½" (13 mm). No field modification of the geogrid roll width shall be permitted.

5. Neither rubber tire nor track vehicles may operate directly on the geogrid. Construction vehicle traffic in the reinforced zone shall be limited to speeds of less than 5 mph (8 km/hr) once a minimum of 9 inches (230 mm) of compacted fill has been placed over the geogrid reinforcement. Sudden braking and turning of construction vehicles in the reinforced zone shall be avoided.

E. Construction Tolerance. Allowable construction tolerance of the retaining wall shall be as follows:
   1. Deviation from the design batter and horizontal alignment, when measured along a 10' (3 m) straight wall section, shall not exceed 3/4" (19 mm).

   2. Deviation from the overall design batter shall not exceed 1/2" (13 mm) per 10' (3 m) of wall height.

   3. The maximum allowable offset (horizontal bulge) of the face in any precast modular block joint shall be 1/2" (13 mm).

   4. The base of the precast modular block wall excavation shall be within 2" (50 mm) of the staked elevations, unless otherwise approved by the Engineer.

   5. Differential vertical settlement of the face shall not exceed 1' (300 mm) along any 200' (61 m) of wall length.

   6. The maximum allowable vertical displacement of the face in any precast modular block joint shall be 1/2" (13 mm).

   7. The wall face shall be placed within 2" (50 mm) of the horizontal location staked.

3.5 WALL INFILL AND REINFORCED BACKFILL PLACEMENT

A. Backfill material placed immediately behind the drainage aggregate shall be compacted as follows:
   1. 98% of maximum dry density at ± 2% optimum moisture content per ASTM D698 standard proctor or 85% relative density per ASTM D4254.

B. Compactive effort within 3’ (0.9 m) of the back of the precast modular blocks should be accomplished with walk-behind compactors. Compaction in this zone shall be within 95% of maximum dry density as measured in accordance with ASTM D698 standard proctor or 80% relative density per ASTM D 4254. Heavy equipment should not be operated within 3’ (0.9 m) of the back of the precast modular blocks.

C. Backfill material shall be installed in lifts that do not exceed a compacted thickness of 9” (230 mm).

D. At the end of each workday, the RWIC shall grade the surface of the last lift of the granular wall infill to a 3% ± 1% slope away from the precast modular block wall face and compact it.

E. The Contractor shall protect, or direct the Grading Contractor to protect, the precast modular block wall structure against surface water runoff at all times through the use of berms, diversion ditches, silt fence, temporary drains and/or any other necessary measures to prevent soil staining of the wall face, scour of the retaining wall foundation or erosion of the reinforced backfill or wall infill.

3.6 OBSTRUCTIONS IN THE INFILL AND REINFORCED FILL ZONE

A. The RWIC shall make all required allowances for obstructions behind and through the wall face in accordance with the approved construction shop drawings.

B. Should unplanned obstructions become apparent for which the approved construction shop drawings do not account, the affected portion of the wall shall not be constructed until the RWDE can appropriately address the required procedures for construction of the wall section in question.

3.7 COMPLETION

A. For walls supporting unpaved areas, a minimum of 12” (300 mm) of compacted, low-permeability fill shall be placed over the granular wall infill zone of the precast modular block retaining wall structure. The adjacent retained soil shall be graded to prevent ponding of water behind the completed retaining wall.

B. For retaining walls with crest slopes of 5H:1V or steeper, silt fence shall be installed along the wall crest immediately following construction. The silt fence shall be located 3’ to 4’ (0.9 m to 1.2 m) behind the uppermost precast modular block unit. The crest slope above the wall shall be immediately seeded to establish vegetation. The Contractor shall ensure that the seeded slope receives adequate irrigation and erosion protection to support germination and growth.

C. The Contractor shall confirm that the as-built precast modular block wall geometries conform to the requirements of this section. The Contractor shall notify the City of any deviations.

END OF SECTION

SECTION 32 93 00
VEGETATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The work shall consist of furnishing all labor, equipment, and material necessary to final grade, seed, mulch, fertilize, maintain, and establish vegetation for the areas indicated on the Drawings and as specified herein.

1.2 SUBMITTALS

A. Submit a complete materials list of items proposed for the work and a description of how the work will be completed.

B. Submit seed and fertilizer certifications for all bags used in the project, including name and location of seed supplier(s) and a complete list of each seed mix by weight and proportion that is being supplied before the seed mix is ordered.

C. Submit Seed and mulch equipment and turf maintenance equipment.

D. Submit Installer qualifications.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure live seed, year of production, net weight, date of packaging and location of packaging. Damaged packages are not acceptable.

B. All seeds shall be packaged and kept dry to ensure adequate protection against damage and to maintain dormancy while in transit, storage, or during planting operations.

C. All seed mixture(s) shall be delivered to the site in vendor's sealed containers and labeled, in compliance with the Federal Seed Act and applicable State laws.

D. Seed shall not be delivered and stored longer than 9 months prior to date of installation.

E. Straw mulch shall be stored off the ground under a cover that provides protection from moisture and humidity.

F. Deliver fertilizer in waterproof bags showing weight, chemical analysis and name of manufacturer.

1.4 MAINTENANCE

A. Maintain vegetated surfaces and supply additional topsoil where necessary, including areas affected by erosion.

B. Replant damaged grass areas showing root growth failure, deterioration, bare or thin spots and eroded areas.

C. Establish and maintain all turf in a vigorous, well-kept condition and warrant them against defects including death, improper maintenance, and unsatisfactory growth for a period of one (1) year.

1.5 QUALIFICATIONS

A. Installer Qualifications: The work of this section shall be performed by a Contractor with a minimum of 5 years of documented experience and specializing in seeding lawn installations and turf maintenance.

PART 2 PRODUCTS

2.1 GROWING MEDIA

A. Fertilizer: starter fertilizer 20-27-5 (Nitrogen-Phosphorous-Potassium)

2.2 SEED MIXTURE

A. The following permanent seed mixture shall be used:
   1. Furnish turf seed that meets specifications of an 80/20 Turf Type Tall Fescue Mix with perennial rye.

   2. Seed mix shall not include annual ryegrass, KY 31 (coarse-leaf tall fescue), Linn (perennial ryegrass cultivar), Orchardgrass, Redtop, and Timothy.

   3. Any alternative seed mixtures intended for use on the project site must be submitted to the Engineer for review and approval.

   4. The permanent seed mixture to be used on the project stability berm and collector ditch shall be no-mow and drought resistant.

2.3 MULCH

A. Mulching material: Oat or wheat straw, reasonably free from weeds, foreign matter detrimental to plant life, and in a dry condition.

B. Erosion control blanket: Uniform open weave jute matting; excelsior matting; erosion control mulching fabric consisting of knitted construction of yarn interwoven with strips of biodegradable paper; or organic fiber protective fiber mat consisting of half-inch layer of chopped straw, knitted into mat with thin netting of biodegradable polypropylene. Shall be environmentally sensitive and certified weed see free. Performance capabilities shall have a shear stress rating of 84 Pa (1.75 lb/ft^2) for slopes that are 2H:1V and flatter.

PART 3 EXECUTION

3.1 EXAMINATION

A. The Contractor shall not begin work in this section until the final grading has been approved by the Resident Project Representative.

B. Prior to seeding, examine and verify the acceptability of the job site. Notify the Engineer if conditions detrimental to plant growth are encountered such as rubble fill, adverse drainage conditions, or obstructions. Do not proceed with the work until unsatisfactory conditions have been corrected or resolved in writing by the Engineer.

C. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.

D. Coordination is required to ensure rainfall/groundwater seepage does not result in soil moisture conditions that will cause excessive rutting during lawn installation operations. Suspend soil spreading, grading and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

3.2 PREPARATION

A. Test the soil for the appropriate pH and submit test results to the Resident Project Representative.

B. De-compaction: De-compact areas trafficked by construction activities to a minimum depth of 12 inches.

C. Rough Grading: Grade surfaces to assure drainage away from structures and to prevent ponding and pockets of surface drainage. Provide subgrade free from irregular surface changes and as follows:

1. Rough grade shall equal plus/minus 0.20 feet, subgrade tolerance shall be free of exposed boulders or stones exceeding 1 inch in greatest dimension.

2. Fill in all areas of settlement to proper grade before subsequent placement of topsoil.

3.3 APPLICATION

A. Do not temporarily seed slopes 3H:1V or steeper after placing topsoil. Only permanently seed those slopes.

B. The seeding shall be completed within three days after completion of final grading or as soon thereafter as conditions are favorable. Seeding shall occur between March 15th and September 15th.

C. Provide minimum 6 inches of topsoil (according to AASHTO T267) in areas where vegetation is to be established. The seedbed shall be prepared by pulverizing and breaking up the soil to a minimum depth of two inches with a disk harrow, drag harrow, spike tooth harrow or similar tool. All rocks over two inches in diameter, clods and undesirable material that would interfere with seeding operations shall be removed. Immediately after seedbed preparation, the Contractor shall apply the fertilizer uniformly over the area at a rate of 155 pounds per acre (3.5 pounds per 1,000 square feet). Apply fertilizers by mechanical drop or rotary distributor, thoroughly and evenly incorporated with soil to a depth of 3 inches by disking or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.

D. The seed shall be drilled or broadcast uniformly over the seedbed at a rate of 220 pounds per acre (5 pounds per 1,000 square feet) using methods and equipment acceptable to the Resident Project Representative. The seeded area shall be passed over with a cultipacker or similar tool to help cover more seed and improve seeding establishment. Application of grass seed and fertilizer at the same time, in the same machine is not permitted.

E. Seed sowing is not permitted immediately following rain, when the ground is too dry, or during windy periods.

F. The approved mulch shall be applied over the seeded area at a rate of 2 tons per acre (one bale per 1,000 square feet) for straw. Hydro mulching will not be permitted.

G. Mulching material shall be kept in place with asphalt emulsion applied at a minimum rate of 60 gallons per ton of mulching material.

H. The Contractor shall seed and mulch all access roads, slopes, ditches, spoil areas and all other areas disturbed by construction.

I. Seeded areas shall be watered as necessary to promote good growth during the germination and establishment period. During the establishment period the Contractor shall water a minimum of one inch over the seeded area two times per week. In dry weather, more frequent watering will be required. A minimum of 12 waterings is required.

J. The Contractor shall perform the first mowing at a height not to exceed 5 inches. The grass shall not be cut shorter than 3 inches.

3.4 INSTALLATION

A. Establishment blanket:

1. Cover seeded slopes where grade is 2:1 or greater with establishment blanket. Roll matting down over slopes without stretching or pulling. Any mat used shall be biodegradable, no mats containing plastic netting will be permitted.

2. Lay matting smoothly on soil surface, burying top end of each section in narrow 6-inch trench. Leave 12-inch overlap from top roll over bottom roll. Leave 4-inch overlap over adjacent section.

3. Staple outside edges and overlaps at 36-inch intervals.

4. Lightly dress slopes with topsoil to ensure close contact between matting and soil.

5. In ditches, unroll matting in direction of flow. Overlap ends of strips 6 inch with upstream section on top.

3.5 ADJUSTING

A. Any vegetated areas which are found to not have an adequate growth of cover during the first year, shall be re-seeded as soon as weather conditions permit, at no additional cost to the City.

3.6 PROTECTION

A. The Contractor shall secure the work area and protect the vegetated areas from any traffic, disturbances, wildlife, or public use until vegetation is accepted.

END OF SECTION

DIVISION 33 – SUBDRAINAGE

SECTION 33 42 13
STORMWATER CULVERTS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. This work includes the removal and realignment of the culvert connecting the Collector Ditch Pond (and Collector Ditch) to the Huron River as shown in the contract drawings.

1.2 SUBMITTALS

A. Shop Drawings: Indicate dimensions, layout of piping, pipe inverts, and gradient of slope.

B. Product Data: Provide data on pipe products and pipe accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record location of pipe runs, connections, and principal invert elevations.

E. Pipe Bedding

PART 2 PRODUCTS

2.1 CULVERT MATERIALS

A. Single Wall Culvert Pipe: 15.5-inch inner diameter High Density Polyethylene (HDPE), corrugated, smooth inner-walled pipe with fused ends meeting the requirements of ASTM F667.

B. All joints shall be water-tight and shall be joined with gaskets meeting the requirements of ASTM F667 and compatible with the pipe as recommended by the manufacturer. Gaskets shall incorporate a closed-cell synthetic expanded rubber gasket meeting the requirements of ASTM D1056 Grade 2A2.

C. All Pipe shall be installed and handled following the manufacturer’s instructions.

D. The Contractor shall order and install pipe made by a single approved manufacturer.

E. Pipe Bedding Material: per MDOT 902

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that the excavations, dimensions, and elevations are as indicated on the drawings and are in accordance with the specifications. Each piece of pipe and each joint be cleaned and examined for defects before it is installed. No cracked, broken, or defective piece should be discovered after having been installed. If discovered, it shall be removed and replaced with a sound piece in a satisfactory manner by the Contractor at no additional cost.

B. Sections of pipe which have cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. Undamaged portions of the pipe shall then be rejoined using heat fusion joining method.

3.2 PREPARATION

A. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.

B. Do not place pipe until the subgrade has been approved by the Resident Project Representative. Over-excavate unsuitable subgrade soils as directed by the Resident Project Representative and replace with suitable compacted fill as directed by the Resident Project Representative.

C. Pipe shall be stored on a clean, level ground surface to prevent scratching or gouging. If pipe is stacked for storage, the stacking shall be in accordance with manufacturer's recommendations. Pipe shall be handled during unloading, movement to the site of installation, or during installation at the site so that it is not pulled over sharp objects or cut by chokers or lifting equipment.

3.3 INSTALLATION

A. Install pipe and accessories in accordance with manufacturer's written instructions.

B. Fused sections of pipe shall be handled carefully to avoid damage to the pipe. Chains or cable type chokers shall not be used to handle pipe. Nylon slings shall be used to handle pipe. Spreader bars shall be used when lifting long fused sections.

C. Proper and suitable tools and appliances for the safe and convenient cutting, handling, fusion, and installation of the pipe and fitting shall be used.

D. Suitable fittings shall be used where shown on the Plans and as required to install the pipe systems.

E. All lines shall be closed off with bulkheads or solid caps when pipe installation is not in progress. Pipe shall be thoroughly cleaned before it is laid and kept clean until it is accepted in the completed Work.

F. Place pipe in the trench in accordance with the Plans. At all times the Contractor shall exercise due care in handling the pipe to prevent crushing or kinking of the pipe.

G. Heavy equipment, including bulldozers and rollers, may not be operated directly on top of any pipe until a minimum of one (2) foot of fill has been placed and compacted, unless otherwise specified by the pipe manufacturer. In cases where less than one (2) foot of fill exists above the pipe, a plate tamper must be used for compaction directly above the pipe, and the pipe should never be crossed or driven upon by bulldozers, rollers, and other heavy equipment.

H. Pipe shall not be placed in water or when the subgrade is saturated or frozen. If forecasts indicate sub-freezing temperatures are expected following pipe installation, a minimum amount of fill must be placed and compacted above the crown of the pipe before daily operations are completed to prevent heaving or movement.

3.4 INSTALLATION TOLERANCES

A. Lay pipe to alignment and slope gradients as shown on the plans.

B. Install anchor blocks and ties as necessary to secure the pipe in place along length of pipe and at outlet.

3.5 TESTING

A. The Contractor shall perform visual inspection of the 15” diameter HDPE pipe in order to verify pipes were installed without damage or open joints. The visual inspection shall be performed with the City Project Representative after placed and immediately prior to being covered with the specified backfill material.

END OF SECTION

SECTION 33 46 00
UNDERDRAINS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. This work includes construction of the drainage systems as shown on the drawings, including placement of aggregates and piping.

1.2 SUBMITTALS

A. Shop Drawings: Indicate dimensions, layout of piping, pipe inverts, and gradient of slope.

B. Product Data: Provide data on pipe products and pipe accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record location of pipe runs, connections, and principal invert elevations.

E. Filter Aggregate and Pipe Bedding

F. Samples: Two pieces, minimum 12 inches by 12 inches, of filter fabric.

PART 2 PRODUCTS

2.1 PIPE MATERIALS

A. Solid Pipe: 6-inch inner diameter High Density Polyethylene (HDPE), non-corrugated, smooth walled pipe with a minimum diameter to thickness ratio, DR, of 15.5. All joints shall be water-tight and shall be fusion welded by a qualified party.

B. Perforated Pipe: 6-inch inner diameter High Density Polyethylene (HDPE), non-corrugated, smooth walled pipe with a minimum diameter to thickness ratio, DR, of 15.5 with 1/8" slot widths.

C. Perforations shall be provided by slots with a maximum width of 1/8-inch. The length of slots shall not exceed 1 3/8-inch and shall be oriented as shown on Sheet 46 of the Plans. The water inlet area shall be a minimum of 0.75 in^2/ft.

D. For 6-inch HDPE pipe, provide pipe animal and debris guards, end caps, and other accessories as recommended by the pipe manufacturer.

E. Unless otherwise shown or specified, pipe fittings and joints shall conform to ASTM F714 Standard Specification, with butt fusion joints as specified by ASTM D3261 and installed and handled following the manufacturer’s instructions.

F. The Contractor shall order and install pipe made by a single approved manufacturer, but if different approved manufactures are installed, the Contractor shall follow all manufacturers' recommendations with regards to compatibility of fusion techniques.

G. Pipes shall be high density, high molecular weight, PE 3408 polyethylene resin material extruded from resin meeting the Standard Specifications of ASTM D3350 with a minimum cell classification of PE 345444C and SDR rating of 15.5. The material shall be listed by PPI (Plastics Pipe Institute, a Division of the Society of the Plastics Industry) in PPI TR-4 with a 73°F hydrostatic design basis of 1,500 psi and a 140°F hydrostatic design basis of 800 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on the ASTM D2837 Standard Test Method.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that the excavations, dimensions, and elevations are as indicated on the drawings and are in accordance with the specifications. Each piece of pipe and each fitting shall be cleaned and examined for defects before it is installed. No cracked, broken, or defective piece should be discovered after having been installed. If discovered, it shall be removed and replaced with a sound piece in a satisfactory manner by the Contractor at no additional cost.

B. Sections of pipe which have cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. Undamaged portions of the pipe shall then be rejoined using heat fusion joining method.

3.2 PREPARATION

A. Remove large stones or other hard matter that could damage piping or impede consistent backfilling or compaction.

B. Do not place pipe until the subgrade has been approved by the Resident Project Representative. Over excavate unsuitable subgrade soils as directed by the Resident Project Representative and replace with suitable compacted fill as directed by the Resident Project Representative.

3.3 INSTALLATION

A. Install pipe and accessories in accordance with MDOT 404 and manufacturer's instructions.

B. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.

C. Shore pipe to required position; retain in-place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.

D. Any pipe damaged during construction shall be replaced by the Contractor to the satisfaction of the Resident Project Representative at no additional cost to the Owner.

E. Fused sections of pipe shall be handled to avoid damage to the pipe. Chains or cable type chokers shall not be used to handle pipe. Nylon slings shall be used to handle pipe. Spreader bars shall be used when lifting long fused sections.

F. Proper and suitable tools and appliances for the safe and convenient cutting, handling, fusion, and installation of the pipe and fitting shall be used.

G. Suitable fittings shall be used where shown on the Plans and as required to install the pipe systems. Properly executed electrofusion fittings may be used at the Contractor's option. If required for unusual circumstances, mechanical joint adapters, flanges, unions, grooved-couplers, transition fittings, and some mechanical couplings may be considered for use to mechanically connect HDPE pipe if the preferred connection methods are not possible; use of mechanical connections is subject to the review and approval of the Engineer and ODNR. If used, no additional payment shall be made for electrofusion or mechanical fittings.

H. All lines shall be closed off with bulkheads or solid caps when pipe installation is not in progress. Pipe shall be thoroughly cleaned before it is laid and kept clean until it is accepted in the completed Work.

I. Before placing the pipe, the aggregate material as specified in the Contract Drawings shall be placed and compacted in the bottom of the trench.

J. Place pipe in the trench in accordance with the Plans. At all times the Contractor shall exercise due care in handling the pipe to prevent crushing or kinking of the pipe.

K. Heavy equipment, including bulldozers and rollers, may not be operated directly on top of any pipe until a minimum of three (3) feet of fill has been placed and compacted, unless otherwise specified by the pipe manufacturer. Some circumstances exist where the Plans call for less than three (3) feet total fill above certain areas of pipe. In cases where less than three (3) feet of fill exists above the pipe, a plate tamper must be used for compaction directly above the pipe, and the pipe should never be crossed or driven upon by bulldozers, rollers, and other heavy equipment.

L. Pipe shall not be placed in water or when the subgrade is saturated or frozen. If forecasts indicate sub-freezing temperatures are expected following pipe installation, a minimum amount of fill must be placed and compacted above the crown of the pipe before daily operations are completed to prevent heaving or movement.

3.4 INSTALLATION TOLERANCES

A. Lay pipe to alignment and slope gradients as shown on the plans.

3.5 PROTECTION

A. Protect pipe and bedding from damage or displacement.

3.6 TESTING

A. The Contractor shall perform visual inspection of the 6" diameter HDPE pipe in order to verify all pipes were installed without damage or open joints. The visual inspection shall be performed with the project Engineer after placed and immediately prior to being covered with the specified backfill material.

END OF SECTION

SECTION VI – ATTACHMENTS

PROPOSAL SUBMISSION ATTACHMENTS – To be completed by Contractor and Submitted with the Proposal

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

Attachment J – Davis-Bacon Wage Requirements

Attachment K – Federal DBE Participation

Attachment L – Federal Debarment Certification

Attachment M – Federal Good Faith Efforts

Attachment N – Sample Certified Payroll Report Template

DETAILED SPECIFICATION ATTACHMENTS – For Contractor Information Only - Not to be Submitted

Attachment O – Historic Drawings (original Record Drawings)

Attachment P – Existing Geotechnical Data

Attachment Q – Barton Dam Temporary Construction Emergency Action Plan (TCEAP)

Attachment R – Railroad Permit

Attachment S – Joint Permit

Attachment T – Drilling Program Plan

Attachment U – Piezometric Monitoring Data

Attachment V – Memorandum on High Flow Mitigation at Toe Drain 23

Attachment W – Construction Dam Safety Surveillance and Monitoring Plan (CDSSMP)

Attachment X - Quality Control Inspection Program (QCIP)

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:

Administrative Use Only
Contract Date: _____

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 Barton Dam Right Embankment Remediation 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 Water Treatment Services Unit – Water Treatment Plant

Project means Barton Dam Right Embankment Remediation, Bid number 24-03

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: Mr. Glen Wiczorek, PE whose job title is Senior Utilities Engineer, Water Treatment Plan. 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 Seventeen (17) consecutive calendar months.

(C) The substantial completion date is September 30, 2025, and the final completion date is November 15, 2025.

(D) 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 $500.00 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

Choose one only.

(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.

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, 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.

FOR CONTRACTOR

By_____

Its:_____

FOR THE CITY OF ANN ARBOR

By_____
Christopher Taylor, Mayor

By_____
Jacqueline Beaudry, City Clerk

Approved as to substance

By_____

Milton Dohoney, City Administrator

By_____

Brian Steglitz, Public Services Area Administrator

Approved as to form and content

_____
Atleen Kaur, City Attorney

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 _____ (Signature)	By _____ (Signature)
Its _____ (Title of Office)	Its _____ (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 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;

(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:	Name and address of agent:
_____	_____
Atleen Kaur, City Attorney	_____
	_____

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 - $500,000 each accident
Bodily Injury by Disease - $500,000 each employee
Bodily Injury by Disease - $500,000 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 $1,000,000.

(2) 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 29 - Surety Bonds

Bonds will be required from the successful bidder as follows:

(1) A Performance Bond to the City of Ann Arbor for the amount of the bid(s) accepted;
(2) A Labor and Material Bond to the City of Ann Arbor for the amount of the bid(s) accepted.

Bonds shall be executed on forms supplied by the City in a manner and by a Surety Company authorized to transact business in Michigan and satisfactory to the City Attorney.

Section 30 - Damage Claims

The Contractor shall be held responsible for all damages to property of the City or others, caused by or resulting from the negligence of the Contractor, its employees, or agents during the progress of or connected with the prosecution of the work, whether within the limits of the work or elsewhere. The Contractor must restore all property injured including sidewalks, curbing, sodding, pipes, conduit, sewers or other public or private property to not less than its original condition with new work.

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:

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

9/25/15 Rev 0 PW

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 $15.90/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 $17.73/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, 2023 - ENDING APRIL 29, 2024

$15.90 per hour
If the employer provides health care benefits*

$17.73 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.

V.

W. ENFORCEMENT

X. 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

Revised 2/1/2023

ATTACHMENT 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 ( ) Interest in vendor's company ( ) 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

COI – Ver. 1 – 6/9/16

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

2016 Rev 0 NDO-2

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.

ATTACHMENT J

DAVIS-BACON AND RELATED ACTS/PREVAILING FEDERAL WAGES

P.L. 111-88 requires compliance with the Davis-Bacon Act and adherence to the current U.S. Department of Labor Wage Decision. Attention is called to the fact that not less than the minimum salaries and wages as set forth in the Contract Documents (see Wage Decision included herein) must be paid on this project. The Wage Decision, including modifications, must be posted by the Contractor on the job site. The "Contracting Agency" or "Contracting Officer" for Davis-Bacon Wage Decision posters on jobsites is the loan applicant/bond issuer. A copy of the Labor Standards Provisions for Federally Assisted Projects is included and is hereby a part of this contract.

REPLACE THIS PAGE WITH THE APPROPRIATE WAGE DECISION AND MODIFICATIONS.

NOTE: The required/appropriate Wage Decision must be obtained from the United States Department of Labor (DOL) at: sam.gov/content/wage-determinations

The Wage Decision that appears in the contract specifications must be that which was in effect on the date 10 days before bid opening. Updated Wage Decisions can be included in the contract documents as an addendum.

A single category of Wage Determinations should be used unless multiple classifications can be justified as a substantial part of the project. If using multiple Wage Determination classifications, the contract must be at least $1 million and must comprise at least 20 percent of the total project cost.

Questions regarding prevailing wage and labor standards provisions should be directed to the DOL Wage and Hour Division. Regional offices can be found on the DOL website at dol.gov/agencies/whd or by calling 866-487-9243. To submit an email inquiry, use the WHD Contact Form

"General Decision Number: MI20230157 05/19/2023

Superseded General Decision Number: MI20220157

State: Michigan

Construction Type: Heavy PIPELINE

Counties: Michigan Statewide.

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g. an option is exercised) on or after January 30, 2022:	• Executive Order 14026 generally applies to the contract. • The Contractor must pay all covered workers at least $16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	• Executive Order 13658 generally applies to the contract. • The Contractor must pay all covered workers at least $12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for

performance of work on the contract does not appear on this wage determination, the Contractor must still submit a conformance request.

Additional information on Contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	**01/06/2023**
1	**05/12/2023**
2	**05/19/2023**

*** ENGI0325-012 05/01/2023**

	Rates	Fringes
Power equipment operators - gas distribution and duct installation work:		
GROUP 1	$ 36.18	25.25
GROUP 2	$ 33.45	**25.25**

SCOPE OF WORK: The construction, installation, treating and reconditioning of pipelines transporting gas vapors within cities, towns, subdivisions, suburban areas, or within private property boundaries, up to and including private meter settings of private industrial, governmental or other premises, more commonly referred to as ""distribution work,"" starting from the first metering station, connection, similar or related facility, of the main or cross country pipeline and including duct installation.

Group 1: Backhoe, crane, grader, mechanic, dozer (D-6 equivalent or larger), side boom (D-4 equivalent or larger), trencher (except service), endloader (2 yd. capacity or greater).

GROUP 2: Dozer (less than D-6 equivalent), endloader (under 2yd. capacity), side boom (under D-4 capacity), backfiller, pumps (1 or 2 of 6-inch discharge or greater), boom truck (with powered boom), tractor (wheel type other than backhoe or front endloader). Tamper (self-propelled), boom truck (with non-powered boom), concrete saw (20 hp or larger), pumps (2 to 4 under 6-inch discharge), compressor (2 or more or when one is used continuously into the second day) and trencher (service). Oiler, hydraulic pipe pushing machine, grease person and hydrostatic testing operator.

LABO1076-005 04/01/2023

MICHIGAN STATEWIDE

LABORER (DISTRIBUTION WORK)	Rates	Fringes
Zone 1	$ 25.17	13.32
Zone 2	$ 24.22	13.45
Zone 3	$ 21.60	13.45
Zone 4	$ 20.97	13.43
Zone 5	$ 21.00	13.40

DISTRIBUTION WORK - The construction, installation, treating and reconditioning of distribution pipelines transporting coal, oil, gas or other similar materials, vapors or liquids, including pipelines within private property boundaries, up to and including the meter settings on residential, commercial, industrial, institutional, private and public structures. All work covering pumping stations and tank farms not covered by the Building Trades Agreement. Other distribution lines with the exception of sewer, water and cable television are included.

Underground Duct Layer Pay: $.40 per hour above the base pay rate.

Zone 1 - Macomb, Oakland and Wayne

Zone 2 - Monroe and Washtenaw

Zone 3 - Bay, Genesee, Lapeer, Midland, Saginaw, Sanilac, Shiawassee and St. Clair

Zone 4 - Alger, Baraga, Chippewa, Delta, Dickinson, Gogebic, Houghton, Iron, Keweenaw, Luce, Mackinac, Marquette, Menominee, Ontonagon and Schoolcraft

Zone 5 - Remaining Counties in Michigan

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

Note: Executive Order(EO)13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the Contractor must provide employees with 1 hour of paid sick leave for every 30 hours

they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on Contractor requirements and worker protections under the EO is available at

https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5(a)(1)(ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers[1111] that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s)listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CSA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on

a wage determination matter

* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations Wage and Hour Division

U.S. Department of Labor

200 Constitution Avenue,

N.W. Washington, DC 20210

2.) If the answer to the question in 1). is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator

U.S. Department of,Labor

200 Constitution Avenue,

N.W. Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board

U.S. Department of Labor

200 Constitution Avenue,

N.W. Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

"General Decision Number: MI20230095 02/24/2023

Superseded General Decision Number: MI20220095

State: Michigan

Construction Type: Building

County: Oakland County in Michigan.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.l(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g. an option is exercised) on or after January 30, 2022:	• Executive Order 14026 generally applies to the contract. • The Contractor must pay all covered workers at least $16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	• Executive Order 13658 generally applies to the contract. • The Contractor must pay all covered workers at least $12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the Contractor must still submit a conformance request.

Additional information on Contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification	Publication Date
0	01/06/2023
1	02/03/2023
2	02/24/2023

ASBE0025-002 06/01/2022

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR	$36.63	32.91

BOIL0169-001 01/01/2021

	Rates	Fringes
BOILERMAKER	$35.95	34.52

* BRMI0001-001 06/01/2022

	Rates	Fringes
BRICKLAYER	$35.95	25.18
TILE FINISHER	$30.75	22.67
TILE SETTER	$37.88	22.67

CARP0687-003 06/01/2021

	Rates	Fringes
CARPENTER (Including Acoustical Ceiling Installation, Drywall Hanging, Form Work Metal Stud Installation & Scaffold Building)	$35.16	29.22

CARP1045-001 06/01/2020

	Rates	Fringes
CARPENTER (Floor Layer – Carpet, Resilient, & Vinyl Flooring)……	$ 30.60	24.58

CARP1102-002 06/01/2020

	Rates	Fringes
MILLWRIGHT……	$ 35.30	34.10

ELEC0058-011 07/02/2022

ELECTRICIAN

	Rates	Fringes
Excludes Alarm Installation & Low Voltage Wiring……	$ 44.34	24.91
Low Voltage Wiring Installer……	$ 31.58	14.72
Technician……	$ 39.33	14.95

ELEV0036-002 01/01/2023

	Rates	Fringes
ELEVATOR MECHANIC……	$ 59.82	37.335+a+b

FOOTNOTES:

A. PAID HOLIDAYS: New Years Day; Memorial Day; Independence Day; Labor Day; Veterans' Day; Thanksgiving Day; the Friday after Thanksgiving Day; and Christmas Day.

B. Employer contributes 8% basic hourly rate for 5 years or more of service of6% basic hourly rate for6 months to 5 years of service as vacation pay credit.

ENGI0324-017 06/01/2022

OPERATOR: Power Equipment

	Rates	Fringes
GROUP 1……	$ 46.44	24.95
GROUP 2……	$ 44.94	24.95
GROUP 3……	$ 43.44	24.95
GROUP 4……	$ 43.14	24.95

	Rates	Fringes
GROUP 5	$ 42.32	24.95
GROUP 6	$ 41.46	24.95
GROUP 7	$ 40.49	24.95
GROUP 8	$ 38.78	24.95
GROUP 9	$ 30.44	24.95

FOOTNOTES:
Tower cranes: to be paid the crane operator rate determined by the combined length of the mast and the boom. If the worker must climb 50ft. or more to the work station, $.25 per hour additional.

Derrick and cranes where the operator must climb 50 ft. or more to the work station, $.25 per hour additional to the applicable crane operator rate.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Crane with boom and jib or leads 400' or longer

GROUP 2: Crane with boom and jib or leads 300' or longer

GROUP 3: Crane with boom and jib or leads 220' or longer

GROUP 4: Crane with boom and jib or leads 140' or longer

GROUP 5: Crane with boom and jib or leads 120' or longer

GROUP 6: Regular crane operator, and concrete pump with boom operator

GROUP 7: Backhoe/Excavator/Trackhoe, bobcat/skid Loader, broom/sweeper, bulldozer, grader/blade, highlift, hoist, loader, roller, scraper, tractor & trencher

GROUP 8: Forklift & extend-a-boom forklift

GROUP 9: Oiler

IRON0025-019 06/01/2022

IRONWORKER

	Rates	Fringes
REINFORCING	$ 31.43	34.77
STRUCTURAL	$ 34.50	38.44

IRON0025-022 06/01/2022

	Rates	Fringes
IRONWORKER STRUCTURAL (Metal Building Erection Only)…..…….....$ 25.81		26.43

LAB00259-002 08/01/2022

	Rates	Fringes
LABORER: Asbestos Abatement (Removal from Floors, Walls & Ceilings)…….....$ 32.78		14.97

LAB00334-005 06/01/2022

LABORER: Landscape & Irrigation

	Rates	Fringes
GROUP 1…..……..……....$ 23.82		7.60
GROUP 2..…….....$ 21.60		7.60

CLASSIFICATIONS

GROUP 1: Landscape specialist, including air, gas and diesel equipment operator, lawn sprinkler installer, skidsteer (or equivalent)

GROUP 2: Landscape laborer: small power tool operator, material mover, truck driver and lawn sprinkler installer tender

LABO1076-003 06/01/2022

LABORER

	Rates	Fringes
Common or General; Grade Checker; Mason Tender – Brick/Cement/Concrete; Pipelayer; Sandblaster……$ 29.75		16.95

PAIN0022-003 06/01/2022

	Rates	Fringes
PAINTER: Brush and Roller……..…$ 32.85		20.41
PAINTER: Drywall Finishing/Taping……..…..$ 32.85		20.41
PAINTER: Spray……...$ 26.86		17.66

PAIN0357-002 06/01/2022

	Rates	Fringes
GLAZIER	$ 37.15	20.98

PAID HOLIDAYS: New Year's Day, Decoration Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day; provided that the employee has worked the last full regular scheduled work day prior to the holiday, and the first full regular scheduled work day following the holiday, provided the employee is physically able to work.

PLAS0067-001 04/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 30.63	14.07

PLAS0067-004 04/01/2014

	Rates	Fringes
PLASTERER	$ 30.63	14.07

* PLUM0098-001 06/01/2022

	Rates	Fringes
PLUMBER, Excludes HVAC Pipe and Unit Installation	$ 35.24	30.54

PLUM0636-011 06/05/2022

	Rates	Fringes
PIPEFITTER (Includes HVAC Pipe Installation; Excludes HVAC System Installation)	$ 41.61	29.35

ROOF0149-001 07/01/2021

	Rates	Fringes
ROOFER	$ 38.16	25.91

SFMI0704-001 08/01/2022

	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers)….	$ 48.17	30.99

SHEE0080-001 06/01/2022

	Rates	Fringes
SHEET METAL WORKER, Includes HVAC Duct and Unit Installation….	$ 47.64	26.15

TEAM0247-001 06/01/2018

TRUCK DRIVER

	Rates	Fringes
GROUP 1		
Flatbed; Pickup; Dump & Tandem…….	$ 26.71	0.70+a
GROUP 2		
Semi……..	$ 26.86	0.70+a
GROUP 3		
Lowboy…….	$ 26.96	0.70+a

PAID HOLIDAYS: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. If any of the above holidays fall on a Sunday, the following Monday shall be considered the holiday and, if work is performed, the rate shall be double time.

FOOTNOTE:

a. $456.70 per week, plus $67.10 per day.

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* SUMI2011-020 02/01/2011

	Rates	Fringes
ELECTRICIAN (Alarm Installation)…….	$ 24.31	5.53
INSTALLER – OVERHEAD DOOR….	$ 27.98	0.00
IRONWORKER, ORNAMENTAL……..	$ 18.48	7.93
TRUCK DRIVER: Tractor Haul Truck…...	$ 13.57	1.18

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026($16.20) or 13658 ($12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the Contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year.

Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on Contractor requirements and worker protections under the EO is available at

https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5(a)(1)(ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CSA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations Wage and Hour Division

U.S. Department of Labor

200 Constitution Avenue,

N.W. Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator

U.S. Department of Labor

200 Constitution Avenue,

N.W. Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board

U.S. Department of Labor

200 Constitution Avenue, N.W. Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

§5.5 Contract provisions and related matters.

(a) The Agency head shall cause or require the contracting officer to insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a public building or public work, or building or work financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated),and which is subject to the labor standards provisions of any of the acts listed in Sec. 5.1, the following clauses (or any modifications thereof to meet the particular needs of the agency, *Provided,* That such modifications are first approved by the Department of Labor):

(1) Minimum wages. (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in Sec. 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination, and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

ATTACHMENT K

Disadvantaged Business Enterprises (DBE) Requirements

Prime contractors bidding on this project must follow, document, and maintain documentation of their Good Faith Efforts (GFE), as listed below, to ensure that Disadvantaged Business Enterprises (DBEs) have the opportunity to participate in the project by increasing DBE awareness of procurement efforts and outreach. Bidders must make the following Good Faith Efforts for any work that will be subcontracted.

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. Place DBEs on solicitation lists and solicit DBEs whenever they are potential sources.

2. Make information on forthcoming opportunities available to DBEs. Arrange timeframes for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. Whenever possible, post solicitation for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date. The DBEs should be given a minimum of 5 days to respond to the posting.

3. Consider in the contracting process whether firms competing for large contracts can be subcontracted with DBEs. Divide total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

4. Encourage contracting with a consortium of DBEs when a contract is too large for one DBE firm to handle individually.

5. Use the services and assistance of the Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce.

Subsequent to compliance with the Good Faith Efforts, the following conditions also apply under the DBE requirements. Completed Good Faith Efforts Worksheets, along with the required supporting documentation outlined in the instructions, must be submitted with your bid proposal. EPA form 6100-2 must also be provided at the pre-bid meeting. A copy of this form is available on the Forms and Guidance page of the EGLE Water Infrastructure Financing Section website.

1. The prime Contractor must pay its subcontractor for work that has been satisfactorily completed no more than 30 days from the prime Contractor's receipt of payment from the Owner.

2. The prime Contractor must notify the Owner in writing prior to the termination of any DBE subcontractor for convenience by the prime Contractor and employ the Good Faith Efforts if soliciting a replacement Contractor.

3. If a DBE Contractor fails to complete work under the subcontract for any reason, the prime Contractor must employ the Good Faith Efforts if soliciting a replacement Contractor.

4. The prime Contractor must employ the Good Faith Efforts.

Good Faith Efforts Worksheet

Bidder: _____

Subcontract Area of Work (one per worksheet):_____

Outreach Goa/: Solicit a minimum of three (3) DBEs via email/letter/fax. It is recommended that various sources be used to locate the minimum number of DBEs. The Michigan Department of Transportation (MDOT) website and www.sam.gov registries may be two resources used to find a minimum of three DBEs.

List the DBEs contacted for the above area of work and complete the following information for each.

Company Name	Contact Method	Date Contacted	Price Quote Received	Accepted or Rejected	If rejected, explain why

Explanation for Not Achieving a Minimum of Three Contacts; you may include a printout of the MDOT and www.sam.gov search results (attach extra sheets if necessary):

MITA DBE Posting Date (if applicable):_____
(Attach a copy of the DBE advertisement)

Other Efforts (attach extra sheets if necessary):

Please include the completed worksheet and supporting documentation with the bid proposal.

Instructions to Bidders for the Completion of the Good Faith Efforts Worksheet

1. Separate worksheets must be provided for each area of work to be subcontracted out. This includes both major and minor subcontracts.

2. A minimum of three (3) DBEs must be contacted by a verifiable means of communication such as email, letter, or fax for each area of work to be subcontracted out. Copies of the solicitation letters/emails and fax confirmation sheets must be provided with the worksheet.

3. If less than three (3) DBEs exist statewide for the area of work, then provide documentation that other DBE resources were consulted. This may include the MOOT and www.sam.gov registries and an advertisement in a publication. A printout of the website searched (conducted prior to the end of the bid period) must be submitted.

4. Posting solicitations for quotes/proposals from DBEs on the MITA website (www.mitadbe.com) is highly recommended to facilitate participation in the competitive process whenever possible. The solicitation needs to identify the project and the areas of work to be subcontracted out. A copy of the MITA DBE advertisement must be submitted with the Good Faith Efforts worksheet, if used, or a printout of the resulting quotes posted to the MITA website can be submitted with this form as supporting documentation.

5. If the area of work is so specialized that no DBEs exist, then an explanation is required to support that conclusion, including the documentation required in number 3 above.

6. The date of the DBE contact must be identified, as it is important to document that the DBE solicitation was made during the bid period and that sufficient time was given for the DBE to return a quote.

7. Each DBE firm's price quote must be identified if one was received, or N/A entered on the worksheet if a quote was not received. Copies of all quotes must be submitted with the worksheet.

8. If a quote was received, indicate if it was accepted or rejected. Justification for not accepting a quote and not using the DBE subcontractor must be provided.

9. Under Other Efforts, please indicate additional steps you have taken to obtain DBE contractors and provide the appropriate supporting documentation such as:

    a. Follow-up emails, faxes, or letters.
    b. Copies of announcements/postings in newspapers, trade publications, or minority media that target DBE firms.

Disadvantaged Business Enterprise (DBE) Good Faith Effort (GFE) Solicitations Quick Summary of the SRF/DWRF Requirements for Prime Bidders [JMB 1/17]

[Note: This process is very different from MDOT's DBE Policy. Unless the contract is part of a joint project with MDOT, if a bidder follows the MDOT DBE requirements they will not be in compliance.]

1. At least three (3) DBE subcontractors for each potential subcontracted area of work must be directly contacted by Primes during the bidding period (i.e. prior to bid opening). Primes must complete a GFE Worksheet for each area of work that may be subcontracted and attach documentation of the direct contacts that were made with DBE subcontractors (e.g. copies of all solicitation letters, e-mails, fax confirmation sheets, phone logs, etc.).

The Prime must indicate on each GFE Worksheet if there was a 'Price Quote Received' and if it was 'Accepted/Rejected' along with an Explanation if it was Rejected.

2. If a Prime determines less than three (3) DBE subcontractors exist for an area of work that may be subcontracted, printouts dated prior to the bid opening must be provided for adequate supporting documentation EITHER from two (2) state-wide DBE registries and an advertisement through a publication which directly contacts DBEs for identified subareas (e.g. MITA) OR from three (3) state-wide DBE registries without publishing such an advertisement. The Michigan Department of Transportation (MDOT-MUCP) http://mdotjboss.state.mi.us/UCP/ and the federal System for Award Management (SAM) www.sam.gov are both acceptable DBE registries. Other registries consulted will be considered if printouts are provided dated prior to the opening of bids.

[Note: If a Prime claims on its GFE Worksheet there are zero (0) DBE subcontractors for an area of work, the printouts must support this. If a Prime claims on its GFE Worksheet there are only one or two (1 or 2) DBE subcontractors, the printouts must support this AND a direct contact(s) for each identified DBE subcontractor must be documented.]

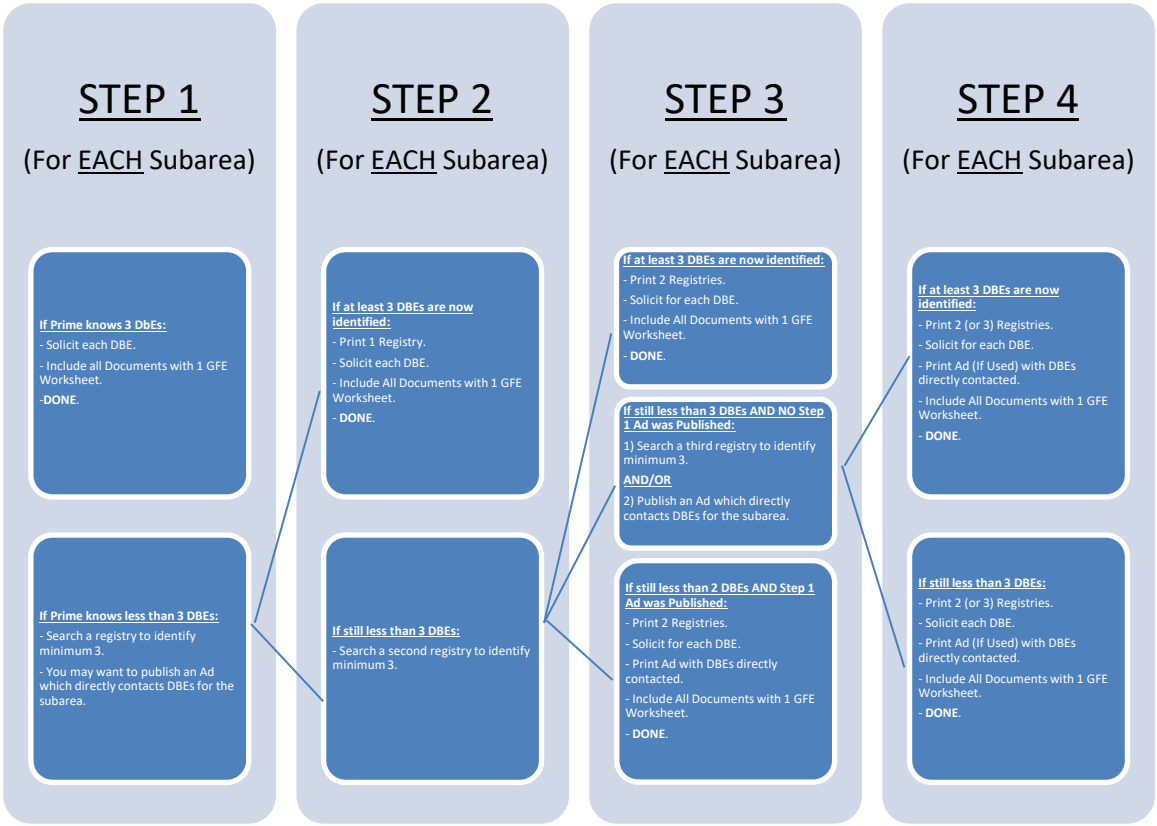
3. Posting a solicitation for quotes/proposals from DBE subcontractors on the MITA website (www.mitadbe.com) is highly recommended to facilitate participation in the competitive process. The solicitation must identify the project and the area(s) of work to be subcontracted. If used, a copy of the MITA advertisement must be provided.

4. Refer to the DBE-GFE solicitation documents in the current version of the required contract language and the design phase guidance which are both available on the DEQ website at www.michigan.gov/cleanwaterrevolvingfund. If a potential bidder has any DBE-GFE questions, have them contact the DEQ Project Manager.

IF YOU INTEND TO SUBCONTRACT WORK, FOLLOW FLOW CHART PROCESS BELOW FOR EACH SUBAREA OR ELSE YOUR BID WILL BE REJECTED.

A DBE-GFE Flow Chart for Prime Bidders [JMB 7 June 2017]
REQUIREMENT: Solicit At Least 3 DBEs for EACH Subarea

[Note: Prime Bidders must follow this Flow Chart process below for EACH Subarea AND complete prior to bid opening all the necessary activities in order to achieve a 'DONE' status. If a Prime Bidder will be Self-Performing all the work, a GFE Worksheet must be filled out as such for a 'DONE' status.]



Disadvantaged Business Enterprise (DBE) and Good Faith Efforts (GFE) Requirements
Frequently Asked Questions Regarding Contractor Compliance

Q: What is the Good Faith Efforts Worksheet and how is it completed?
A: The worksheet captures efforts by the prime Contractor to solicit DBEs for each area of work type that will be subcontracted out. A separate GFE Worksheet must be provided by the prime Contractor for each area of work type to be subcontracted out. There are specific instructions that accompany the worksheet that prescribe minimum efforts which bidders must make in order to be in compliance with the DBE requirements.

Q: Can non-certified DBEs be used?
A: While non-certified DBEs can be used, only DBEs, MBEs, and WBEs that are certified by EPA, SBA, or MOOT (or by tribal, state, and local governments, as long as their standards for certification meet or exceed the standards in EPA policy) can be counted toward the fair share goal. Proof of certification by one of these recognized and approved agencies should be sought from each DBE.

Q: How does a DBE get certified?
A: Applications to be certified by MOOT can be found at mdotjboss.state.mi.us/MUCPWeb/eliqibilityRequirements.htm
To register with the U.S. Small Business Association visit sba.gov/federal-contracting/contracting-assistance-programs/small-disadvantaged-business
To be certified by EPA, a DBE must first have sought certification through SBA, MOOT, or a tribal, state, or local organization and be unsuccessful in that attempt.

Q: If a bidder follows the MOOT DBE requirements, will the bidder comply with the SRF DBE requirements?
A: No. Federally funded highway projects utilize DBE goals, which require a certain percentage of
work be performed by DBE subcontractors. For SRF projects, there is no financial goal. However, there is a solicitation effort goal. Bidders must use Good Faith Efforts for each and every area of work to be subcontracted out to obtain DBEs. The bidders are not required to use DBEs if the quotes are higher than non-DBE subcontractors. There is no required DBE participation percentage contract goal for the SRF. However, if the SRF project is part of a joint project with MOOT, the project can be excluded from SRF DBE requirements (i.e., the Good Faith Efforts Worksheet is not required) as it would be difficult to comply with both programs' requirements.

Q: Should the Good Faith Efforts Worksheet and supporting documentation be submitted with bid proposals?
A: Yes. This is a requirement to document that the Contractor has complied with the DBE requirements and GFE. These compliance efforts must be done during the bidding phase and not after-the-fact. It is highly recommended that the need for these efforts and the submittal of the forms with the bid proposals be emphasized at the pre-bid meeting. Failure to show that the Good Faith Efforts were complied with during the bidding process can lead to a prime Contractor being found non-responsive.

Q: What kinds of documentation should a Contractor provide to document solicitation efforts?
A: Documentation can include fax confirmation sheets, copies of solicitation letters/emails, printouts of online solicitations, printouts of online search results, affidavits of publication in newspapers, etc.

Q: What if no forms are turned in with the bid proposal or forms are blank or incomplete? Should this because to determine that the bidder is non-responsive?
A: While the Good Faith Efforts Worksheet is important, it is more critical to confirm that the Contractor complied with the DBE requirements prior to bid opening. The Owner should contact the bidder as soon as deficiencies are noted for documentation of efforts taken to comply with the

DBE requirements. Immediate submittal of the completed forms will be acceptable provided the Good Faith Efforts were made and it is just a matter of transferring information to the forms.

Q: How much time will compliance with GFE require in terms of structuring an adequate bidding period?
A: Due to the extent of the efforts required, a minimum of 30 calendar days is recommended between bid posting and bid opening to ensure adequate time for contractors to locate certified DBEs and solicit quotes.

Q: How does a Contractor locate certified DBEs?
A: MOOT has a directory of all Michigan certified entities located at mdotjboss.state.mi.us/MUCPWeb/. Additionally, the federal System for Award Management (SAM) is another place to search and can be found at sam.gov. SAM contains information from the former Central Contractor Registration (CCR) database.

Q: If the bidder does not intend to subcontract any work, what forms, if any, must be provided with the bid proposal?
A: The bidder should complete the Good Faith Efforts Worksheet with a notation that no subcontracting will be done. However, if the bidder is awarded the contract and then decides to subcontract work at any point, then the Good Faith Efforts must be made to solicit DBEs.

Q: If the prime Contractor is a DBE, does he have to solicit DBE subcontractors?
A: Yes, the DBE requirements still apply if the prime intends to subcontract work out. GFE must be used to solicit DBEs.

Q: If the area of work is one where there are less than three DBE contractors, how is the Contractor to document this?
A: Copies of printouts from MOOT and SAM showing no DBEs and advertisements soliciting quotes for all subcontract areas, including the questionable areas, will be adequate if the dates on the printouts are prior to the bid or proposal closing date.

ATTACHMENT L
FEDERAL DEBARMENT CERTIFICATION FORM

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transactions

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension (1986) and Executive Order 12689, Debarment and Suspension (1989) at 2 C.F.R. Part 180.

(BEFORE COMPLETING CERTIFICATION, READ THE INSTRUCTIONS ON THE WHICH ARE AN INTEGRAL PART OF THE CERTIFICATION)

1. The prospective recipient of Federal assistance funds certifies, by Response, that it is in compliance with the requirements of 2 C.F.R. Part 180 and that neither it, its principals, nor its subcontractors are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. Where the prospective recipient of Federal assistance funds is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this Response.

ATTESTATION

By signing this report, I certify to the best of my knowledge and belief that the foregoing is true, complete, and accurate. I am aware that any false, fictitious, or fraudulent information, or the omission of any material fact, may subject me to criminal, civil or administrative penalties for fraud, false statements, false claims or otherwise. (U.S. Code Title 18, Sections 3729-3730 and 3801-3812).

_____

Company Name

_____

Name and Title of Authorized Representative

_____ _____

Signature Date

Instructions for Certification

1. By signing and submitting this Response, the prospective recipient of Federal assistance funds is providing the certification as set out below.

2. The certification in this class is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective recipient of Federal assistance funds knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the Department of Labor (DOL) may pursue available remedies, including suspension and/or debarment.

3. The prospective recipient of Federal assistance funds shall provide immediate written notice to the person to which this Response is submitted if at any time the prospective recipient of Federal assistance funds learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The prospective recipient of Federal assistance funds agrees by submitting this Response that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the DOL.

5. The prospective recipient of Federal assistance funds further agrees by submitting this Response that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

ATTACHMENT M

The Six Good Faith Efforts and Contract Administration Requirements

They Keys to Outreach and Opportunity

Program Comparison

Old MBE/WBE Program	New DBE Program
Following the "Six Affirmative Steps" under 40 CFR Part 31, and the Six Positive Efforts under 40 CFR Part 30 were required by all grantees.	The "Six Good Faith Efforts" combine the "Six Affirmative Steps" and the "Six Positive Efforts" and are still required by all grantees. **The substance of the efforts has not changed**.
No protections for DBE Subcontractors	Several mechanisms are in place to protect DBE Subcontractors: • 30 day payment provision, notifications of DBE terminations, and continuing the Six Affirmative Steps after termination of a DBE. • Completion of 3 new forms to prevent "bait and switch" tactics. None of these new forms are completed, or submitted by the grant recipient. These forms are filled out by the recipient's prime contractors and subcontractors.
No mechanism for recipients to develop and maintain their own list of DBEs	Recipients are now required to create and maintain a bidders list. There is a $250K exemption for this requirement.

WHAT IS THE PURPOSE OF THE SIX GOOD FAITH EFFORTS?

The Good Faith Efforts are required methods implored by all EPA financial assistance agreement recipients to ensure that all disadvantaged business enterprises (DBEs) have the opportunity to compete for procurements funded by EPA financial assistance dollars.

WHAT ARE THE SIX GOOD FAITH EFFORTS?

- Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local and Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

- Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

- Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

- Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
- Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.

- If the prime Contractor awards subcontracts, require the prime Contractor to take the steps in paragraphs (a) through (e) of this section.

WHAT ARE THE NEW CONTRACT ADMINISTRATION REQUIREMENTS?

There are a number of new provisions designed to prevent unfair practices that adversely affect DBEs. Those provisions are as follows:

- A recipient must require its prime Contractor to pay its subcontractor for satisfactory performance no more than 30 days from the prime Contractor's receipt of payment from the recipient.

- A recipient must be notified in writing by its prime Contractor prior to any termination of a DBE subcontractor for convenience by the prime Contractor.

- If a DBE subcontractor fails to complete work under the subcontract for any reason, the recipient must require the prime Contractor to employ the six good faith efforts if soliciting a replacement subcontractor.

- A recipient must require its prime Contractor to employ the six good faith efforts even if the prime Contractor has achieved its fair share objectives.

WHAT ARE THE NEW FORMS ASSOCIATED WITH THE NEW CONTRACT ADMINISTRATION PROVISIONS?

- EPA Form 6100-2 - DBE Program Subcontractor Participation Form. This form gives a DBE subcontractor the opportunity to describe the work the DBE subcontractor received from the prime Contractor, how much the DBE subcontractor was paid and any other concerns the DBE subcontractor might have.

- EPA Form 6100-3 - DBE Program Subcontractor Performance Form. This form captures an intended subcontractor's description of work to be performed for the prime Contractor and the price of the work submitted to the prime.

- EPA Form 6100-4 – DBE Program Subcontractor Utilization Form. This form captures the prime's intended use of an identified DBE subcontractor, and the estimated dollar amount of the subcontract.

Form:	Requirement:	Provided By:	Completed By:	Submitted To:
EPA Form 6100-2	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	EPA DBE Coordinator
EPA Form 6100-3	Recipients required to have prime contractors provide form to Subcontractors	Prime Contractors	DBE Subcontractors	Recipients as part of a bid or proposal package
EPA Form 6100-4	Recipients required to have prime contractors complete the form	Recipients	Prime Contractors	Recipients as part of a bid or proposal package

What is the New Bidders List Requirement?

The purpose of a bidders list is to provide the recipient and entities receiving identified loans who conduct competitive bidding with as accurate of a database as possible about the universe of MBE/WBE and non-MBE/WBE prime and subcontractors.

- A recipient of a Continuing Environmental Program Grant or other annual grant must create and maintain a bidders list.

- A recipient of an EPA financial assistance agreement to capitalize a revolving loan fund also must require entities receiving identified loans to create and maintain a bidders list if the recipient of the loan is subject to, or chooses to follow, competitive bidding requirements.

- The list must include all firms that bid or quote on prime contracts, or bid or quote subcontracts on EPA assisted projects, including both MBE/WBEs and non-MBE/WBEs.

- The bidders list must only be kept until the grant project period has expired and the recipient is no longer receiving EPA funding under the grant. For entities receiving identified loans, the bidders list must only be kept until the project period for the identified loan has ended.

WHAT INFORMATION MUST BE RETAINED ON THE BIDDERS LIST?

- (1) Entity's name with point of contact;

- (2) Entity's mailing address, telephone number, and email address;

- (3) The procurement on which the entity bid or quoted, and when; and

- (4) Entity's status as an MBE/WBE or non-MBE/WBE.

WHAT ARE THE EXEMPTIONS FROM THE BIDDERS LIST REQUIREMENTS?

- A recipient of an EPA financial assistance agreement in the amount of $250,000 or less for any single assistance agreement, or of more than one financial assistance agreement with a combined total of $250,000 or less in any one fiscal year, is exempt from the requirement to create and maintain a bidders list.

- A recipient under the CWSRF, DWSRF, or BCRLF Program is not required to apply the bidders list

requirement to an entity receiving an identified loan in an amount of
$250,000 or less, or to an entity receiving more than one identified loan with a combined total of $250,000 or less in any one fiscal year.

- These exemptions are limited to the bidders list requirements only.

ATTACHMENT N

THIS IS AN OFFICIAL GOVERNMENT NOTICE AND
MUST BE DISPLAYED WHERE EMPLOYEES CAN READILY SEE IT.

2017 Rev. 0

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
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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.

ATTACHMENT O

Historic Drawings

NOTES:

- PRIOR TO THE START OF WORK, CONTRACTOR SHALL CONTACT "MISS DIG" @ 800-482-7171 FOR EXACT LOCATION OF UNDERGROUND UTILITIES.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ALL FEES AND PERMITS
- CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LAYOUT STAKING. PARKS DEPARTMENT WILL ASSIST IN FIELD LOCATING THE EXACT PATHWAY ALIGNMENT. (CONTRACTOR TO PROVIDE LATHE, ETC. AS NECESSARY)
- EXISTING TOPSOIL, WHERE IF EXISTS, SHALL BE STRIPPED AND STOCKPILED PRIOR TO GRADING OPERATION. CONTRACTOR SHALL SUPPLY ADDITIONAL TOPSOIL AS NECESSARY. TOPSOIL SHALL BE RESPREAD AT A MINIMUM DEPTH OF 4".
- GRADING OPERATION SHALL INCLUDE CLEARING AND GRUBBING OF ALL SCRUB GROWTH VEGETATION WITHIN THOSE AREAS, OF PROPOSED GRADE CHANGE. APPROVAL OF THE PARKS DEPT. SHALL BE OBTAINED PRIOR TO THE REMOVAL OF ANY TREE OF 6" TRUNK DIAMETER OR GREATER.
- ABSOLUTELY NO CONSTRUCTION TRAFFIC WILL BE ALLOWED OVER THE EXISTING PUMP STATION SEPTIC FIELD. CONTRACTOR SHALL PROVIDE BARRICADES AS NECESSARY.
- 135 C.Y. EXISTING SAND/CLAY FILL (NOT REFLECTED BY EXISTING CONTOURS ON PLAN) LOCATED AT SOUTH EDGE OF EXISTING PARKING AREA SHALL BE USED IN THE PROPOSED MOUND NORTH OF THE ENTRY DRIVE.
- ALL SALVAGABLE ITEMS TO BE REMOVED SHALL BE TRANSPORTED TO CITY STORAGE FACILITIES ON ELLSWORTH ROAD ADJACENT TO THE AIRPORT. ALL OTHER ITEMS TO BE DISPOSED OF OFF-SITE AT CONTRACTOR'S EXPENSE.

EDGE OF ASPHALT SHALL BE CUT TO A CLEAN EDGE PRIOR TO INSTALLATION OF TURN LANES AND PRIOR TO REMOVAL OF EXISTING ASPHALT DRIVE.

- CONSTRUCTION ACCESS TO THE NORTH SIDE OF THE TRACKS SHALL BE UNDER THE EXISTING CONRAIL BRIDGE. GABION WALKWAY MAY BE UTILIZED FOR ACCESS HOWEVER CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE INCURRED (SETTLEMENT, GABION BASKET DISPLACEMENT, ETC.)
- CONTRACTOR SHALL INSTALL TREE PROTECTION DEVICES AROUND 5 LARGE TREES N. OF EXISTING DRIVE AND AROUND BLACK LOCUST GROVE ADJ. TO POND. SAID DEVICES SHALL CONSIST OF SNOW FENCE INSTALLED AT THE DRIP LINE OF THE TREES. OTHER TREES SUBJECT TO CONSTRUCTION DAMAGE SHALL BE PROTECTED FROM MOVING EQUIPMENT BY MEANS OF BOARDS LASHED TOGETHER AROUND THE TREE TRUNK.
- EXISTING PUMP STATION DRIVE SHALL NOT BE REMOVED UNTIL SUCH TIME AS THE PROPOSED ACCESS DRIVE IS OPEN TO VEHICULAR TRAFFIC.
- 30"-18" CMP LOCATED AT THE OUTLET TO THE PROPOSED POND IS EXISTING BUT MUST BE RESET AT THE ELEVATIONS SHOWN.
- CONTRACTOR SHALL HAND DIG TO ACCOMPLISH THE CHANGE IN GRADE AROUND THE EXISTING POWER POLE S.E. OF THE PROPOSED PARKING LOT.
- LIMITS OF CONSTRUCTION SHALL BE NO MORE THAN 3' BEYOND THE EDGE OF ANY PROPOSED IMPROVEMENT
- CONTRACTOR SHALL SECURE THE CONSTRUCTION AREA FROM UNAUTHORIZED VEHICULAR ACCESS THROUGH TIMELY INSTALLATION OF THE ENTRANCE GATE(S) OR BY OTHER APPROVED MEANS.
- EXACT LOCATION OF PICNIC TABLES AND BENCHES SHALL BE DETERMINED IN FIELD. INSTALLATION DETAILS FOR BENCHES AND PICNIC TABLES ARE LOCATED IN THE SPECIFICATION BOOK.
- MANHOLE TO BE ABANDONED SHALL HAVE RIM AND COVER REMOVED AND SHALL BE BACKFILLED W/ COMPACTED CLASS II FILL.

CONTRACTOR SHALL HAND DIG ALL FENCE POST HOLES IN VICINITY OF INDICATED SEPTIC FIELD. ADJUSTMENTS IN ACTUAL POST LOCATIONS MAY BE NECESSARY TO MISS EXISTING TILE LINES (4" TILES ARE LOCATED APPROX. 1'9" BELOW GRADE).

EXISTING CONDITIONS:

- CONTOUR LINE - 1' INTERVAL
- SPOT ELEVATION
- BENCHMARK
- STORM SEWER W/ HEADWALL
- SANITARY SEWER W/ MANHOLE
- WATER MAIN OR SERVICE LEAD
- OVERHEAD ELECTRIC W/ POWER POLE
- UNDERGROUND ELECTRIC
- OVERHEAD COMMUNICATION LINE W/ POLE
- FIRE HYDRANT
- LIGHT POLE
- ABANDONED UTILITIES
- CHAINLINK FENCE TO BE RELOCATED
- CHAINLINK FENCE TO REMAIN
- EDGE OF WATER OR CREEK
- EDGE OF GRAVEL SURFACING
- EXISTING VEGETATION W/ SPECIES & SIZE (SPECIES KEY: O = OAK, S = SPRUCE, W = WILLOW)

PROPOSED IMPROVEMENTS:

- CONTOUR LINE - 1' INTERVAL
- SPOT ELEVATION
- STORM SEWER W/ INLET
- OVERHEAD ELECTRIC W/ POLE
- UNDERGROUND ELECTRIC
- POLES TO BE REMOVED
- NEW (6'HGT. OR RELOCATED (7'HGT.) CHAINLINK FENCE
- ASPHALT PAVEMENT
- CAST-IN-PLACE CONC. CURB AND GUTTER
- PRE-CAST CONC. CURB
- GABION WALL
- EXISTING DRIVE TO BE REMOVED (ALT. BID)
- COMMON RIP-RAP
- ERODED AREAS
- HANDRAIL
- MANHOLE TO BE RAISED OR ABANDONED - I.S.A. IN EXISTING DRIVE (ALT. BID)

SOIL EROSION / SEDIMENTATION CONTROL:

- (SE) SEED AND MULCH
- (SO) SOD
- (VS) VEGETATIVE BUFFER STRIP
- (RR) RIP-RAP, GABIONS
- (AA) AGGREGATE COVER
- (SB) SEDIMENT BASIN
- (SFI) DRAIN INLET W/ FILTER FABRIC AND STONE COVER
- (SD) STONE CROSSING IN EXISTING DITCH TO FILTER RUN-OFF

P= PERMANENT MEASURE
T= TEMPORARY MEASURE

NOTES:
- CONTROL MEASURE SAT SHALL BE INSTALLED PRIOR TO THE START OF ANY WORK IN THE VICINITY OF THE PARKING LOT.
- INSTALLATION OF THE 12" CONC. PIPE SHALL BE ACCOMPLISHED IN A SINGLE DAY TO MINIMIZE SEDIMENTATION WITHIN THE EXISTING STREAM.
- CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING AND/OR REPAIRING ALL SEDIMENTATION CONTROL DEVICES DURING THE COURSE OF THE CONTRACT (PARTICULARLY AFTER MAJOR STORM EVENTS).
- ALL TEMPORARY MEASURES SHALL BE REMOVED BY THE CONTRACTOR AFTER TURF AREAS HAVE FULLY ESTABLISHED THEMSELVES OR EARLIER AT THE CITY'S DISCRETION.
- ROAD SURFACES SHALL BE KEPT FREE OF DIRT AND DEBRIS.
- ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED AS SOON AS POSSIBLE. AREAS WHICH MUST REMAIN IN A DISTURBED STATE FOR LONGER THAN 2 WEEKS SHALL BE TEMPORARILY MULCHED.
- THE NEED FOR ADDITIONAL SOIL EROSION/SEDIMENTATION CONTROL MEASURES MAY BECOME APPARENT AFTER CONSTRUCTION BEGINS. SAID ADDITIONAL MEASURES SHALL BE CONSIDERED AS EXTRAS TO THE CONTRACT, IF THEIR SIZE AND COMPLEXITY WARRANTS.

KEY NUMBERS ARE PER "MICHIGAN SOIL EROSION & SEDIMENTATION CONTROL GUIDEBOOK"

STONE FILTER
FILTER FABRIC
MEASURE 36T

CLEAN CRUSHED STONE FILTER
DEPRESS FILTER 6"
MEASURE 41T

SCALE 1" = 40'

BIRD ROAD
(E. BIRD RD. R.O.W. (E.W. ¼ LINE SEC. 17, ANN ARBOR TWP.)

HURON RIVER DRIVE

HURON RIVER
FLOW

BARTON POND
N.W.L. (MAY 1 - NOV. 1) 797.0
N.W.L. (NOV. 1 - MAY 1) 794.5

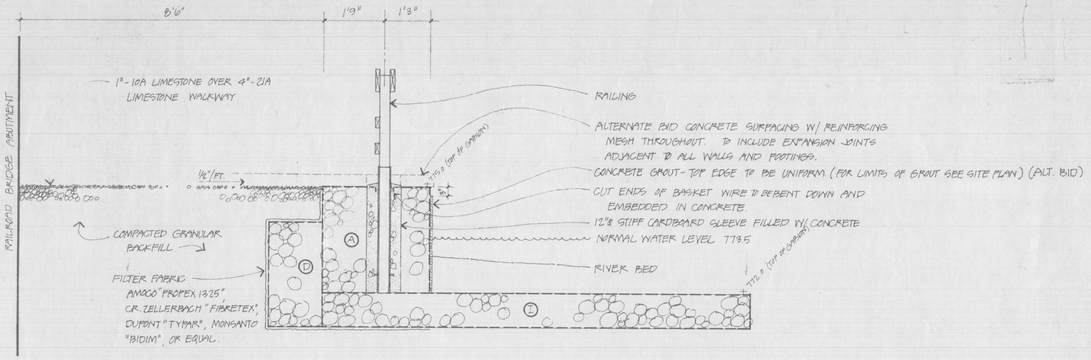
DRAWN C.HILL
DESIGNED C.HILL
CHECKED T.G.R.
DATE NOV. 10 1983

REVISIONS 4/29/83
POST BID REVISIONS

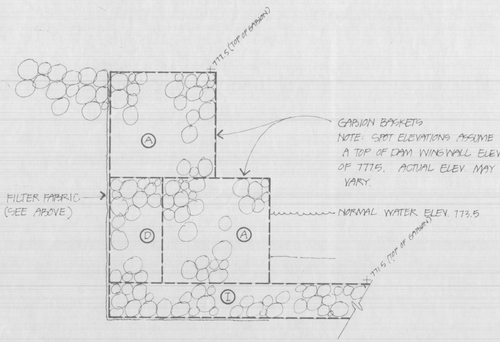
BARTON PARK
site plan

SHEET NO. 1

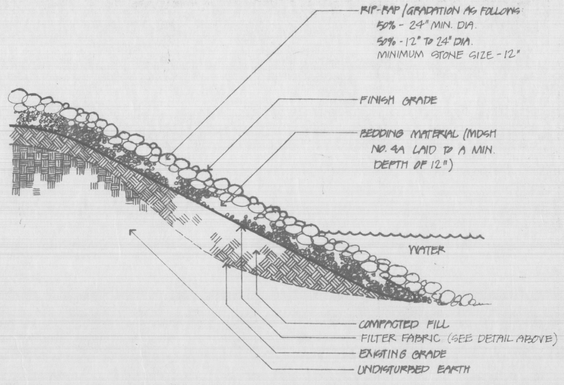
DEPARTMENT OF PARKS & RECREATION
100 N. FIFTH AVE. BOX 8647
ANN ARBOR, MICHIGAN 48107
TELEPHONE: (313) 994-2780
SUPERINTENDENT - VERN J. HARTENBURG



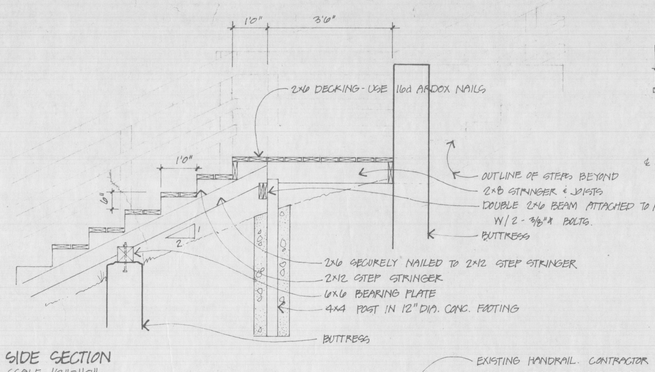
GABION WALL AND WALKWAY- SECTION AA
SCALE 1/2" = 1'0"



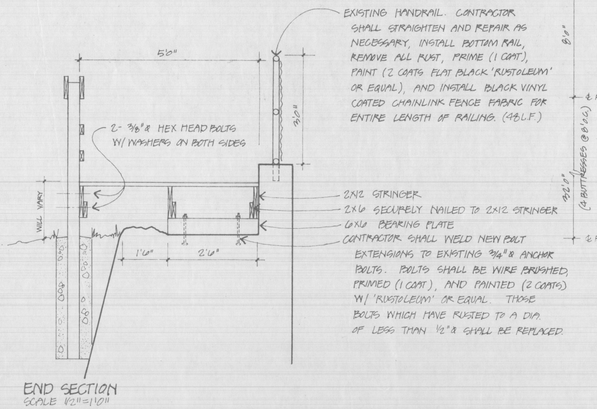
GABION SHORE PROTECTION - SECTION CC (ALT. BID)
SCALE 1/2" = 1'0"



LARGE RIP-RAP SHORE PROTECTION - SECTION C-C (BASE BID)
NO SCALE



SIDE SECTION
SCALE 1/2" = 1'0"



END SECTION
SCALE 1/2" = 1'0"

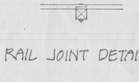
TIMBER STEPS ADJACENT TO DAM
SCALE AS NOTED

- ALL LUMBER SHALL BE PRESSURE TREATED IN ACCORDANCE W/ A.W.P.A. STANDARD P-5 (OSMOSE, WOLMAN, OR EQUAL): IN GROUND TIMBERS TO BE TREATED TO .50 LBS/C.F. RETENTION, ABOVE GROUND TIMBERS TO .20 LBS/C.F. RETENTION.
- ALL SAW CUTS, DRILLED HOLES, AND THE LIKE SHALL RECEIVE 2 COATS APPROVED BRUSH-ON PRESERVATIVE.
- ALL NAILS, BOLTS, AND HARDWARE SHALL BE HOT DIPPED GALVANIZED. ALL NUTS SHALL BE SET W/ PUNCH, COLD CHISEL, OR OTHER MEANS TO PREVENT UNAUTHORIZED REMOVAL.

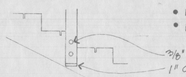
GENERAL TIMBER CONSTRUCTION NOTES

SECTION

NOTES:
- FOR POSTS INSTALLED IN GABIONS (W/O ALTERNATE BID CONC. SURFACING), THE FOLLOWING DIMENSIONS SHALL APPLY: * 1'3" ** 3'0" *** 3'4"
- HEIGHT OF RAILING @ STAIRS SHALL BE 3'0" MEASURED FROM TREAD NOSING.
- INSTALL ALL BOLTS W/ CARRIAGE HEAD TO THE WALK SIDE OF RAIL. BOLT THREADS SHALL NOT PROTRUDE MORE THAN 1/8" BEYOND NUT AFTER TIGHTENING.
- RAILS SHALL OVERHANG LAST POST BY 8".
- RAIL JOINTS SHALL BE STAGGERED FROM POST TO POST.
- POSTS TO BE 6'0" O.C. UNLESS NOTED OTHERWISE.

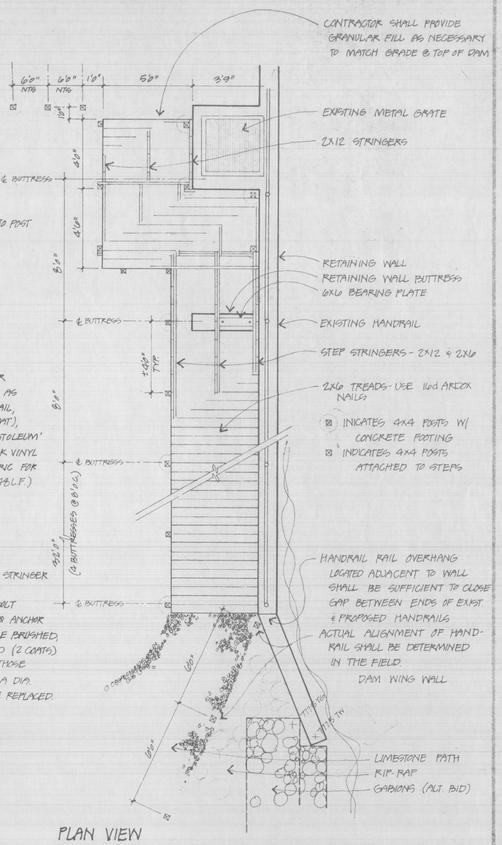


RAIL JOINT DETAIL

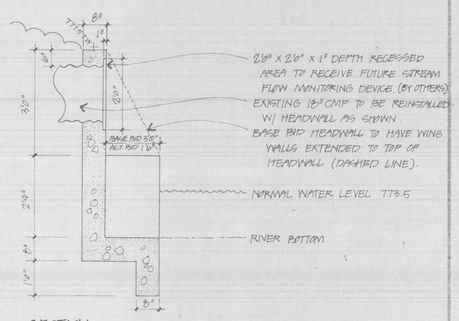


STEPS CONNECTION

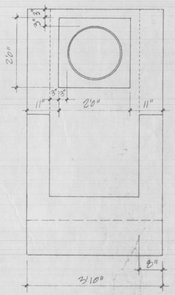
HANDRAIL
SCALE 1/2" = 1'0"



PLAN VIEW
SCALE 1/4" = 1'0"



SECTION



ELEVATION

HEADWALL - 18" CMP
SCALE 1/2" = 1'0"

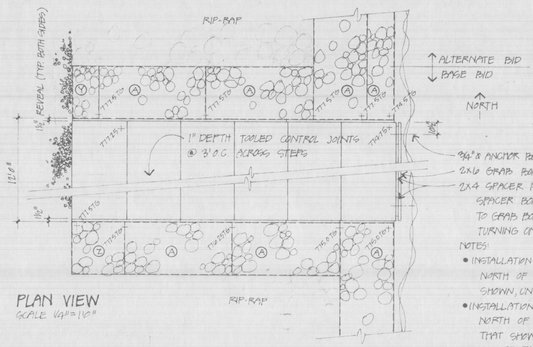
NOTES:
- HEADWALL TO BE REINFORCED THROUGHOUT W/ #4 BARS @ 12" O.C. BARS TO 2" MIN. COVER.
- EXPOSED EDGES OF CONCRETE TO BE CHAMFERED 1/2".
- REINSTALLATION OF THE EXISTING 18" CMP ALSO TO INCLUDE PROVISION OF A PREFORMED END SECTION @ INLET END OF PIPE.

GABION SCHEDULE

CODE	SIZE	C.Y. CAPACITY
(A)	6'X3'X3'	2
(D)	6'X3'X1'6"	1
(G)	6'X3'X1'	.67
(H)	9'X3'X1'	1
(I)	12'X3'X1'	1.33
(Y)	1'6"X3'X1'	.17
(Z)	3'X3'X1'	.33

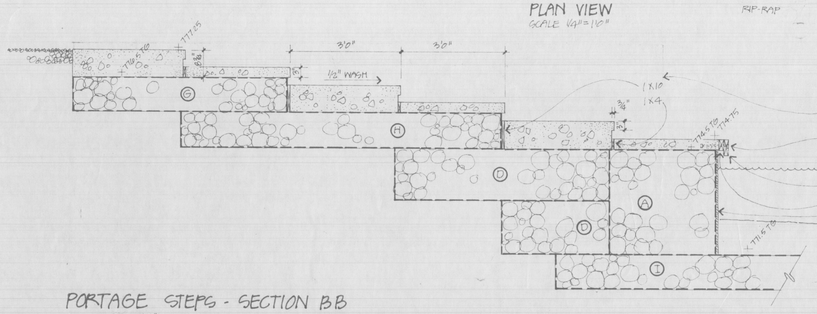
NOTE: GABIONS (Y) & (Z) SHALL BE FIELD FABRICATED TO THE SIZES SHOWN.

GABION BASKETS ARE AVAILABLE FROM MACCAFERRI GABIONS (GREAT LAKES) INC. 3155 BIG BEAVER RD SUITE 122 TROY, MICHIGAN 48084 TELEPHONE (313) 643-0088



PLAN VIEW
SCALE 1/4" = 1'0"

NOTES:
- INSTALLATION OF THE "CHEEK" GABIONS NORTH OF THE STEPS SHALL BE AS SHOWN, UNDER THE ALTERNATE BID.
- INSTALLATION OF THE "CHEEK" GABIONS NORTH OF THE STEPS SHALL MATCH THAT SHOWN FOR THE SOUTH SIDE, UNDER THE BASE BID.



PORTAGE STEPS - SECTION BB
SCALE 1/2" = 1'0"

NOTES:
- CONCRETE TO RECEIVE VERY COURSE BROOMED SURFACE TRANSVERSE TO PITCH OF STEPS.
- CONTRACTOR SHALL ENDEAVOR TO PULL THE GABION BASKET WIRE MESH UP INTO THE CONCRETE STEPS TO INSURE GOOD ADHESION.
- ALL SPOT ELEVATIONS ASSUME A TOP OF DAM WINGWALL ELEV. OF 777.5 AND THEREFORE MAY REQUIRE FIELD ADJUSTMENT TO CORRESPOND W/ ACTUAL WINGWALL ELEV.

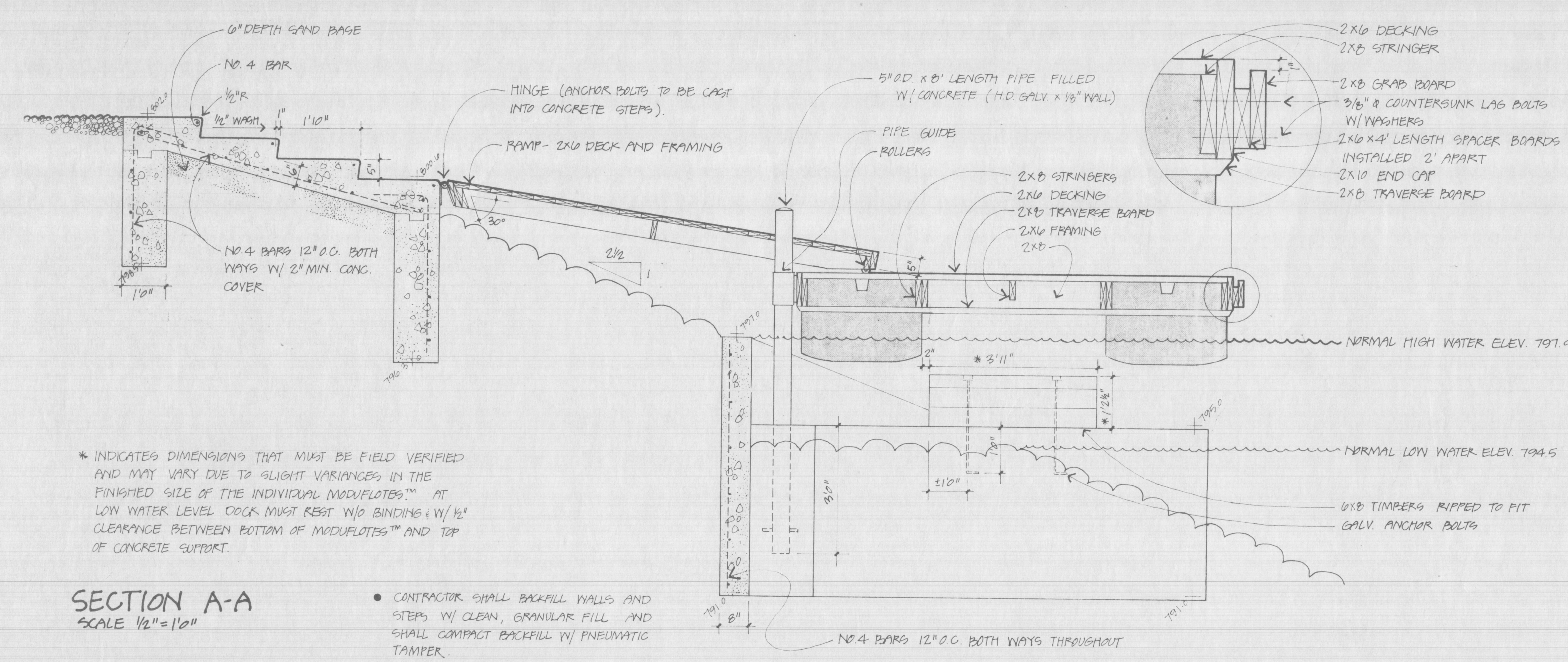
DESIGNED CHW | DRAWN CHW | DATE MAR. 8, 1995 | CHECKED T.G.F.

REVISIONS

BARTON PARK
river edge improvements

SHEET NO. 2

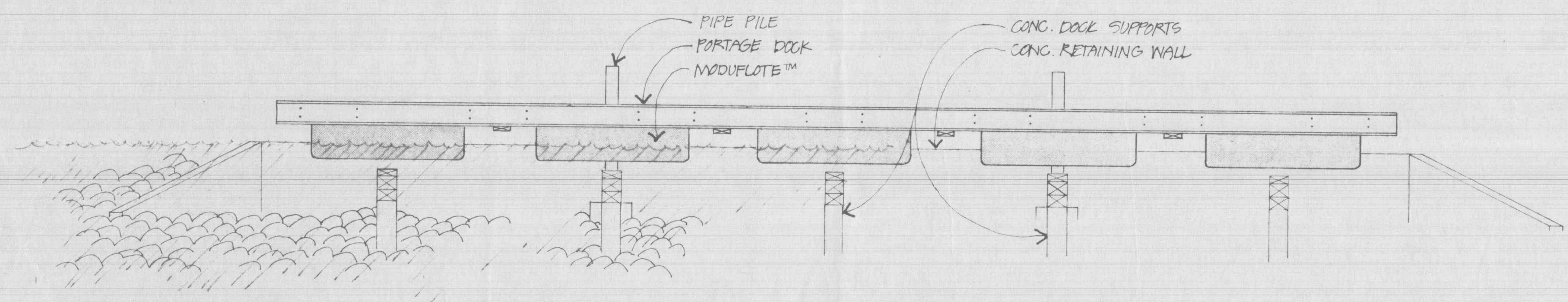
DEPARTMENT OF PARKS & RECREATION
100 N. FIFTH AVE. (BOX 8)
ANN ARBOR, MICHIGAN 48107
TELEPHONE: (313) 994-2780
SUPERINTENDENT - VERN J. MATTENSON



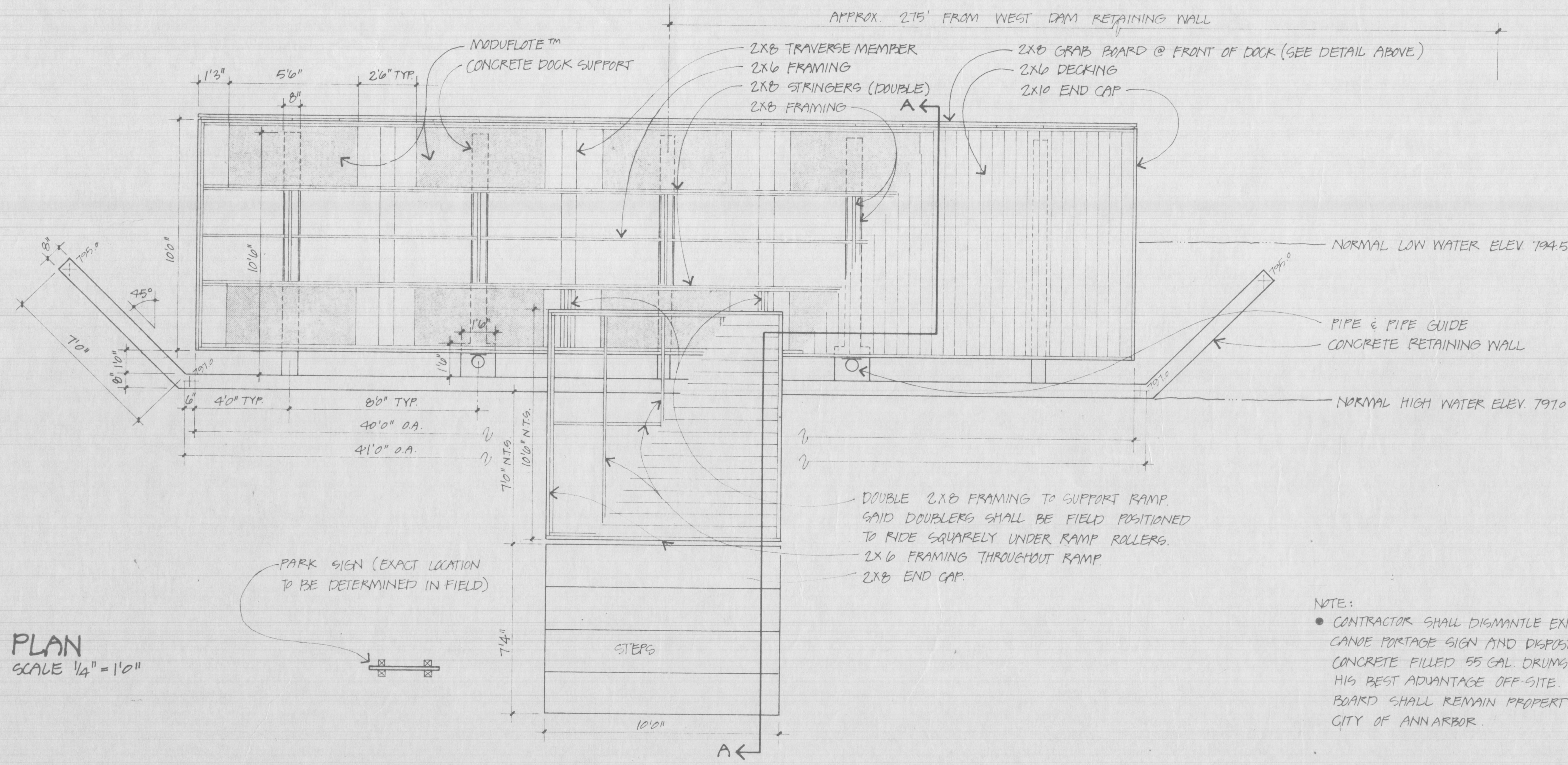
* INDICATES DIMENSIONS THAT MUST BE FIELD VERIFIED AND MAY VARY DUE TO SLIGHT VARIANCES IN THE FINISHED SIZE OF THE INDIVIDUAL MODUFLOTES™. AT LOW WATER LEVEL DOCK MUST REST W/O BINDING & W/ 1/2" CLEARANCE BETWEEN BOTTOM OF MODUFLOTES™ AND TOP OF CONCRETE SUPPORT.

SECTION A-A
SCALE 1/2" = 1'0"

- CONTRACTOR SHALL BACKFILL WALLS AND STEPS W/ CLEAN, GRANULAR FILL AND SHALL COMPACT BACKFILL W/ PNEUMATIC TAMPER.
- RIP-RAP REPLACEMENT ADJACENT TO STEPS AND WALLS SHALL CONFORM TO DRY RIP-RAP DETAIL, SHEET 4.



ELEVATION
SCALE 1/4" = 1'0"

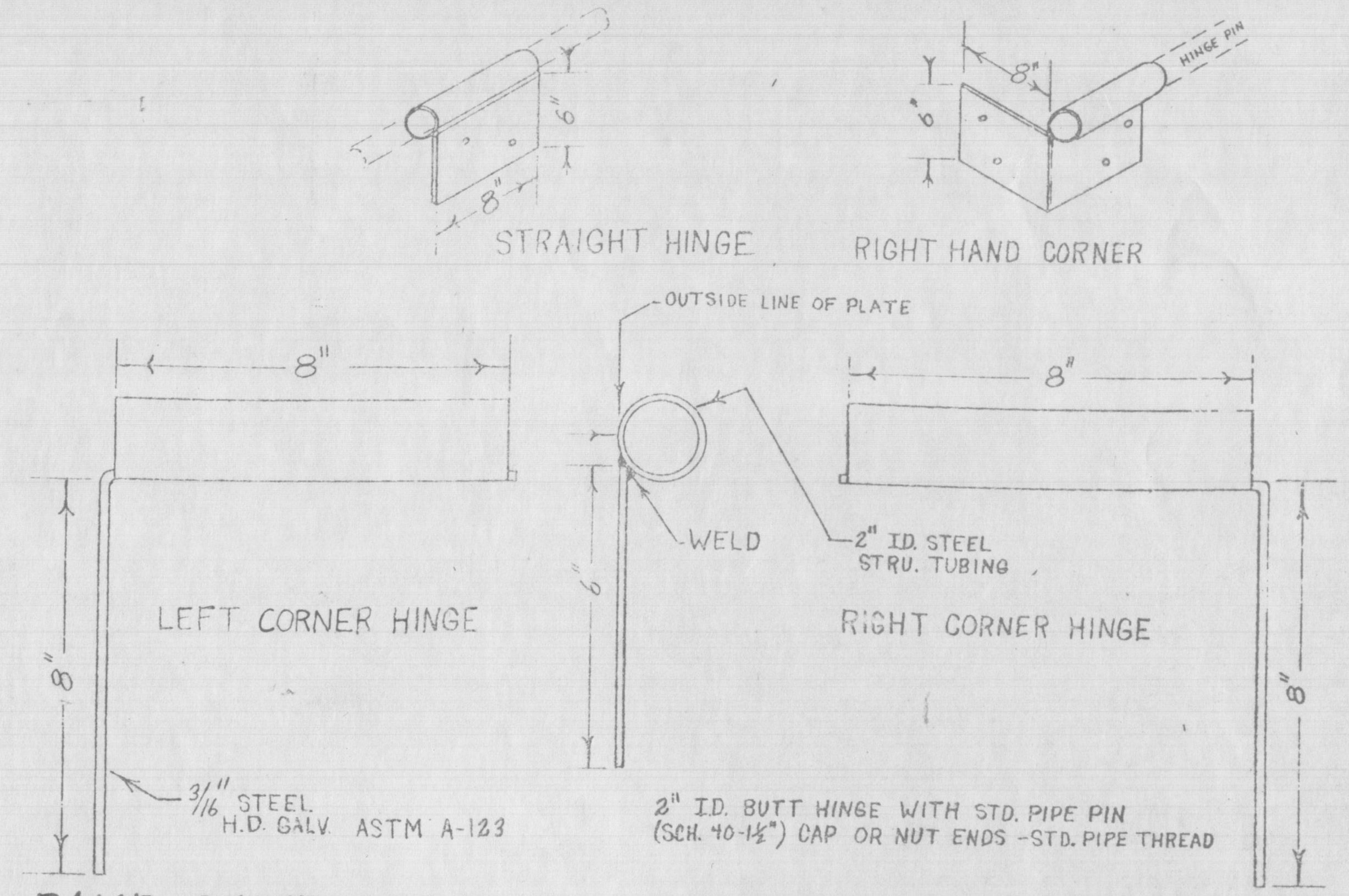


PLAN
SCALE 1/4" = 1'0"

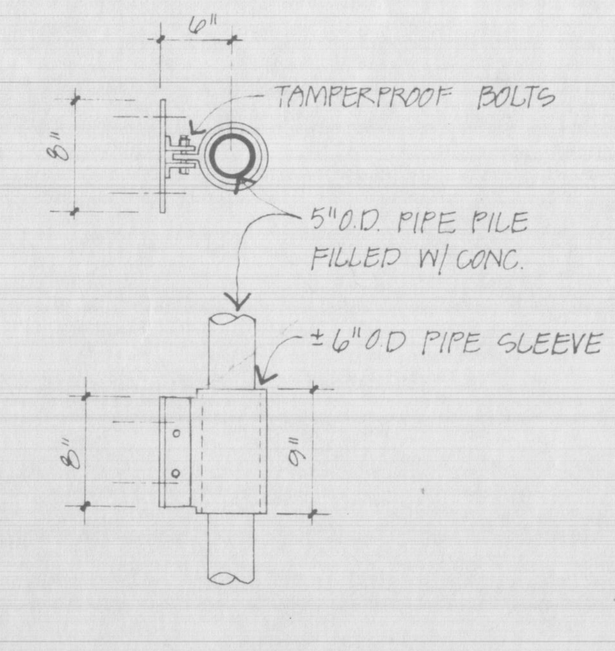
NOTE:
- CONTRACTOR SHALL DISMANTLE EXISTING CANOE PORTAGE SIGN AND DISPOSE OF CONCRETE FILLED 55 GAL. DRUMS TO HIS BEST ADVANTAGE OFF-SITE. SIGN BOARD SHALL REMAIN PROPERTY OF CITY OF ANN ARBOR.

NOTES:

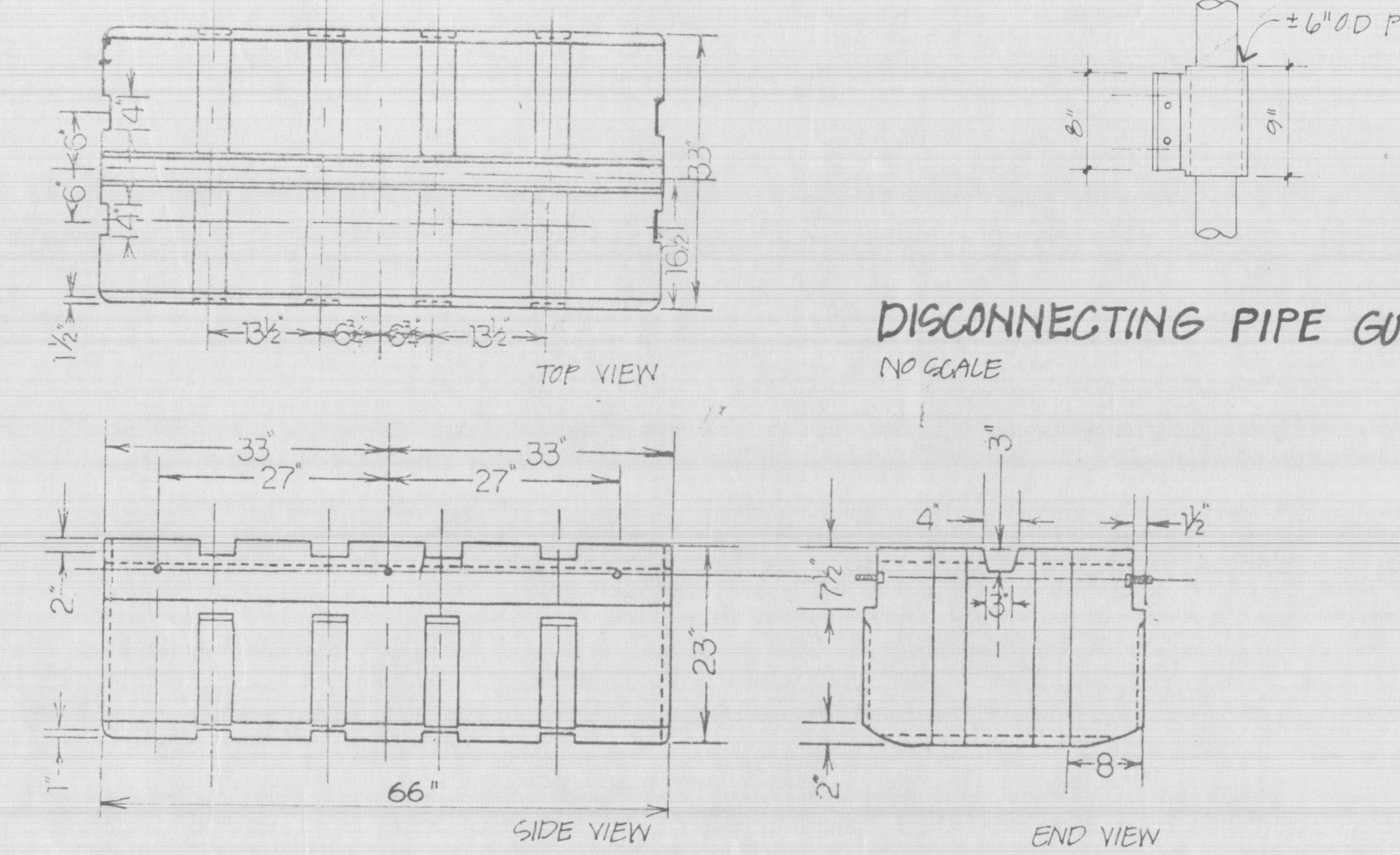
- MODUFLOTE™ IS A REGISTERED TRADEMARK OF THE E.W. HEINRICH CO. ALL STANDARD DRAWING USED HEREIN ARE PROPERTY OF THE E.W. HEINRICH CO. AND HAVE BEEN USED WITH THEIR PERMISSION.
- CONTRACTOR SHALL SUPPLY ALL MATERIALS NECESSARY. MODUFLOTES™, PIPE PILES, PIPE GUIDES, HINGES, ANGLE BRACES, BOLTS, ROLLERS, AND OTHER MISC. HARDWARE (EXCEPT NAILS) ARE AVAILABLE FROM:
  E. W. HEINRICH CO.
  8173 MACOMB ST., P.O. BOX 91
  GROSSE ILE, MI. 48138
  TELEPHONE 313-675-3010
- APPROVED EQUAL FLOTATION SYSTEMS MAY BE SUBSTITUTED. DRAWINGS SHALL ACCOMPANY ANY BID BASED ON APPROVED EQUAL SYSTEMS.
- ALL LUMBER SHALL BE CCA PRESSURE TREATED S.Y.P. OR DOUG. FIR IN ACCORDANCE WITH A.W.P.B. STANDARDS LP-22 (WOLMAN, OSMOSE, OR EQUAL). (.20 RETENTION)
- NAILS SHALL BE 16d ARDOX (GALV.).
- ROLLERS TO BE 'COLSON' NO. 3-4108-839, 500#, 4" DIA., 2" WIDE WITH BOLTS AND BRACKETS. OR EQUAL



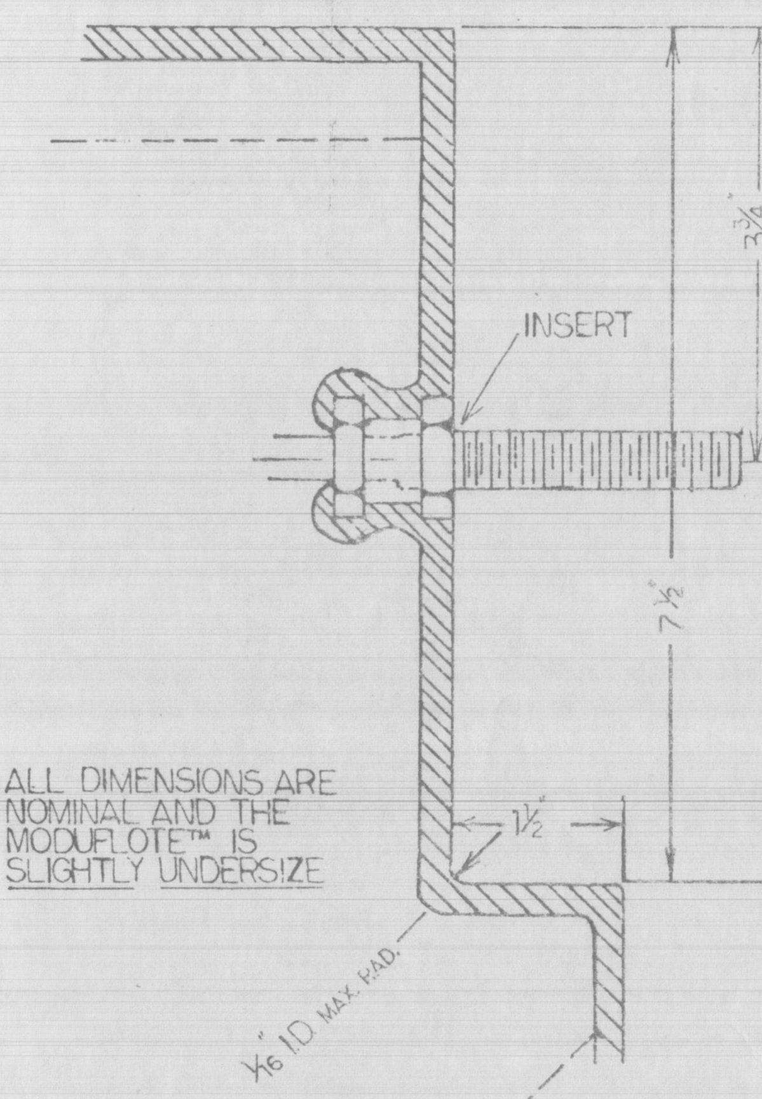
RAMP CONNECTORS
NO SCALE



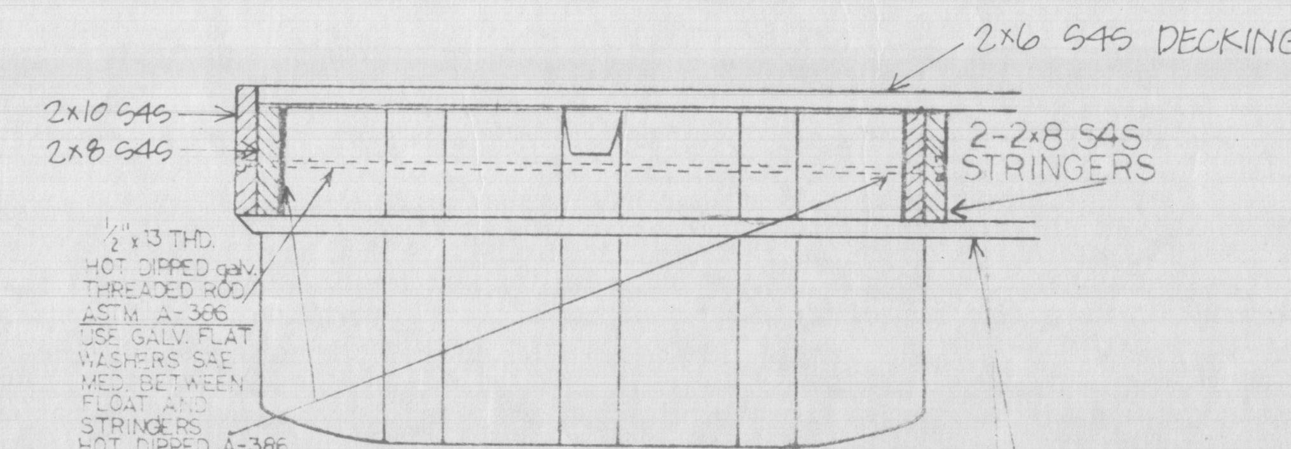
DISCONNECTING PIPE GUIDE
NO SCALE



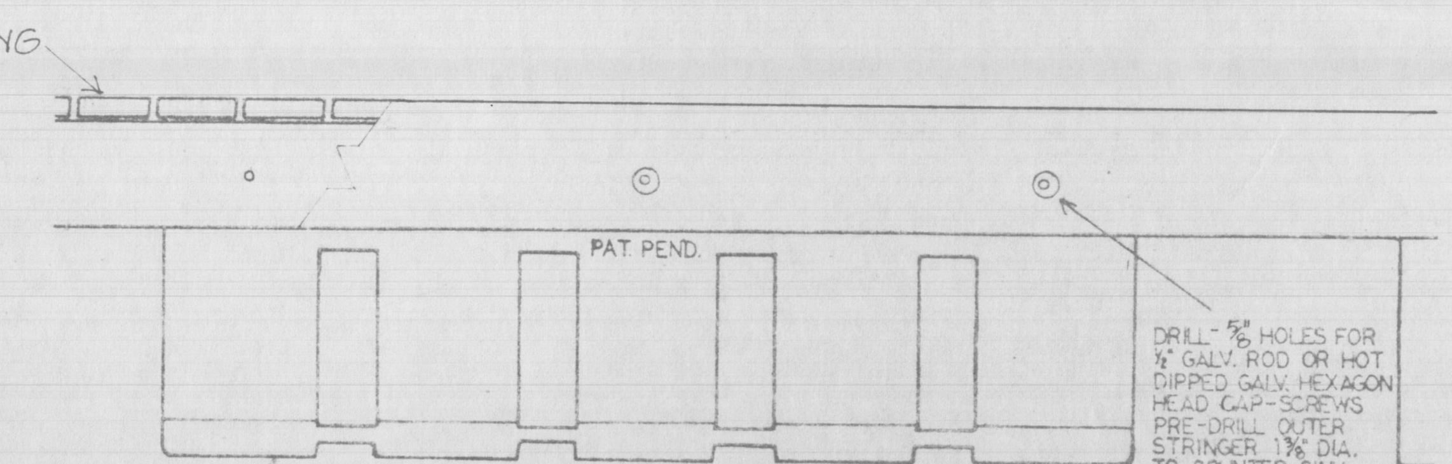
MODUFLOTE™ HF-20-25LF
NO SCALE



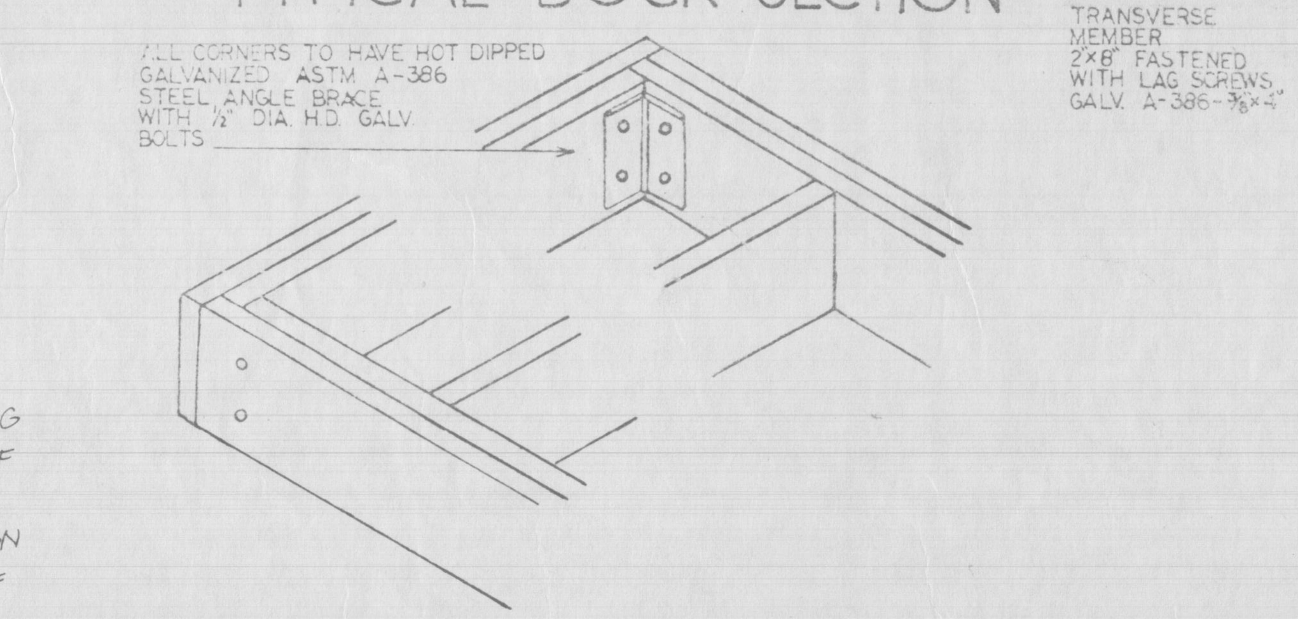
MODUFLOTE INSERT / BENCH DETAIL
NO SCALE



TYPICAL DOCK SECTION



TYPICAL DOCK ~ SIDE VIEW



TYPICAL DOCK CONSTRUCTION DETAILS
NO SCALE

DEPARTMENT OF PARKS AND RECREATION · ANN ARBOR

DESIGNED	DRAWN
C.HILL	C.HILL
CHECKED	DATE
T.G.R.	JAN. 6, 1983

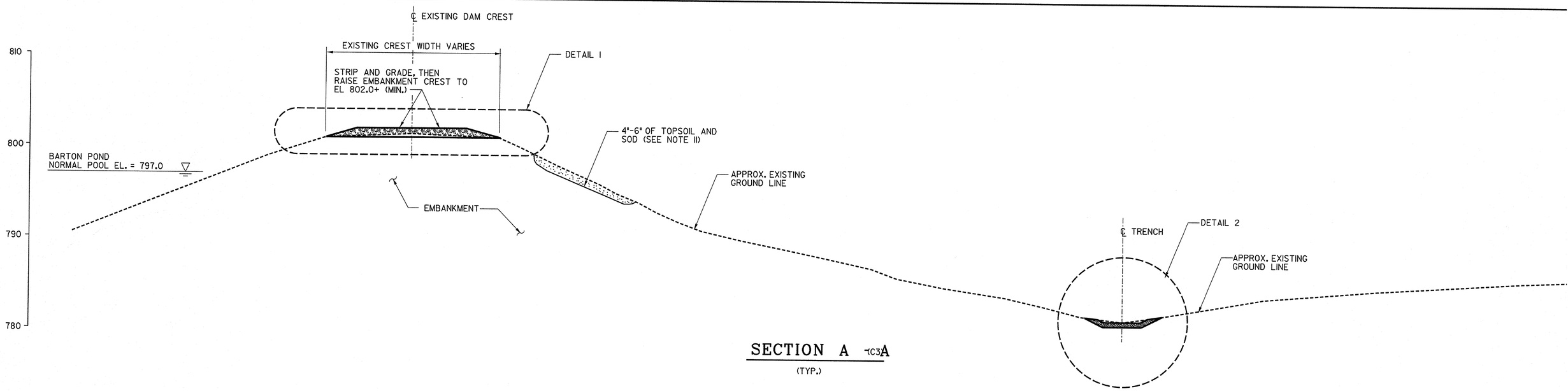
REVISIONS

BARTON PARK
portage dock

SHEET NO. 3

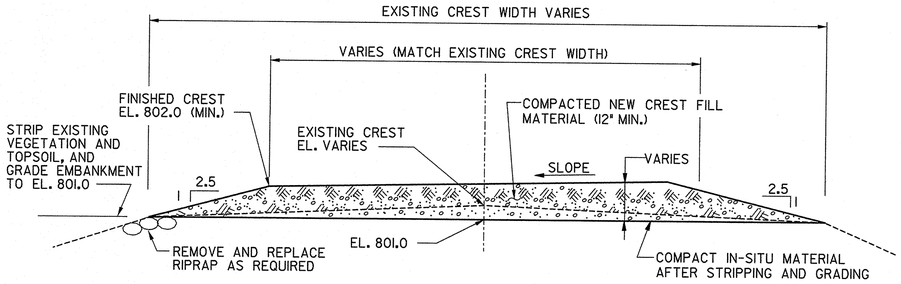
DEPARTMENT OF PARKS & RECREATION
100 N. FIFTH AVE. BOX 8647
ANN ARBOR, MICHIGAN 48107
TELEPHONE: (313) 994-2780
SUPERINTENDENT - VERN J. HARTENBURG

CITY OF ANN ARBOR MICHIGAN



SECTION A ~~C3~~A

(TYP.)

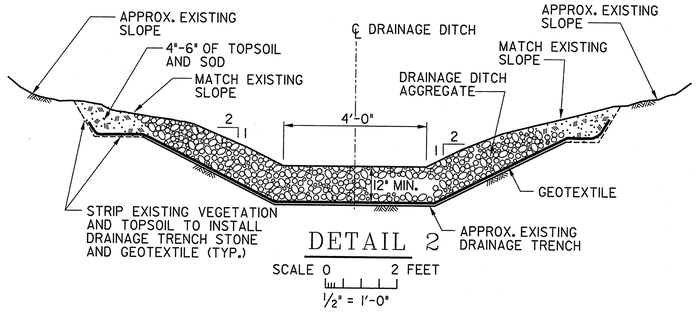


TYPICAL CREST IMPROVEMENT STA. 0+00 TO 13+50

DETAIL 1

SCALE 0 2 FEET

½" = 1'-0"



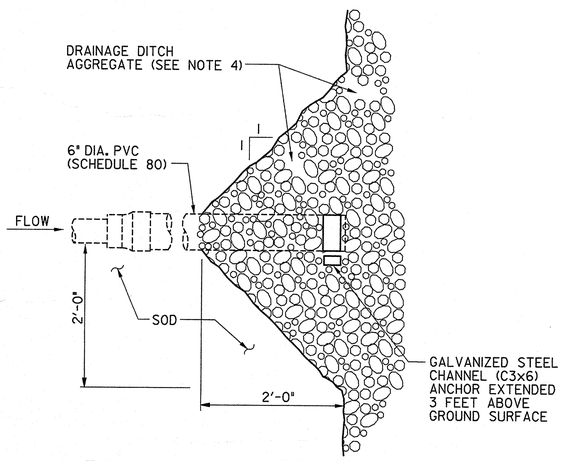
DETAIL 2

SCALE 0 2 FEET

½" = 1'-0"

NOTES:

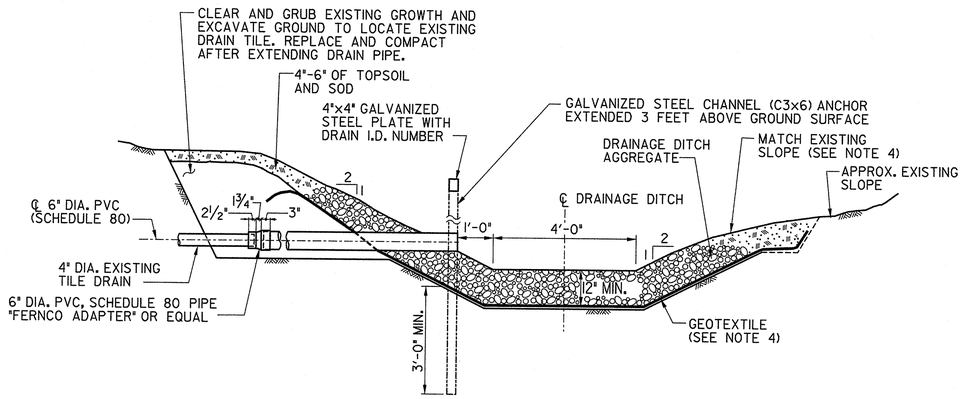
1. MATERIAL CONFORMING TO SPECIFICATIONS SHALL BE USED FOR THE EMBANKMENT CREST IMPROVEMENTS. MATERIAL SHALL BE PLACED TO MINIMUM ELEVATION OF 802.0 FEET, MATCH THE EXISTING EMBANKMENT CREST WIDTH, AND BE SLOPED TO DRAIN INTO THE RESERVOIR. MATERIAL SHALL BE PLACED IN ACCORDANCE WITH SPECIFICATIONS.
2. EMBANKMENT FILL SHALL BE BLENDED TO EXISTING GRADE AT EL.80 AT THE WEST END OF THE EMBANKMENT.
3. THE INVERT OF THE IMPROVED DRAINAGE DITCH SHALL FOLLOW EXISTING GRADE, EXCAVATED WHERE NECESSARY TO MAINTAIN A MINIMUM SLOPE OF 1/8 INCH PER FOOT. THE IMPROVED DRAINAGE DITCH SHALL BE 4 FEET WIDE ACROSS THE DITCH BOTTOM WITH SIDE SLOPES OF 2H:1V UNLESS SHOWN OTHERWISE. EXISTING TRENCH INVER VARIES FROM APPROX. EL. 800 TO APPROX. EL. 778.
4. GRADATION OF DRAINAGE DITCH AGGREGATE SHALL CONFORM TO ASTI C33 COARSE AGGREGATE GRADATION NO. 1. GEOTEXTILE SHALL BE NOI AMOCO 4557 AS MANUFACTURED BY AMOCO FABRICS AND FIBERS CON OR APPROVED EQUAL.
5. ALL DISTURBED GROUND ADJACENT TO DITCH SHALL BE RESTORED B ADDING MDOT CLASS II GRANULAR FILL COMPACTED TO 95% OF STANI PROCTOR ASTM D-698, GRADING TO REGAIN INITIAL GRADE OR AS SPI ABOVE, ADDING TOPSOIL AND SOD CONFORMING TO MDOT 8.21 CLASS E
6. ALL EXISTING 4 INCH DRAIN TILES SHALL BE LOCATED FROM THE SPI AT STA. 2+00 TO STA. 12+00 BY CAREFULLY EXCAVATING ALONG THI DITCH TO WHERE THE LOCATION OF EACH DRAIN TILE IS ANTICIPATED (5 FOOT SPACING). INVERT ELEVATIONS OF EXISTING DRAIN TILES VAR SHEET C2 FOR ELEVATIONS OF EXPOSED DRAINS.
7. EXISTING DRAIN TILES SHALL BE CLEARED OF ACCUMULATED SEDIMEN
8. ALL DAMAGED DRAIN TILE MATERIAL SHALL BE REMOVED, AND DRAIN TILES SHALL BE EXTENDED WITH 6 INCH PVC PIPE AS SHOWN. PVC PIPE SHALL BE 6 INCH DIAMETER SCHEDULE 80 PIPE ACCORDING TO ASTM D-1785.
9. ALL DRAINS FROM STA. 0+00 TO STA. 12+00 SHALL BE MARKED WITH DRAIN I.D. NUMBER AND NUMBERED CONSECUTIVELY BEGINNING WITH THE FIRST DRAIN AT OR NEAR STA. 0+00.
10. DRAIN I.D. NUMBER SHALL BE ETCHED 1/8 INCH DEEP INTO A 4 INCH BY 4 INCH STEEL PLATE, AND ATTACHED TO C3 x 6 ANCHOR, 3 FEET AB THE SURFACE OF THE GROUND USING MOUNTING HARDWARE DESCRIBED ON MDOT 8.26.04.
11. SCATTERED DETERIORATED PATCHES OF DOWNSTREAM SLOPE OF EMBA SHALL BE REPAIRED WITH TOPSOIL (4" TO 6") AND SOD, INCLUDING PEG PLASTIC WIRE MESH EROSION CONTROL MATS. AREA TO BE REPAIRED BE CLEANED OF ALL LOOSE MATERIAL PRIOR TO INSTALLATION OF TO AND SOD. EMBANKMENT SHALL BE RESTORED TO EXISTING GRADE. (SE SPECIFICATIONS FOR INSTALLATION OF SOD).



DRAINAGE PIPE EXTENSION PLAN

SCALE 0 1 FEET

1" = 1'-0"



DRAINAGE DITCH DRAIN PIPE EXTENSION SECTION

SCALE 0 2 FEET

½" = 1'-0"

SCALE 0 5 10 FEET

1" = 5'-0"

UNLESS NOTED

WATER UTILITIES DEPARTME
CITY OF ANN ARBOR

BARTON DAM REHABILITATION PROJEC

EMBANKMENT AN
DRAINAGE DITCH IMPF
SECTIONS & DETAI

SUBM. | TDM | ELECT. | REVIEWED

SOIL EROSION CONTROL NOTES:

GENERAL:

1. THE CONTRACTOR SHALL IMPLEMENT AND MAINTAIN THE SOIL EROSION CONTROL MEASURES AS SHOWN ON THE PLANS AT ALL TIMES DURING THE CONSTRUCTION OF THIS PROJECT. ANY MODIFICATIONS OR ADDITIONS TO THE SOIL EROSION CONTROL MEASURES DUE TO CONSTRUCTION OR CHANGED CONDITIONS SHALL BE COMPLIED WITH AS REQUIRED OR DIRECTED BY OWNER OR OWNER'S REPRESENTATIVE.
2. ALL SOIL EROSION CONTROL WORK SHALL CONFORM TO THE PERMIT REQUIREMENTS.
3. DAILY INSPECTION OF THE SOIL EROSION CONTROL SHALL BE MADE BY THE CONTRACTOR. ANY NECESSARY CORRECTIONS SHALL BE MADE WITHOUT DELAY.
4. EROSION FROM THE WORK ON THE SITE SHALL BE CONTAINED AND NOT BE ALLOWED TO COLLECT IN WATERWAYS.
5. CONSTRUCTION OPERATIONS SHALL BE SCHEDULED AND PERFORMED SO THAT SOIL EROSION CONTROL MEASURES ARE IN PLACE PRIOR TO EXCAVATION.
6. ROADS SHALL BE MAINTAINED FREE OF DIRT, SILT, AND CONSTRUCTION DEBRIS.
7. ALL AREAS OF DISTURBED EARTH SHALL RECEIVE 4" OF TOPSOIL, SEED, AND MULCH.
8. THE EXISTING SOILS IN THE PROPOSED WORK AREA ARE SEBEWA LOAM.

GRAPHIC SCALE
0 15 30 60
1 inch = 30 feet

EROSION CONTROL ESTIMATED QUANTITIES:
- FOR PERMIT USE ONLY.
- SHALL NOT BE USED FOR BIDDING PURPOSES.

AREA TO BE DISTURBED:
4 LOCATIONS x 30 SF. EACH =120 SF. TOTAL

ESTIMATED QUANTITIES OF EARTHWORK:
EXCAVATION 4 LOCATIONS x 1.25 CYD. EACH = 7 CYD. TOTAL

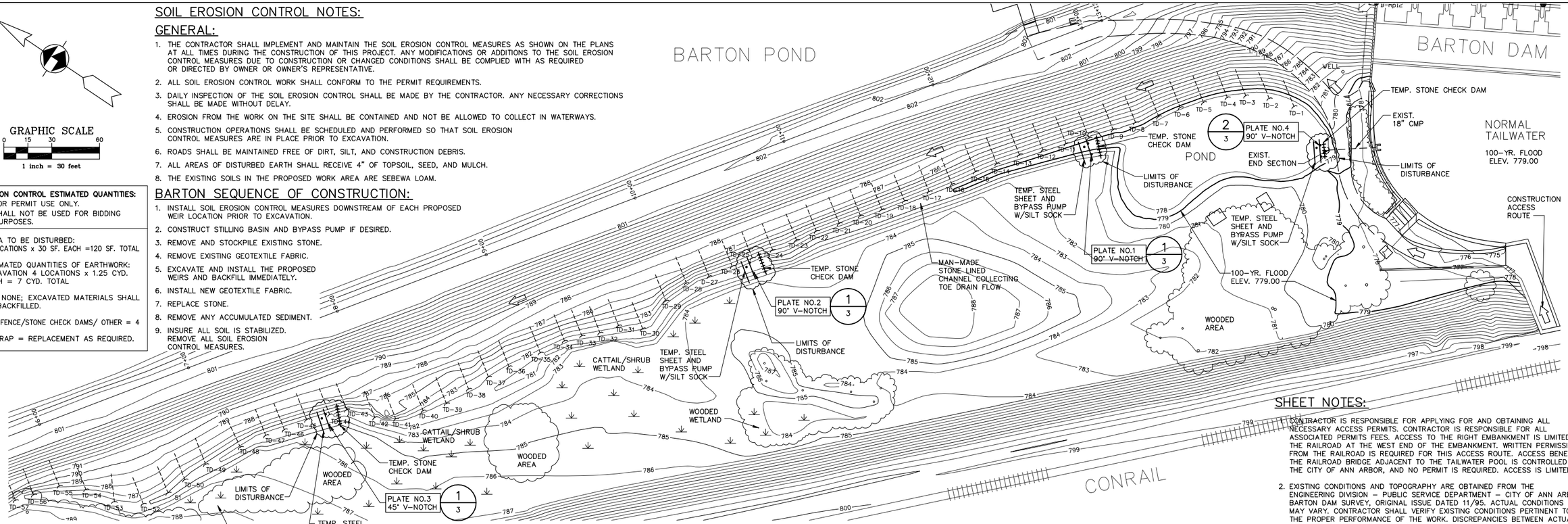
FILL NONE; EXCAVATED MATERIALS SHALL BE BACKFILLED.

SILT FENCE/STONE CHECK DAMS/ OTHER = 4

RIP RAP = REPLACEMENT AS REQUIRED.

BARTON SEQUENCE OF CONSTRUCTION:

1. INSTALL SOIL EROSION CONTROL MEASURES DOWNSTREAM OF EACH PROPOSED WEIR LOCATION PRIOR TO EXCAVATION.
2. CONSTRUCT STILLING BASIN AND BYPASS PUMP IF DESIRED.
3. REMOVE AND STOCKPILE EXISTING STONE.
4. REMOVE EXISTING GEOTEXTILE FABRIC.
5. EXCAVATE AND INSTALL THE PROPOSED WEIRS AND BACKFILL IMMEDIATELY.
6. INSTALL NEW GEOTEXTILE FABRIC.
7. REPLACE STONE.
8. REMOVE ANY ACCUMULATED SEDIMENT.
9. INSURE ALL SOIL IS STABILIZED. REMOVE ALL SOIL EROSION CONTROL MEASURES.

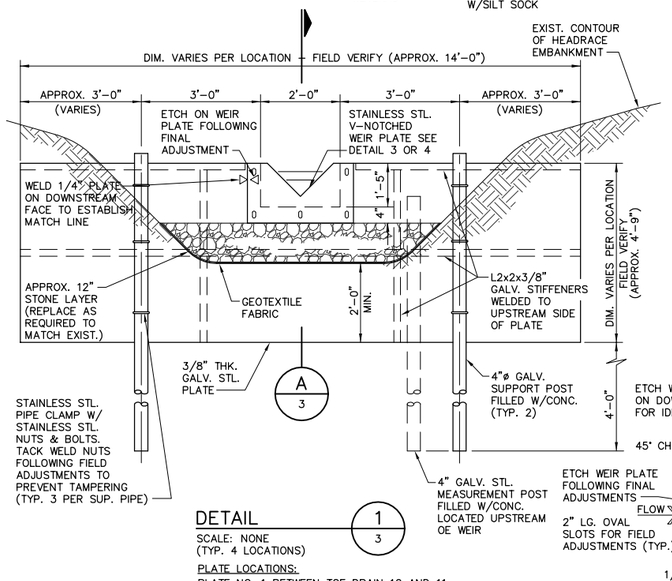


BARTON DAM SITE PLAN

SCALE:1"=30'

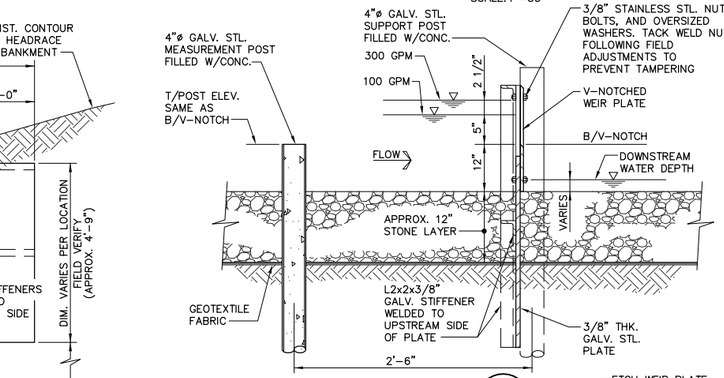
SHEET NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR APPLYING FOR AND OBTAINING ALL NECESSARY ACCESS PERMITS. CONTRACTOR IS RESPONSIBLE FOR ALL ASSOCIATED PERMITS FEES. ACCESS TO THE RIGHT EMBANKMENT IS LIMITED BY THE RAILROAD AT THE WEST END OF THE EMBANKMENT. WRITTEN PERMISSION FROM THE RAILROAD IS REQUIRED FOR THIS ACCESS ROUTE. ACCESS BENEATH THE RAILROAD BRIDGE ADJACENT TO THE TAILWATER POOL IS CONTROLLED BY THE CITY OF ANN ARBOR, AND NO PERMIT IS REQUIRED. ACCESS IS LIMITED
2. EXISTING CONDITIONS AND TOPOGRAPHY ARE OBTAINED FROM THE ENGINEERING DIVISION – PUBLIC SERVICE DEPARTMENT – CITY OF ANN ARBOR, BARTON DAM SURVEY, ORIGINAL ISSUE DATED 11/95. ACTUAL CONDITIONS MAY VARY. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS PERTINENT TO THE PROPER PERFORMANCE OF THE WORK. DISCREPANCIES BETWEEN ACTUAL FIELD CONDITIONS AND THOSE SHOWN ON THE PLANS SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE CITY'S REPRESENTATIVE.
3. CONTRACTOR SHALL LOCATE, IDENTIFY, AND PROTECT ALL EXISTING UTILITIES THAT MAY BE IMPACTED BY THE WORK.
4. CONTRACTOR SHALL CONTACT MISSDIG (1-800-482-7171) PRIOR TO ANY EXCAVATION.
5. ALL TOPSOIL AND VEGETATION SHALL BE REMOVED FROM AREAS REQUIRING STRIPPING. TOPSOIL SHALL BE STOCKPILED FOR LATER USE IN THE PROJECT IN LOCATIONS APPROVED BY THE CITY'S REPRESENTATIVE.
6. ALL EXCAVATED MATERIAL SHALL BE STOCKPILED IN LOCATIONS APPROVED BY THE CITY'S REPRESENTATIVE. EXCAVATED MATERIAL FROM WHICH ORGANIC MATERIAL AND DEBRIS HAS BEEN REMOVED MAY BE USED ON SITE FOR COMPACTED FILL. EXCESS EXCAVATED MATERIAL, IF ANY, SHALL BE DISPOSED OF OFF SITE IN AN ACCEPTABLE MANNER BY THE CONTRACTOR, OR AS DIRECTED BY THE CITY'S REPRESENTATIVE.
7. AT COMPLETION OF THE WORK, CONTRACTOR SHALL REMOVE ALL GRAVEL AND OTHER MATERIALS PLACED FOR TEMPORARY ROADWAYS, AND RESTORE THE PROJECT SITE AND ANY OTHER DISTURBED AREAS TO PRECONSTRUCTION CONDITIONS OR BETTER.
8. ALL EXISTING TOE DRAINS SHALL BE PROTECTED THROUGHOUT THE COURSE OF THE PROJECT. CONTRACTOR SHALL REPAIR ANY DAMAGED TOE DRAINS.
9. THE EXISTING TOE DRAINS ARE ACTIVE AND THEREFORE PRODUCING FLOWS. CONSEQUENTLY, THERE IS WATER FLOWING THROUGH THE EXISTING DITCH. IT SHALL BE AT THE DISCRETION OF THE CONTRACTOR IF HE/SHE WISHES TO BYPASS PUMP OR WORK IN THE FLOW TO FACILITATE CONSTRUCTION.
10. CONTRACTOR SHALL INSTALL STONE CHECK DAMS, SILT FENCING OR OTHER SOIL EROSION CONTROL MEASURES DOWNSTREAM OF EACH PROPOSED WEIR PRIOR TO CONSTRUCTION.
11. CONTRACTOR SHALL REMOVE ALL SOIL EROSION CONTROL MEASURES, INCLUDING ALL EXISTING STONE CHECK DAMS, ALONG THE DITCH FOLLOWING COMPLETION OF THE WEIR INSTALLATION.
12. HOT DIP GALVANIZE COMPONENTS AFTER COMPLETION OF ALL WELDING. NO WELDING SHALL BE PRFORMED ON COMPONENTS FOLLOWING GALVANIZING. GALVANIZED COMPONENTS SHALL BE PROTECTED FROM DAMAGE DURING TRANSPORTATION AND INSTALLATION. GALVANIZED COMPONENTS SHALL BE PROTECTED FROM SCRATCHING, CHIPPING, AND FLAKING.
13. CONCRETE USED TO FILL THE POSTS SHALL BE 3000 PSI. TOP OF CONCRETE SHALL BE FINISHED FLAT AND SHALL MATCH THE BOTTOM OF V-NOTCH ELEVATION.
14. ALL EXISTING TOE DRAINS (QUANTITY 75) SHALL BE ROUTED CLEAN. EXISTING TOE DRAINS ARE 4"ø DRAIN TILE W/6"ø PVC EXTENSION.
15. CONTRACTOR SHALL RESTORE DITCH AND SITE TO EXISTING CONDITION, OR BETTER, FOLLOWING COMPLETION OF WORK, INCLUDING GEOTEXTILE FABRIC AND STONE REPLACEMENT. MINIMUM OVERLAY OF NEW AND EXISTING GEOTEXTILE FABRIC SHALL BE 12 INCHES IN ALL DIRECTIONS.

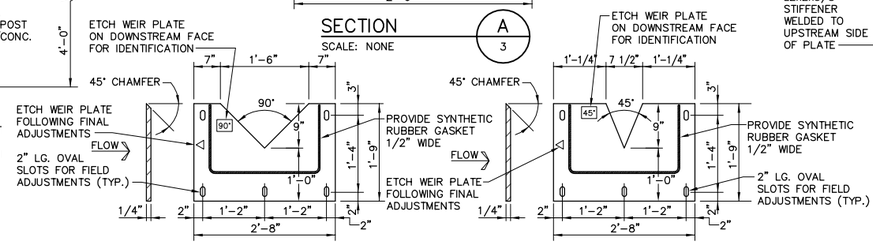


DETAIL 1/3
SCALE: NONE
(TYP. 4 LOCATIONS)

PLATE LOCATIONS:
PLATE NO. 1 BETWEEN TOE DRAIN 10 AND 11
PLATE NO. 2 BETWEEN TOE DRAIN 25 AND 26
PLATE NO. 3 BETWEEN TOE PLATE 44 AND 45
PLATE NO. 4 AT POND OUTLET AT 18" CMP

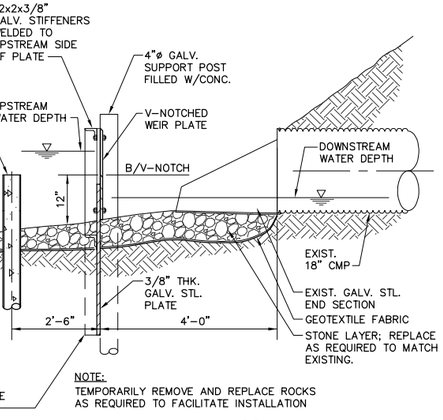


SECTION A/3
SCALE: NONE



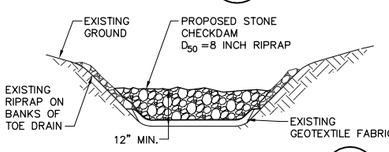
REMOVABLE STAINLESS STEEL 90° V-NOTCH WEIR PLATE DETAIL 3/3
SCALE: NONE
90° V-NOTCH WEIR PLATE (4 REQ'D)

REMOVABLE STAINLESS STEEL 45° V-NOTCH WEIR PLATE DETAIL 4/3
SCALE: NONE
45° V-NOTCH WEIR PLATE (2 REQ'D)



NOTE:
TEMPORARILY REMOVE AND REPLACE ROCKS AS REQUIRED TO FACILITATE INSTALLATION

DETAIL 2/3
SCALE: NONE



TEMPORARY ROCK CHECK DAM 5/3
SCALE: NONE

NOTE:
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING MISS DIG PRIOR TO CONSTRUCTION.

3 WORKING DAYS BEFORE YOU DIG CALL MISS DIG 1-800-482-7171

DATUM: – BENCH MARKS – BARTON

BM #	ELEVATION	DESCRIPTION
1	801.27	CITY OF ANN ARBOR – BRASS DISC IN CONCRETE MONUMENT AT THE NORTHWEST CORNER OF THE BARTON DAM SPILLWAY
2	802.28	CITY OF ANN ARBOR – RECTANGULAR BRASS PLATE ON THE TOP OF THE CONCRETE RETAINING WALL AT AT NE CORNER OF BARTON POWERHOUSE

REV.			
REV.			
REV.			
REV.		6/12/06	SUBMIT FOR SEC
REV.		10/05	BID SET
REV.		9/05	SUBMITTED TO FERC
		8/15/05	OWNER REVIEW

SCALE: AS NOTED | DRAWN BY: PAZ | CHECKED BY: GRW/PJM | SEALED:

CITY OF ANN ARBOR, MICHIGAN
WATER UTILITIES DEPARTMENT

BARTON DAM RIGHT EMBANKMENT MONITORING PLAN AND SEC MEASURES

AYRES, LEWIS, NORRIS & MAY, INC.
engineers • planners • surveyors
3959 Research Park Drive
Ann Arbor, Michigan 48108
(734) 761-1010 phone (734) 761-1200 fax

PROJ. NUMBER: 230782.00.002
SHEET: 3

GENERAL NOTES

1. BIDDERS SHALL FAMILIARIZE THEMSELVES WITH SITE ACCESS, CONSTRUCTION ROUTES, WETLAND CONDITIONS, SUBGRADE CONDITIONS AND SOFT GROUND.
2. CONTRACTOR IS REPONSIBLE FOR THE CONTROL OF WATER ON THE SITE TO FACILITATE CONSTRUCTION. PROVIDE ALL DEWATERING AS NECESSARY.
3. PRIOR TO BEGINNING EARTHWORK AND THROUGHOUT THE CONSTRUCTION PERIOD, CONTRACTOR SHALL HAVE ALL NECESSARY EQUIPMENT ON SITE TO REPAIR ANY NEW BOILS THAT MAY PRESENT THEMSELVES FOLLOWING SOIL STRIPPING. IMMEDIATELY REPAIR ANY BOIL THAT MAY SURFACE.
4. PRIOR TO BEGINNING EARTHWORK AND THROUGHOUT THE CONSTRUCTION PERIOD, CONTRACTOR SHALL HAVE ON SITE A STOCKPILE OF MATERIAL AT THE IMMEDIATE CONSTRUCTION AREA FOR USE IN QUICKLY PLACING TO CURTAIL ANY BOILS.
5. THE CONTRACTOR'S EQUIPMENT SHALL BE OF ADEQUATE SIZE TO EFFICEINTLY PERFORM THE WORK.
6. CONTRACTOR SHALL PERFORM THE WORK IN SECTIONS SO AS TO HAVE EACH SECTION COMPLETED BY THE END OF EACH WORK DAY. NO STRIPPED SOIL SHALL BE LEFT UNPROTECTED. EACH SECTION SHALL BE COMPLETED EACH DAY WITH THE GEOTEXTILE FILTER AND DRAINAGE BLANKET COARSE AGGREGATE.
7. WORK IS NOT PERMITTED OUTSIDE THE LIMITS OF DISTURBANCE.

Know what's **below.** **Call** before you dig.

NOTE:

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Stantec Consulting Michigan Inc.
3754 Ranchero Drive
Ann Arbor MI U.S.A.
48108-2771
Tel. 734.761.1010
Fax. 734.761.1200
www.stantec.com

Consultants

Legend

SILT FENCE

Notes

100 YEAR FLOODPLAIN: ELEV. 779.0

Revision	By	Appd.	YY.MM.DD
C FOR BID	DMD	GRW	13.08.01
B BID SET	DMD	GRW	13.05.01
A FERC REVIEW SET	DMD	GRW	13.04.01

Issued

File Name: 116500C-101.DWG	FA	GW	DD	13.03.14
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

CITY OF ANN ARBOR

BARTON DAM-RIGHT EMBANKMENT DRAINAGE BLANKET INSTALLATION

Ann Arbor, Michigan

Title

SITE PLAN

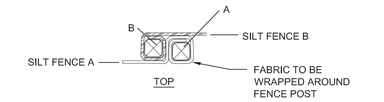
Project No. 2075116500

Scale 1:40 (0, 40, 60, 80)

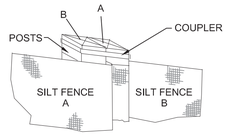
Drawing No. C-101

Sheet 2 of 3

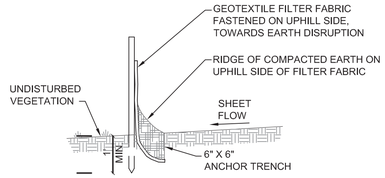
Revision 0



TOP



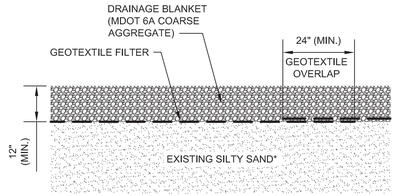
JOINT



SECTION

SILT FENCE INSTALLATION

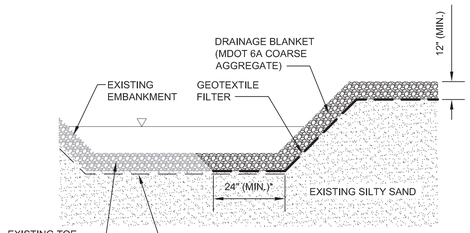
NOT TO SCALE



* AFTER CLEARING & GRUBBING REMOVE TOPSOIL OR TOP 6 INCHES OF EXISTING SILTY SAND, WHICHEVER IS LESS, PRIOR TO PLACING DRAINAGE BLANKET.

TYPICAL DRAINAGE BLANKET DETAIL (1 / C-102)

N.T.S.

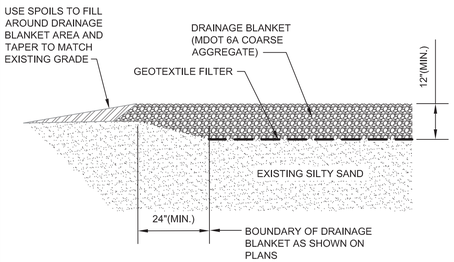


* REMOVE EXISTING DITCH DRAINAGE BLANKET AGGREGATE TO EXPOSE EXISTING GEOTEXTILE FOR 24" OVERLAP.

SECTION - DRAINAGE BLANKET DITCH TERMINATION (A / C-102)

N.T.S.

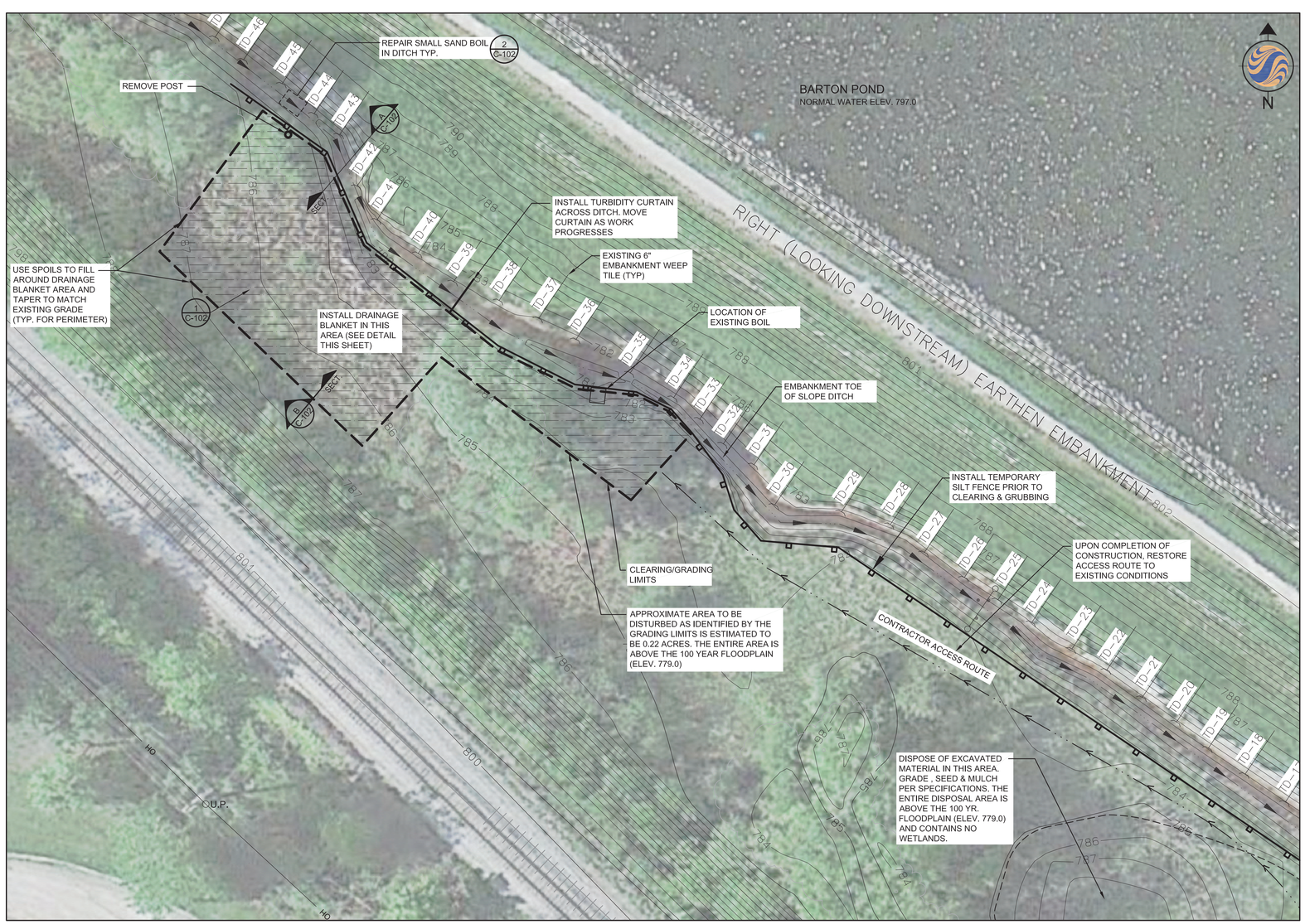
(TYPICAL TOE DRAIN 33 TO 45)



SECTION - DRAINAGE BLANKET LAND TERMINATION (B / C-102)

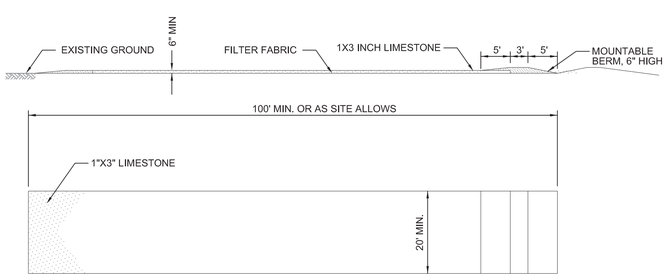
N.T.S.

(TYPICAL FULL LENGTH OF BLANKET)



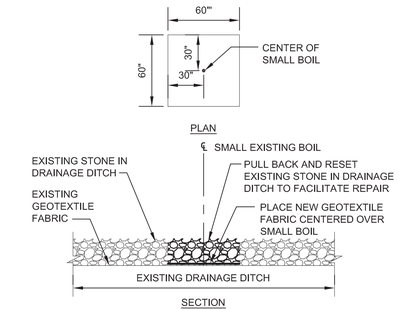
DETAILED SITE PLAN

SCALE: 1" = 20'-0"



MUD TRACKING ROAD (MUD MAT) DETAIL

N.T.S.



SECTION

TYPICAL EXISTING DRAINAGE BLANKET REPAIR DETAIL (2 / C-102)

N.T.S. (ASSUME QUANTITY OF 4 FOR BIDDING PURPOSES)

Know what's **below.** **Call** before you dig.

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Legend

SILT FENCE

Notes

Revision	By	Appd.	YY.MM.DD
C FOR BID	DMD	GRW	13.08.01
B BID SET	DMD	GRW	13.05.01
A FERC REVIEW SET	DMD	GRW	13.04.01

Issued

File Name: 116500C-102.DWG	FA	GW	DD	13.03.14
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

CITY OF ANN ARBOR

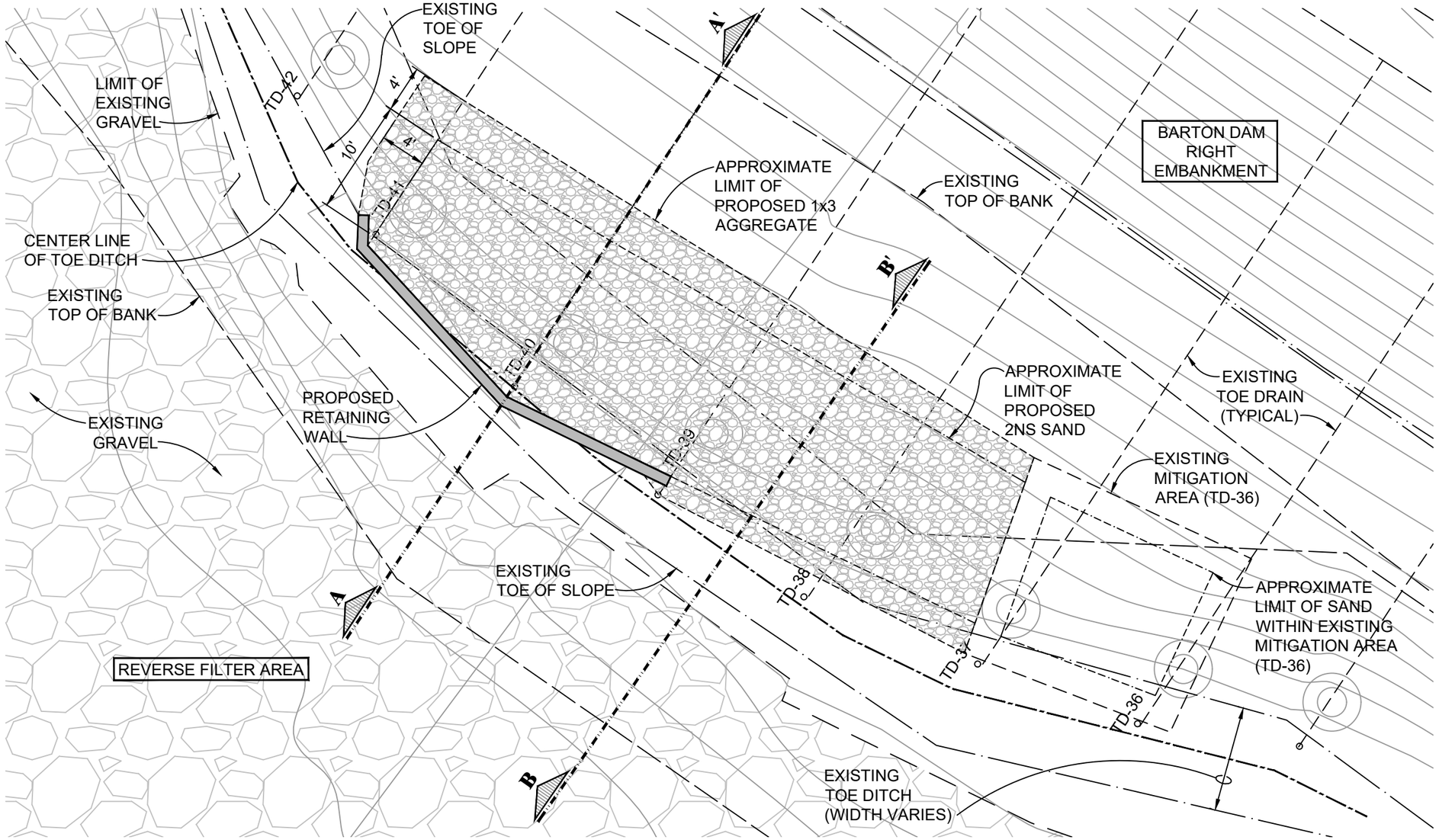
BARTON DAM-RIGHT EMBANKMENT DRAINAGE BLANKET INSTALLATION

Ann Arbor, Michigan

Title

DETAILS

Project No.	Scale
2075116500	1:20 (0, 20, 30, 40)
Drawing No.	Sheet / Revision
C-102	3 of 3 / 0



CONSTRUCTION SEQUENCE AWAY FROM WALL

1. SEE FIGURE No. 3 FOR CONSTRUCTION SEQUENCE IN VICINITY OF RETAINING WALL.
2. FIELD VERIFY LIMITS OF STABILIZATION.
3. CONSTRUCT RETAINING WALL.
4. PLACE SAND FILTER TO UNIFORM THICKNESS WITHIN REPAIR AREA.
5. PLACE FILTER FABRIC OVER SAND WITHIN STABILIZATION AREA.
6. PLACE 1x3 CRUSHED LIMESTONE ON STABILIZATION AREA PER PLAN.

DETAIL PLAN

SCALE: 1" = 10'

LEGEND

- TOE OF SLOPE
- CENTER LINE OF EXISTING TOE DITCH
- LIMITS OF STABILIZATION

NOTES

1. LIMITS OF MATERIALS REPRESENT THE EXTENT OF FULL THICKNESS APPLICATION. BLEND MATERIALS TO EXISTING GROUND SURFACE AS SHOWN IN SECTIONS.

GRAPHIC SCALE

10 0 10

1" = 10'

NTH Consultants, Ltd.

Infrastructure Engineering and Environmental Services

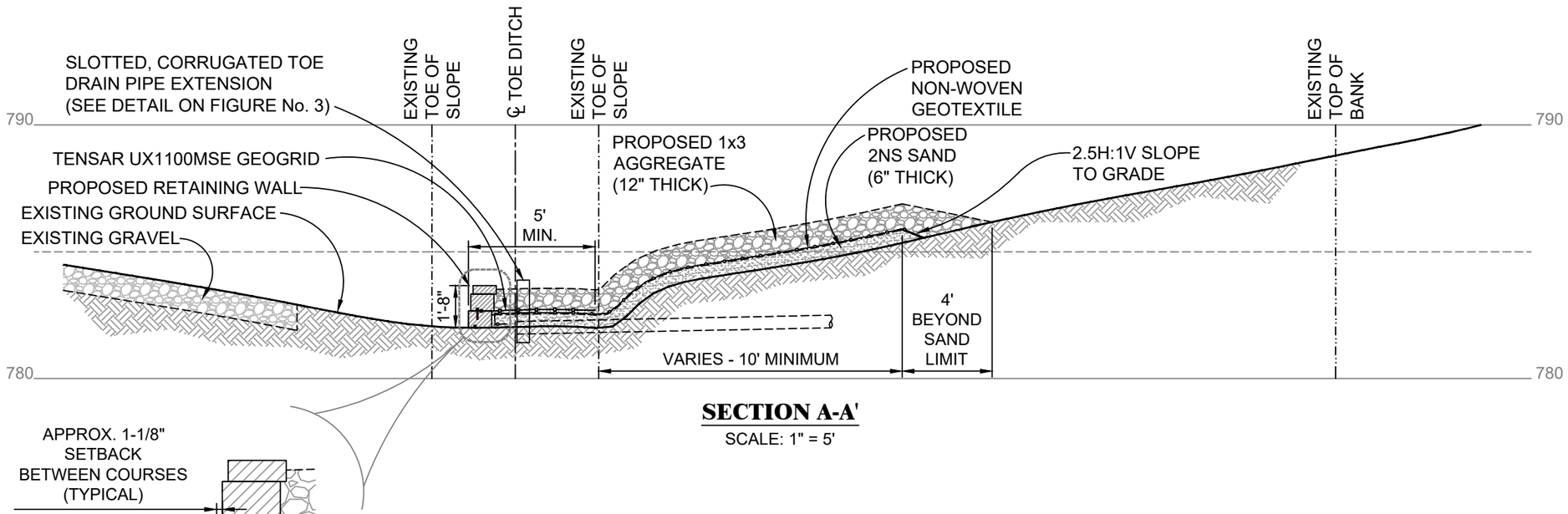
NTH PROJECT No: 61-160089-01C	CAD FILE NAME: D16008915
DESIGNED BY: PAM	INCEP DATE: 04 OCT 2018
DRAWN BY: DET	DRAWING SCALE: AS NOTED
CHECKED BY: KMS	PLOT DATE: 24 Oct 2018

BOIL MITIGATION
(1 OF 3)

BARTON DAM
ANN ARBOR, MICHIGAN

FIGURE No.

1



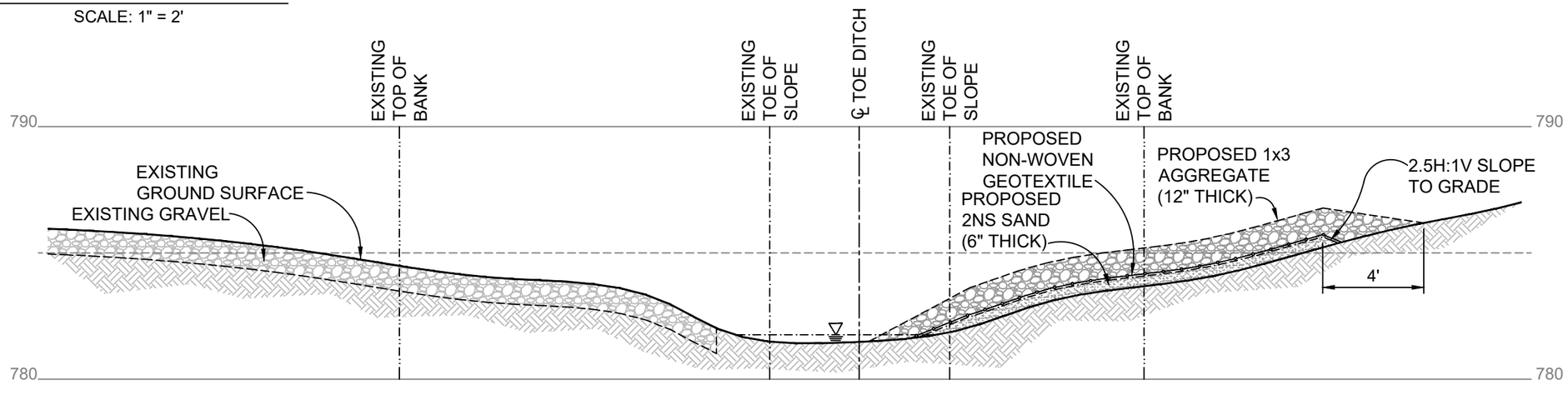
SECTION A-A'

SCALE: 1" = 5'

NOTE
GEOGRID AND GEOTEXTILE NOT SHOWN FOR CLARITY.

RETAINING WALL DETAIL

SCALE: 1" = 2'



SECTION B-B'

SCALE: 1" = 5'

NOTES

1. LIMITS OF MATERIALS REPRESENT THE EXTENT OF FULL THICKNESS APPLICATION. BLEND MATERIALS TO EXISTING GROUND SURFACE AS SHOWN IN SECTIONS.

GRAPHIC SCALE
5 0 5
1" = 5'

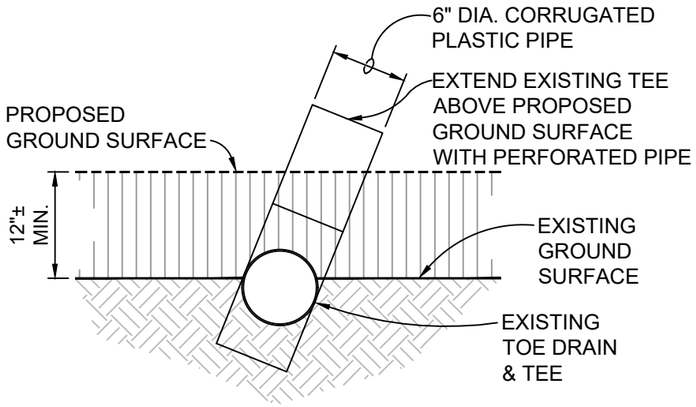
NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services

NTH PROJECT No:	61-160089-01C
DESIGNED BY:	PAM
DRAWN BY:	DET
CHECKED BY:	KMS
CAD FILE NAME:	D16008915
INCEP DATE:	04 OCT 2018
DRAWING SCALE:	AS NOTED
PLOT DATE:	24 Oct 2018

BOIL MITIGATION (2 OF 3)

BARTON DAM
ANN ARBOR, MICHIGAN

FIGURE No.
2



DETAIL AT EXISTING TOE DRAINS

SCALE: NONE

MATERIALS

1. SAND: MATERIAL MEETING THE REQUIREMENTS FOR MDOT 2NS FINE AGGREGATE (NATURAL SAND); REFER TO THE CURRENT MICHIGAN DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION, SECTION 902.

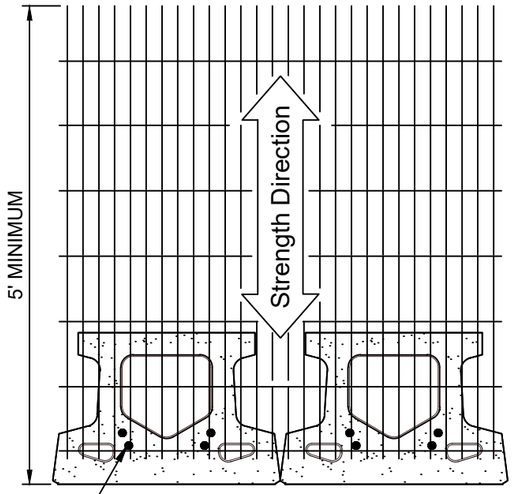
2. SEPARATION GEOTEXTILE: NONWOVEN GEOTEXTILE OF POLYPROPYLENE FIBERS MEETING AASHTO M288 SURVIVABILITY CLASS 1, 2, OR 3 (UNCLASSIFIED MATERIALS ARE NOT ACCEPTABLE) AND HAVING AN APPARENT OPENING SIZE (AOS) ≤ 0.3MM.

3. AGGREGATE: NOMINAL 1-INCH TO 3-INCH CRUSHED LIMESTONE ("1×3"); CRUSHED CONCRETE IS NOT ACCEPTABLE.

4. RETAINING WALL UNITS: KEYSTONE COMPAC RETAINING WALL BLOCKS AND KEYSTONE COMPAC CAP UNITS PRODUCED BY FENDT BUILDERS SUPPLY, INC. OR EQUIVALENT APPROVED BY THE CITY OF ANN ARBOR; 34± LINEAL FEET OF WALL CONSISTING OF 2 COURSES OF RETAINING WALL BLOCKS PLUS ONE COURSE OF CAP UNITS.

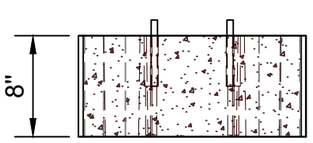
5. TOE DRAIN EXTENSIONS: 6-INCH DIAMETER, SLOTTED, CORRUGATED, POLYETHYLENE DRAIN PIPE WITH FITTINGS AS NEEDED TO CONNECT TO EXISTING TEE FITTINGS ON TOE DRAIN PIPES.

6. GEOGRID: UX1100MSE STRUCTURAL GEOGRID MANUFACTURED BY TENSAR INTERNATIONAL CORPORATION, ALPHARETTA, GA.

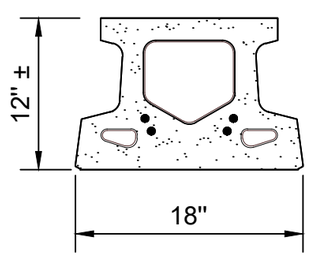


Geogrid is to be Placed on Level Backfill and Extended Over the Fiberglass Pins. Place Next Unit. Pull Grid Taught and Backfill. Stake as required.

Grid & Pin Connection



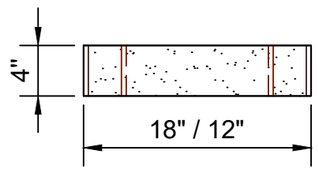
Compac III Elevation



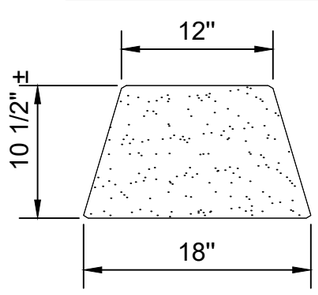
Compac III Plan

Compac III Unit

* Dimensions May Vary by Region



Cap Unit Elevation



Cap Unit Plan

Universal Cap Unit Option

* Dimensions & Availability Will Vary by Region

TYPICAL RETAINING WALL DETAILS

SCALE: NONE

CONSTRUCTION SEQUENCE AT RETAINING WALL

1. FOR CONSTRUCTION AWAY FROM THE RETAINING WALL, SEE THE CONSTRUCTION SEQUENCE ON FIGURE No. 1.

2. FIELD VERIFY LIMITS OF STABILIZATION AND CONFIRM LOCATION OF WALL FACE.

3. SMOOTH THE EXISTING GROUND SURFACE WITHIN THE BOTTOM OF TOE DITCH ALONG THE ALIGNMENT OF THE WALL BY CUTTING AND/OR HAND TAMPING AS REQUIRED TO ACHIEVE A UNIFORM, STABLE SURFACE THAT WILL ALLOW THE RETAINING WALL UNITS TO BE PLACED WITHOUT TILTING. DO NOT CUT MORE THAN 3 INCHES BELOW EXISTING GRADE. PREPARE THE SURFACE TO BE AS CLOSE TO LEVEL AS FEASIBLE IN THE DIRECTION PERPENDICULAR TO THE WALL AND TO FOLLOW THE AVERAGE SLOPE OVER THE LENGTH OF THE WALL. AVOID VARIATIONS IN THE SLOPE OF THE PREPARED SURFACE.

4. PLACE THE FIRST COURSE OF RETAINING WALL UNITS ON THE PREPARED SURFACE. IF THE TOPS OF ANY ADJACENT BLOCKS DIFFER BY MORE THAN 1/8-INCH, REMOVE THE BLOCKS, ADJUST THE PREPARED SURFACE BY TAMPING SO THE TOPS OF THE BLOCKS WILL BE UNIFORM, AND REPLACE THE BLOCKS.

5. ONCE THE FIRST COURSE OF BLOCKS HAS BEEN INSTALLED TO THE SATISFACTION OF THE CITY'S ON-SITE REPRESENTATIVE, PLACE GEOTEXTILE AT BACK OF WALL AS SHOWN IN SECTION A-A' OF SHEET 2 AND TEMPORARILY FOLD OVER FIRST COURSE OF BLOCKS. DO NOT COVER MORE THAN 6 INCHES OR LESS THAN 3 INCHES OF THE TOE DITCH BEHIND THE FIRST COURSE OF BLOCKS. PREVENT THE GEOTEXTILE FROM MOVING DURING SUBSEQUENT MATERIAL PLACEMENT.

6. PLACE 6-INCH LAYER OF SAND TO BACK OF WALL, MAKING SURE THAT GEOTEXTILE IS NOT DAMAGED AND DOES NOT GET PULLED FROM BETWEEN BLOCKS AND SAND DURING PLACEMENT.

7. FOLD GEOTEXTILE BACK OVER THE TOP OF THE SAND TO WRAP THE EDGE OF THE SAND AND PREVENT DIRECT CONTACT BETWEEN THE SAND AND THE RETAINING WALL BLOCKS. USE CARE TO AVOID DISTURBING THE RETAINING WALL BLOCKS AND RETURN ANY BLOCKS THAT ARE MOVED TO THE CORRECT POSITION. CUT THE GEOTEXTILE AT THE OUTLETS OF TOE DRAINS 40 AND 41 TO FIT OVER THE EXISTING TEES. OVERLAP SMALL PIECES OF GEOTEXTILE TO CLOSE AROUND THE TEES.

8. PLACE 1×3 CRUSHED LIMESTONE IN A LEVEL LAYER TO THE TOP OF THE FIRST COURSE OF BLOCKS (APPROXIMATELY 2 INCHES THICKNESS). THIS LAYER OF AGGREGATE IS TO EXTEND BACK TO THE POSITION AT WHICH THE TOP OF THE SAND LAYER AND GEOTEXTILE RISES ABOVE THE TOP OF THE FIRST COURSE.

9. INFILL THE FIRST COURSE OF BLOCKS WITH AGGREGATE, SWEEP OR SIMILARLY CLEAN THE TOP OF THE BLOCKS, INSERT PINS, INSTALL GEOGRID REINFORCEMENT, PLACE SECOND COURSE OF BLOCKS, AND INFILL SECOND COURSE PER MANUFACTURER'S RECOMMENDATIONS. WHEN INSTALLING GEOGRID, PULL END OF GEOGRID BACK (IN THE DIRECTION AWAY FROM THE WALL FACE) SO THE FIRST TRANSVERSE RIB IS SNUG AGAINST THE FIBERGLASS PINS AND KEEP SNUG UNTIL THE NEXT COURSE OF BLOCKS IS PLACED. TRIM ANY "FRINGE" THAT EXTEND PAST THE WALL FACE. KEEP THE GEOGRID AS FLAT AS PRACTICABLE AFTER PLACEMENT AND PULL OUT ANY WAVES OR WRINKLES BEFORE FILLING ON TOP OF THE GEOGRID.

10. CLEAN TOP OF SECOND COURSE OF BLOCKS AND ATTACH CAP UNITS USING ADHESIVE PER MANUFACTURER'S RECOMMENDATIONS.

11. PLACE 1×3 CRUSHED LIMESTONE ON STABILIZATION AREA PER PLAN.

NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services

NTH PROJECT No: 61-160089-01C
CAD FILE NAME: D16008915
DESIGNED BY: PAM
INCEP DATE: 04 OCT 2018
DRAWN BY: DET
DRAWING SCALE: AS NOTED
CHECKED BY: KMS
PLOT DATE: 24 Oct 2018

BOIL MITIGATION (3 OF 3)

BARTON DAM
ANN ARBOR, MICHIGAN

FIGURE No.
3

ATTACHMENT P

Existing Geotechnical Data

soil and materials engineers, inc.

PZ-UR

JOB NAME: BARTON DAM
JOB LOCATION: ANN ARBOR, MICHIGAN
OWNER: CITY OF ANN ARBOR

A/E: HARZA ENGINEERING CO.
BY: TSC/JBG DATE: 4-21-88
JOB NUMBER: E-11753

BORING B-3
SHEET: 1/2

DRILLER: JAY | RIG: 35

PROFILE DESCRIPTION

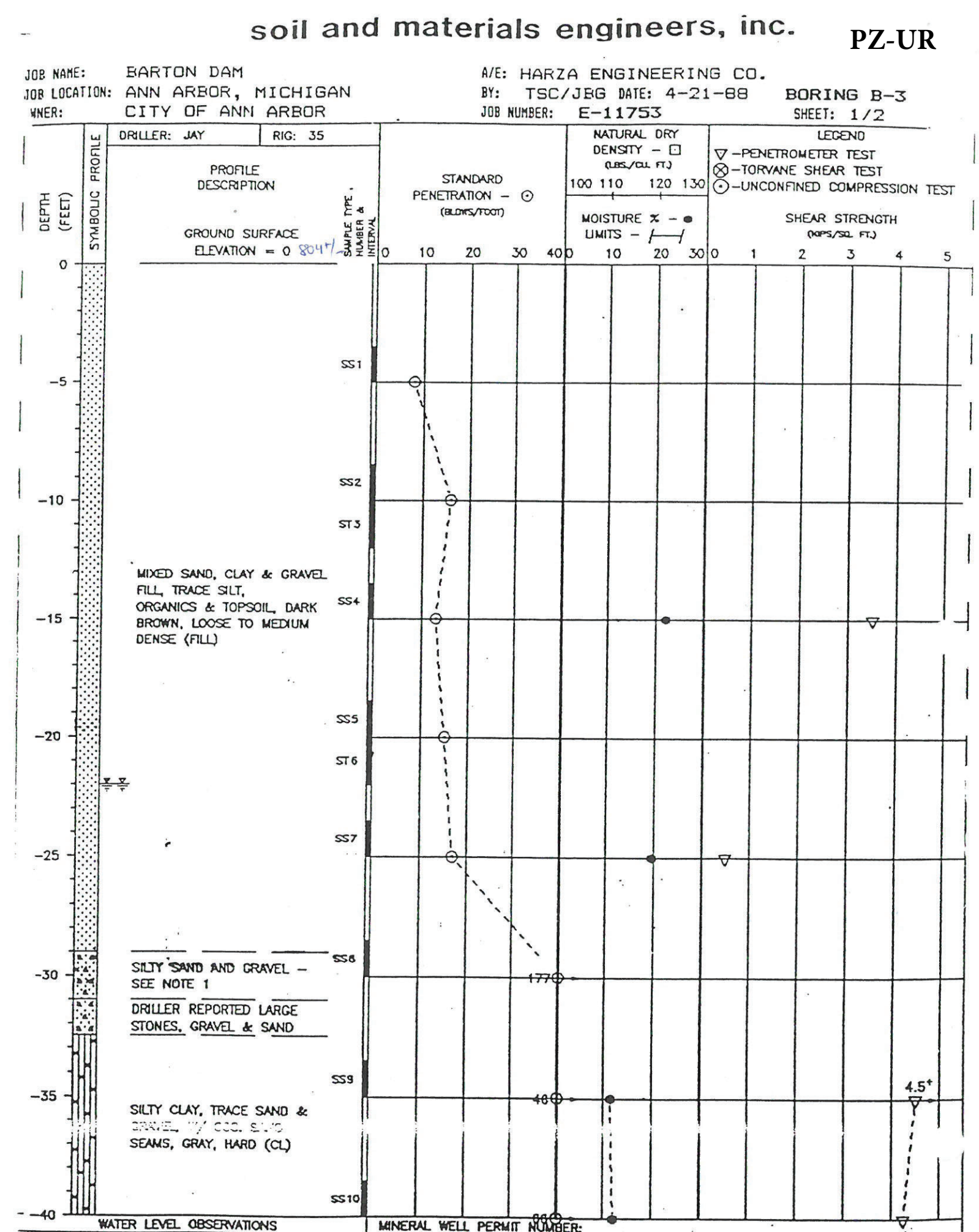
GROUND SURFACE ELEVATION = 0 804+/-

MIXED SAND, CLAY & GRAVEL FILL, TRACE SILT, ORGANICS & TOPSOIL, DARK BROWN, LOOSE TO MEDIUM DENSE (FILL)

SILTY SAND AND GRAVEL – SEE NOTE 1

DRILLER REPORTED LARGE STONES, GRAVEL & SAND

SILTY CLAY, TRACE SAND & GRAVEL, W/ CCC. SILT SEAMS, GRAY, HARD (CL)



WATER LEVEL OBSERVATIONS

▽ GROUNDWATER ENCOUNTERED DURING DRILLING

▽ WATER LEVEL AT COMPLETION

MINERAL WELL PERMIT NUMBER:

NOTES:
1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED.

SOIL AND MATERIALS ENGINEERS, INC.

PZ-UR

JOB NAME: BARTON DAM
JOB LOCATION: ANN ARBOR, MICHIGAN
OWNER: CITY OF ANN ARBOR

A/E: HARZA ENGINEERING CO.
BY: TSC/JBG DATE: 4-21-88 BORING B-3
JOB NUMBER: E-11753 SHEET: 2/2

DRILLER: JAY RIG: 35

PROFILE DESCRIPTION

GROUND SURFACE ELEVATION = 0

SILTY CLAY, TRACE SAND & GRAVEL, W/ OCC. SAND SEAMS, GRAY, HARD (CL)

FINE TO MEDIUM SAND, TRACE GRAVEL, BROWN, WET, DENSE (SP)

SS11

SS12 75+/-

42

NOTE(S):

1. SILTY SAND & GRAVEL, TR ORGANICS, DARK GRAY, DENSE (SM/GM)(RIVER SEDIMENTS)
2. DRILLER TRIED 3 INCHES SHELBY TUBES FROM 10' TO 12' AND FROM 20' TO 22'. NO RECOVERY.
3. AFTER DRILLING, AN OBSERVATION WELL WAS INSTALLED WITH TIP AT A DEPTH OF 35'. SAND BACKFILL WAS PLACED AROUND WELLPOINT AND NATURAL SOIL was then placed to the ground surface. A protective casing was then cemented in at ground surface.
4. Hole was drilled using continuous flight hollow stem augers.

DEPTH (FEET): -40, -45, -50, -55, -60, -65, -70, -75, -80

SYMBOLIC PROFILE

SAMPLE TYPE & NUMBER & INTERVAL

STANDARD PENETRATION - ⊙ (BLOWS/FOOT): 0 10 20 30 40

NATURAL DRY DENSITY - ⊡ (LBS/CU. FT.): 100 110 120 130

MOISTURE % - ● LIMITS - |—|: 0 10 20 30

SHEAR STRENGTH (KIPS/SQ. FT.): 0 1 2 3 4 5

LEGEND
▽ -PENETROMETER TEST
⊗ -TORVANE SHEAR TEST
⊙ -UNCONFINED COMPRESSION TEST

WATER LEVEL OBSERVATIONS

MINERAL WELL PERMIT NUMBER:

NOTES: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED.

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PZ-LR

JOB NAME: BARTON DAM
JOB LOCATION: ANN ARBOR, MICHIGAN
OWNER: CITY OF ANN ARBOR

A/E: HARZA ENGINEERING CO.
BY: TSC/JBG DATE: 4-21-88 BORING B-4
JOB NUMBER: E-11753 SHEET: 1/1

DRILLER: JAY RIG: 35

PROFILE DESCRIPTION

GROUND SURFACE ELEVATION = 0 786+/- (780)

SILTY SAND, TR GRAVEL, CLAY AND TOPSOIL, BROWN AND DARK BROWN, MOIST TO WET, MEDIUM DENSE TO DENSE (SM/SP)(FILL)

SILTY SAND AND GRAVEL - SEE NOTE 1

DRILLER REPORTED LARGE STONES, SAND & GRAVEL

SILTY CLAY, TRACE SAND & GRAVEL, W/ OCC. SILT SEAMS, LAYER OF BROWN, WET SAND AND STONE AT ABOUT 29', GRAY, HARD (CL)

NOTE(S):
1. SILTY SAND AND GRAVEL, TR ORGANICS, DARK GRAY, DENSE (SM/GM)(RIVER SEDIMENTS)
2. AFTER DRILLING, AN OBSERVATION WELL WAS INSTALLED WITH THE TIP AT A DEPTH OF 15'. SAND BACKFILL WAS PLACED AROUND WELLPOINT AND NATURAL soil was then placed to the ground surface. A protective casing was then cemented in at ground surface.

DEPTH (FEET) 0 -5 -10 -15 -20 -25 -30 -35 -40

SYMBOLIC PROFILE

SAMPLE TYPE, NUMBER & INTERVAL: SS1 SS2 SS3 SS4 SS5 SS6 SS7 (756+/-)

STANDARD PENETRATION - ⊙ (BLOWS/FOOT) 0 10 20 30 40

NATURAL DRY DENSITY - □ (LBS./CU. FT.) 100 110 120 130

MOISTURE % - ● LIMITS - |—| 0 10 20 30

SHEAR STRENGTH (KIPS/SQ. FT.) 0 1 2 3 4 5

LEGEND
▽ -PENETROMETER TEST
⊗ -TORVANE SHEAR TEST
⊙ -UNCONFINED COMPRESSION TEST

DRILLER REPORTED STONE

42

44

89

69

131

4.5+

4.5+

Hole was drilled using continuous flight hollow stem augers.

WATER LEVEL OBSERVATIONS
▽ GROUNDWATER ENCOUNTERED DURING DRILLING
▽ WATER LEVEL AT COMPLETION

MINERAL WELL PERMIT NUMBER:

NOTES: 1. THE INDICATED STRATIFICATION LINES ARE APPROXIMATE. IN SITU, THE TRANSITION BETWEEN MATERIALS MAY BE GRADUAL.
2. BORING BACKFILLED WITH NATURAL SOILS UNLESS OTHERWISE NOTED.

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general notes

Drilling & Sampling Symbols

SS – Split-Spoon - 1⅜" I.D. 2"O.D. except where noted
ST – Shelby Tube - 2"O.D., except where noted
PS – Piston Sample - 3" diameter
AS – Power Auger Sample
WS – Wash Sample
HA – Hand Auger Sample
BS – Miscellaneous Bag or Bottle Sample
NR – No Recovery
RC – Rock Core with diamond bit. NX size, except where noted
RB – Rock Bit

Standard "N" Penetration – Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split spoon, except where noted.

Water Level Measurement Symbols

WL – Water Level
WCI – Wet Cave In
DCI – Dry Cave In
WS – While Sampling
WD – While Drilling
BCR – Before Casing Removal
ACR – After Casing Removal
AB – After Boring

Particle Sizes

Boulders – Greater than 12" (305 mm)
Cobbles – 3" (76.2 mm) to 12" (305 mm)
Gravel - Coarse – ¾" (19.05 mm) to 3" (76.2 mm)
Gravel - Fine – No. 4 (3/16") (4.75 mm) to ¾" (19.05 mm)
Sand Coarse – No 10 (2.00 mm) to No. 4 (4.75 mm)
Sand Medium – No. 40 (0.425 mm) to No. 10 (2.00 mm)
Sand Fine – No. 200 (0.074 mm) to No. 40 (0.425 mm)
Silt – 0.005 mm to 0.074 mm
Clay – Less than 0.005 mm

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. The accurate determination of ground water levels may not be possible with short term observations especially in impervious soils. The levels shown may fluctuate throughout the year with variations in precipitation, evaporation, and runoff.

Classification

Cohesionless Soils

Very Loose	:	0 to 4 Blows
Loose	:	5 to 9 Blows
Medium Dense	:	10 to 29 Blows
Dense	:	30 to 49 Blows
Very Dense	:	50 to 80 Blows
Extremely Dense	:	Over 80 Blows

Soil Constituents

"Trace"	Less than 10%
"Trace to Some"	: 10% to 20%
"Some"	: 20% to 35%
"And"	: 35% to 50%

Cohesive Soils

CONSISTENCY		UNCONFINED COMPRESSIVE STRENGTH
Very Soft	:	Less than 0.25 tons/ft²
Soft	:	0.25 to 0.49 tons/ft²
Medium	:	0.50 to 0.99 tons/ft²
Stiff	:	1.00 to 1.99 tons/ft²
Very Stiff	:	2.00 to 3.99 tons/ft²
Hard	:	Greater than 4.00 tons/ft²

Soil Description

If clay content is sufficient so that clay dominates soil properties, then clay becomes the primary noun with the other major soil constituent as modifier, i.e., silty clay. Other minor soil constituents may be added according to estimates of soil constituents present, i.e., silty clay, trace to some sand, trace gravel.

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analysis of aggregate report

Project Barton Dam Date 5-11-88 SME Job No. E11753

Architect/Engineer Harza Engineering Co. Report No.

Contractor Supplier

Sample Source B-4, S-1 and S-2 Date Sampled 4-21-88

Sample Identification Silty Sand Fill Submitted By

Intended Use

Sieve Size or Number	Weight Retained	% Retained	% Passing	Project Specifications
1"	0	0	100	
½"	61.8	27.9	72.1	
# 4	93.6	42.3	57.7	
# 10	117.7	53.2	46.8	
# 30	149.5	67.5	32.5	
# 60	180.7	81.6	18.4	
#100	195.4	88.3	11.7	
#200	206.0	93.0	7.0	
Pan	221.4	100.0	0	
W/L	211.3	95.4	4.6	

☐ Sample meets specified gradation

☐ Sample does not meet specified gradation

Physical Lab Data

Loss By Washing 4.6% Fineness Modulus

Percent Absorption Organic Matter

Specific Gravity Coal & Lignite

Dry Rodded Weight Clay Lumps

Chert Soft Particles

Remarks

cm

Reviewed By J. Givens

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analysis of aggregate report

Project Barton Dam Date 5-11-88 SME Job No. E11753

Architect/Engineer Harza Engineering Co. Report No. ____

Contractor ____ Supplier ____

Sample Source B-3, S-1 and S-2 Date Sampled 4-21-88

Sample Identification Mixed Sand, Clay, Gravel Fill Submitted By ____

Intended Use ____

Sieve Size or Number	Weight Retained	% Retained	% Passing	Project Specifications
½"	0	0	100	
# 4	17.7	17.6	82.4	
# 10	31.3	26.9	73.1	
# 30	52.4	45.1	54.9	
#100	92.4	79.4	20.6	
#200	100.5	86.4	13.6	
Pan	116.3	100.0	0	
W/L	104.4	89.8	10.2	

☐ Sample meets specified gradation

☐ Sample does not meet specified gradation

Physical Lab Data

Loss By Washing 10.2% Fineness Modulus ____

Percent Absorption ____ Organic Matter ____

Specific Gravity ____ Coal & Lignite ____

Dry Rodded Weight ____ Clay Lumps ____

Chert ____ Soft Particles ____

Remarks ____

Reviewed By J. Givens

cm

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Project Barton Dam Date 5-17-88 SME Job No. E11753

Architect/Engineer Harza Engineering Co. Report No. _____

Contractor _____ Supplier _____

Sample Source B-2, S-1 Date Sampled 4-20-88

Sample Identification Mixed Sand, Clay, Topsoil Fill Submitted By _____

Intended Use _____

Sieve Size or Number	Weight Retained	% Retained	% Passing	Project Specifications
W/L	25.3	71.3	28.7	

☐ Sample meets specified gradation

☐ Sample does not meet specified gradation

Physical Lab Data

Loss By Washing 28.7% Fineness Modulus _____

Percent Absorption _____ Organic Matter _____

Specific Gravity _____ Coal & Lignite _____

Dry Rodded Weight _____ Clay Lumps _____

Chert _____ Soft Particles _____

Remarks _____

Reviewed By J. Givens

cm

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analysis of aggregate report

Project Barton Dam Date 5-12-88 SME Job No. E11753

Architect/Engineer Harza Engineering Co. Report No. _____

Contractor _____ Supplier _____

Sample Source B-1, S-7 and S-8 Date Sampled 4-20-88

Sample Identification Silty to Sandy Clay Submitted By _____

Intended Use _____

Sieve Size or Number	Weight Retained	% Retained	% Passing	Project Specifications
# 4	0	0.0	100	
#10	1.90	1.5	98.5	
#20	2.8	2.3	97.7	
#60	6.3	5.1	94.9	
#100	14.1	11.4	88.6	
#200	34.2	27.7	72.3	
Pan	123.4	100.0	0	
W/L	35.2	28.5	71.5	

☐ Sample meets specified gradation

☐ Sample does not meet specified gradation

Physical Lab Data

Loss By Washing 71.5% Fineness Modulus _____

Percent Absorption _____ Organic Matter _____

Specific Gravity _____ Coal & Lignite _____

Dry Rodded Weight _____ Clay Lumps _____

Chert _____ Soft Particles _____

Remarks _____

Reviewed By J. Givens

cm

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Project Barton Dam Date 5-12-88 SME Job No. E11753

Architect/Engineer Harza Engineering Co. Report No.

Contractor Supplier

Sample Source B-1, S-1 and S-2 Date Sampled 4-20-88

Sample Identification Sandy Clay Fill Submitted By

Intended Use

Sieve Size or Number	Weight Retained	% Retained	% Passing	Project Specifications
1"	0	0.00	100.0	
½"	13.9	9.00	91.0	
# 4	25.6	16.5	83.5	
# 30	32.8	21.1	78.9	
#100	47.8	30.8	69.2	
#200	75.5	48.7	51.3	
Pan	155.1	100.0	0	
W/L	81.6 ,	52.6	47.4	

☐ Sample meets specified gradation

☐ Sample does not meet specified gradation

Physical Lab Data

Loss By Washing 47.4% Fineness Modulus

Percent Absorption Organic Matter

Specific Gravity Coal & Lignite

Dry Rodded Weight Clay Lumps

Chert Soft Particles

Remarks

cm Reviewed By J. Givens

PZ-1

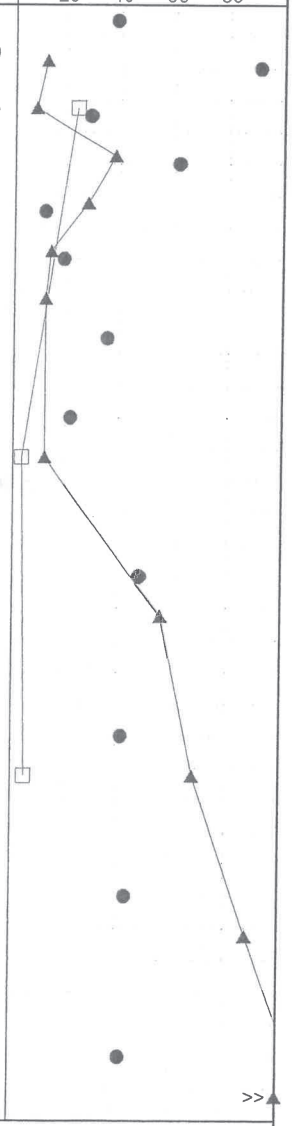
CTI and Associates, Inc.

BORING NUMBER: P-1

CLIENT Stantec
PROJECT NAME Barton Dam Piezometer Installation
PROJECT NUMBER 3142040036
PROJECT LOCATION Ann Arbor, MI
DATE STARTED 12/1/14 COMPLETED 12/1/14
GROUND ELEVATION 792.74 ft +/-
DRILLING CONTRACTOR Stearns Drilling
GROUND WATER LEVELS:
DRILLING METHOD 3-1/4 inch Hollow Stem Auger
DURING DRILLING 9' 6"
LOGGED BY M. Kabalan CHECKED BY K. Foye
AFTER DRILLING N/A
NOTES Deep Piezometer Near Crest of Embankment
COLLAPSE DEPTH N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
0		12 inches of TOPSOIL FILL					
		SAND (SC - FILL)- dark brown, fine to medium, with clay, traces of gravel and organics, moist	SS 1	89	2-3-3 (6)		19
			SS 2	39	3-2-2 (4)		46
5			SS 3	44	5-8-11 (19)		14
		SANDY GRAVEL (GW - FILL)- brown, traces of clay, moist	SS 4	6	12-9-5 (14)		31
		SANDY CLAY (CL - FILL)- dark brown, with silt and gravel, very moist	SS 5	56	5-4-3 (7)		6
		SANDY GRAVEL (GW - FILL)- brown, traces of clay, moist	SS 6	44	2-3-3 (6)		10
10		** becomes wet					18
		CLAYEY SAND (SC - FILL)- gray, with silt, fine, wet					11
		SAND (SP)- gray, fine to coarse, with gravel, traces of silt, loose to medium dense, wet	SS 7	100	2-3-3 (6)		
15							
							24
20			SS 8	11	5-12-16 (28)		
		SAND (SP)- gray, fine to medium, some silt, traces of gravel, dense, wet	SS 9	100	1-12-22 (34)		21
25							
							22
30			SS 10	100	9-19-25 (44)		
							21
35			SS 11	100	10-21-34 (55)		

▲ SPT N VALUE ▲ (10 20 30 40)
PL MC LL (10 20 30 40)
☐ FINES CONTENT (%) ☐ (20 40 60 80)



Bottom of borehole at 35.0 feet.

PZ-2

CTI and Associates, Inc.

BORING NUMBER: P-2

CLIENT Stantec
PROJECT NAME Barton Dam Piezometer Installation
PROJECT NUMBER 3142040036
PROJECT LOCATION Ann Arbor, MI
DATE STARTED 12/2/14 **COMPLETED** 12/2/14
GROUND ELEVATION 792.56 ft +/-
DRILLING CONTRACTOR Stearns Drilling
GROUND WATER LEVELS:
DRILLING METHOD 3-1/4 inch Hollow Stem Auger
DURING DRILLING 9' 6"
LOGGED BY M. Kabalan **CHECKED BY** K. Foye
AFTER DRILLING N/A
NOTES Shallow Piezometer Near Crest of Embankment
COLLAPSE DEPTH N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
0		30 inches of TOPSOIL FILL					
			SS 1	33	2-2-2 (4)		25
		CLAYEY SAND (SC - FILL) - dark brown, fine to medium, with traces of gravel and organics, moist	SS 2	44	2-1-2 (3)		8
5		SAND (SP - FILL) - brown, fine to coarse, with gravel, some silt, occasional clay layers, moist	SS 3	100	4-4-4 (8)		6
			SS 4	100	4-4-5 (9)		7
		SILTY SAND (SM - FILL) - gray, fine, traces of gravel, wet	SS 5	78	6-4-1 (5)		18
10			SS 6	94	3-3-1 (4)		63
		SILTY SAND (SM - FILL) - gray, fine to medium, wet	SS 7	100	1-1-1 (2)		19
			SS 8	100	3-4-4 (8)		

▲ SPT N VALUE ▲
10 20 30 40
PL MC LL
10 20 30 40
☐ FINES CONTENT (%) ☐
20 40 60 80

63

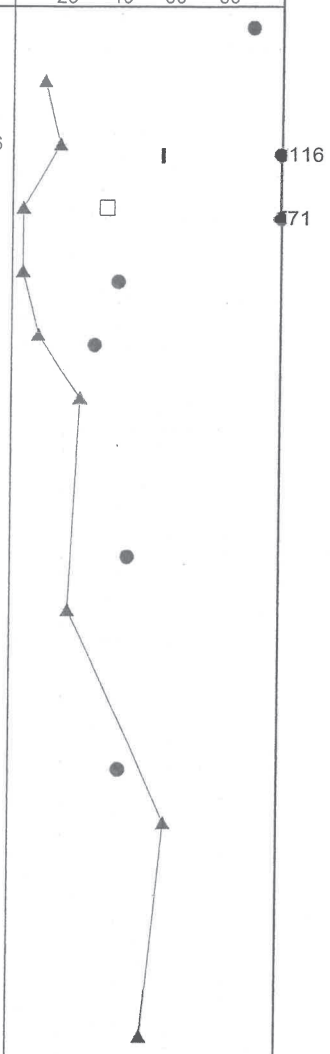
Bottom of borehole at 13.0 feet.

CTI and Associates, Inc.

BORING NUMBER: P-3

CLIENT Stantec
PROJECT NAME Barton Dam Piezometer Installation
PROJECT NUMBER 3142040036
PROJECT LOCATION Ann Arbor, MI
DATE STARTED 12/2/14 **COMPLETED** 12/2/14
GROUND ELEVATION 787.49 ft +/-
DRILLING CONTRACTOR Stearns Drilling
GROUND WATER LEVELS:
DRILLING METHOD 3-1/4 inch Hollow Stem Auger
DURING DRILLING 7'
LOGGED BY M. Kabalan **CHECKED BY** K. Foye
AFTER DRILLING Flowing water (artesian conditions)
NOTES Deep Piezometer Near Mid-Slope of Embankment
COLLAPSE DEPTH N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
0		12 inches of TOPSOIL FILL					
		CLAYEY SAND (SC - FILL) - dark brown, fine to medium, traces of gravel and organics, moist	SS 1	56	3-2-4 (6)		45
			SS 2	11	6-7-2 (9)		116
5		SILTY SAND (SM - FILL) - dark gray, fine to medium, with organics, traces of gravel, moist	SS 3	100	1-1-1 (2)		71
		Loss-on-ignition (organic content)=24%	SS 4	100	1-1-1 (2)		20
		6 inches of wet coarse SAND and GRAVEL	SS 5	100	1-1-4 (5)		16
		SILTY SAND (SM - POSSIBLE FILL) - gray, fine, with gravel, wet					
10		SILTY SAND (SM - POSSIBLE FILL) - gray, fine to coarse, with gravel, wet	SS 6	78	2-4-9 (13)		
		SAND (SP) - gray, fine to medium, with some gravel, medium dense, wet					22
15			SS 7	56	6-7-4 (11)		
							20
20			SS 8	83	9-13-16 (29)		
25			SS 9	89	5-12-13 (25)		



Bottom of borehole at 25.0 feet.

CTI and Associates, Inc.

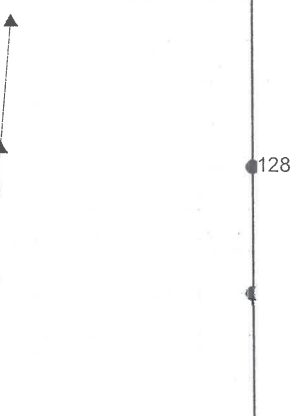
BORING NUMBER: P-4

CLIENT Stantec
PROJECT NUMBER 3142040036
DATE STARTED 12/3/14 **COMPLETED** 12/3/14
DRILLING CONTRACTOR Stearns Drilling
DRILLING METHOD 3-1/4 inch Hollow Stem Auger
LOGGED BY M. Kabalan **CHECKED BY** K. Foye
NOTES Shallow Piezometer Near Mid-Slope of Embankment

PROJECT NAME Barton Dam Piezometer Installation
PROJECT LOCATION Ann Arbor, MI
GROUND ELEVATION 787.47 ft +/-
GROUND WATER LEVELS:
DURING DRILLING Not Encountered
AFTER DRILLING N/A
COLLAPSE DEPTH N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
0.0		12 inches of TOPSOIL					
		CLAYEY SAND (SC - FILL) - dark brown, fine to medium, some gravel, traces of organics, moist	SS 1	22	1-2-4 (6)		
2.5			SS 2	33	3-3-1 (4)		128
		CLAY (CL - FILL) - dark gray to black, with silt and sand, some gravel, and organics, moist	SS 3	44	0-1-1 (2)		114
5.0			SS 4	100	0-1-1 (2)		

▲ SPT N VALUE ▲
10 20 30 40
PL MC LL
10 20 30 40
☐ FINES CONTENT (%) ☐
20 40 60 80



Bottom of borehole at 6.5 feet.

CTI and Associates, Inc.

BORING NUMBER: P-5

CLIENT Stantec
PROJECT NAME Barton Dam Piezometer Installation
PROJECT NUMBER 3142040036
PROJECT LOCATION Ann Arbor, MI
DATE STARTED 12/4/14 COMPLETED 12/4/14
GROUND ELEVATION 784.08 ft +/-
DRILLING CONTRACTOR Stearns Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger
DURING DRILLING 3'
LOGGED BY M. Kabalan CHECKED BY K. Foye
AFTER DRILLING N/A
NOTES Shallow Piezometer Near Toe of Embankment
COLLAPSE DEPTH N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)	▲ SPT N VALUE ▲ 10 20 30 40 / PL MC LL 10 20 30 40 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
0.0		12 inches of TOPSOIL FILL						
		SILTY SAND (SM - FILL) - dark gray to black, with clay and organics, traces of gravel, moist					95	95
2.5		Loss-on-ignition (organic content)=14.6%						
5.0		Bottom of borehole at 5.0 feet.						

CTI and Associates, Inc.

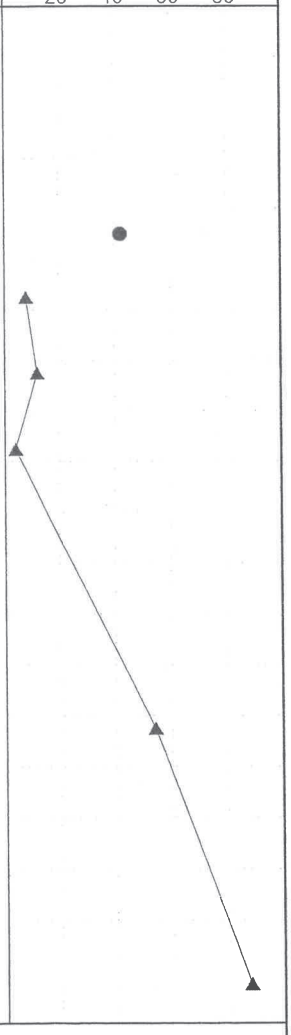
BORING NUMBER: P-6

CLIENT Stantec
PROJECT NUMBER 3142040036
DATE STARTED 12/3/14 **COMPLETED** 12/4/14
DRILLING CONTRACTOR Stearns Drilling
DRILLING METHOD 4-inch Wash Rotary
LOGGED BY M. Kabalan **CHECKED BY** K. Foye
NOTES Deep Piezometer Near Toe of Embankment

PROJECT NAME Barton Dam Piezometer Installation
PROJECT LOCATION Ann Arbor, MI
GROUND ELEVATION 782.92 ft +/-
GROUND WATER LEVELS:
DURING DRILLING Flowing water (artesian conditions)
AFTER DRILLING Flowing water (artesian conditions)
COLLAPSE DEPTH N/A

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf) UNC. STRENGTH (psf)	NATURAL MOISTURE CONTENT (%)
0		12 inches of GRAVEL FILL					
		Woven Geotextile SAND (SP) - gray, fine to medium, with traces of gravel, very loose to loose, wet					21
5			SS 1	33	3-2-2 (4)		
			SS 2	17	2-3-3 (6)		
10			SS 3	33	0-1-1 (2)		
		SAND (SP) - gray, fine to medium, with traces of gravel, medium dense to dense, wet					
15			SS 4	67	9-15-12 (27)		
20			SS 5	11	19-22-22 (44)		

Bottom of borehole at 20.0 feet.



CTI and Associates, Inc.

SUMMARY OF LABORATORY RESULTS

CLIENT Stantec **PROJECT NAME** Barton Dam Piezometer Installation

PROJECT NUMBER 3142040036 **PROJECT LOCATION** Ann Arbor, MI

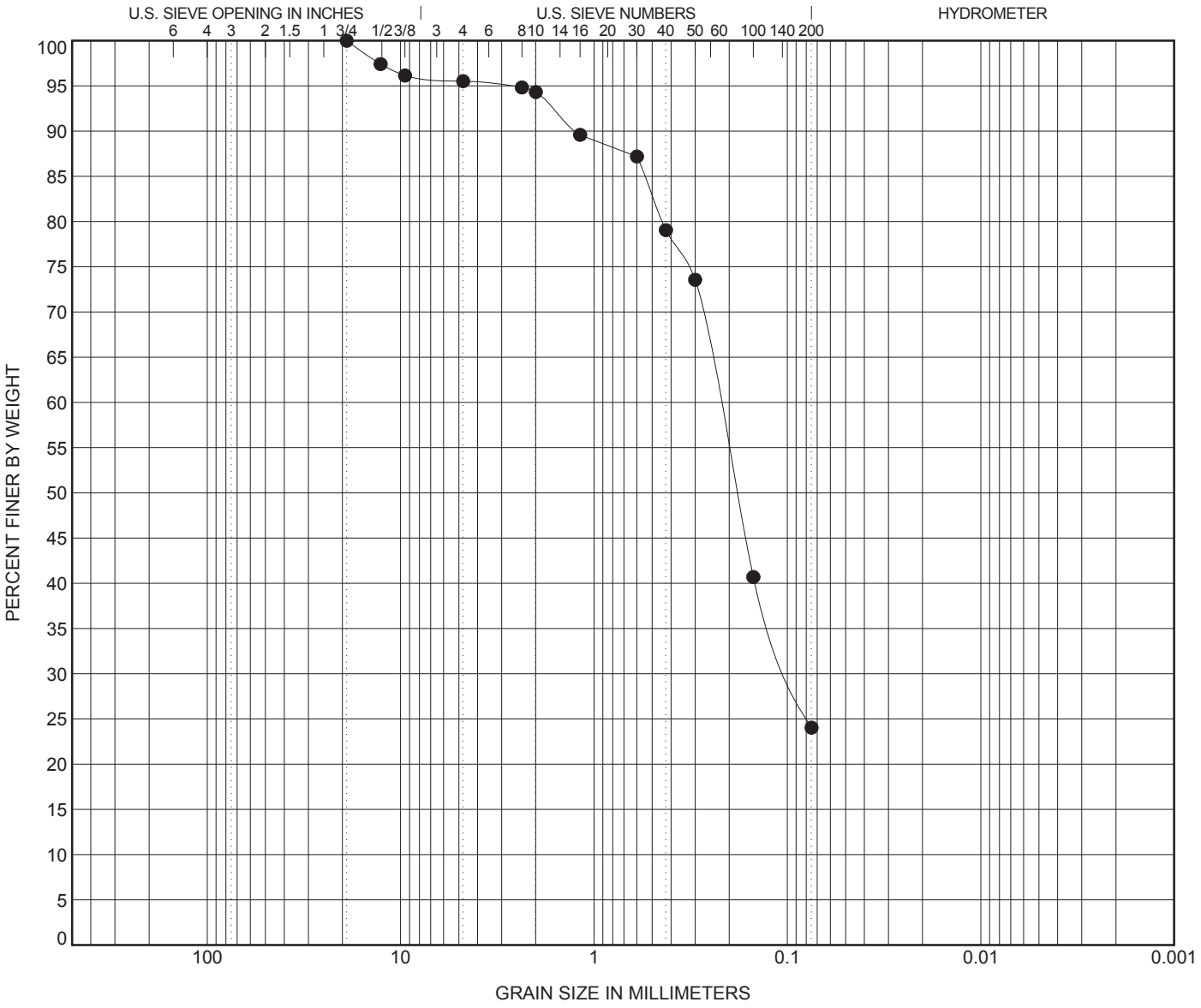
Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Classification	%<#200 Sieve	Water Content (%)	Natural Density (pcf)	Dry Density (pcf)	Hand Penetrometer (tsf)	Unc. Compressive Strength (psf)
P-1	1.0				SC		19				
P-1	2.5				SC	24	46				
P-1	4.0				SC		14				
P-1	5.5				GW		31				
P-1	7.0				CL		6				
P-1	8.5				GW		10				
P-1	11.0				SC		18				
P-1	13.5				SP	3	11				
P-1	18.5				SP		24				
P-1	23.5				SP	5	21				
P-1	28.5				SP		22				
P-1	33.5				SP		21				
P-2	2.5				SC		25				
P-2	4.0				SP		8				
P-2	5.5				SP	5	6				
P-2	7.0				SM	16	7				
P-2	8.5				SM	43	18				
P-2	10.0	24	24	NP	SM	37	63				
P-2	11.5				SM		19				
P-3	1.0				SC		45				
P-3	4.0	28	28	NP	SM	35	116				
P-3	5.5				SM		71				
P-3	7.0				SM		20				
P-3	8.5				SM		16				
P-3	13.5				SP		22				
P-3	18.5				SP		20				
P-4	3.5				SC		128				
P-4	5.0				CL		114				
P-5	2.5				SM		95				
P-6	5.0				SP		21				

GRAIN SIZE DISTRIBUTION

CTI and Associates, Inc.

CLIENT Stantec **PROJECT NAME** Barton Dam Piezometer Installation

PROJECT NUMBER 3142040036 **PROJECT LOCATION** Ann Arbor, MI



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● P-1	2.5	**SAND (SC - FILL)- dark brown, fine to medium, with clay, traces of gravel and organics**					

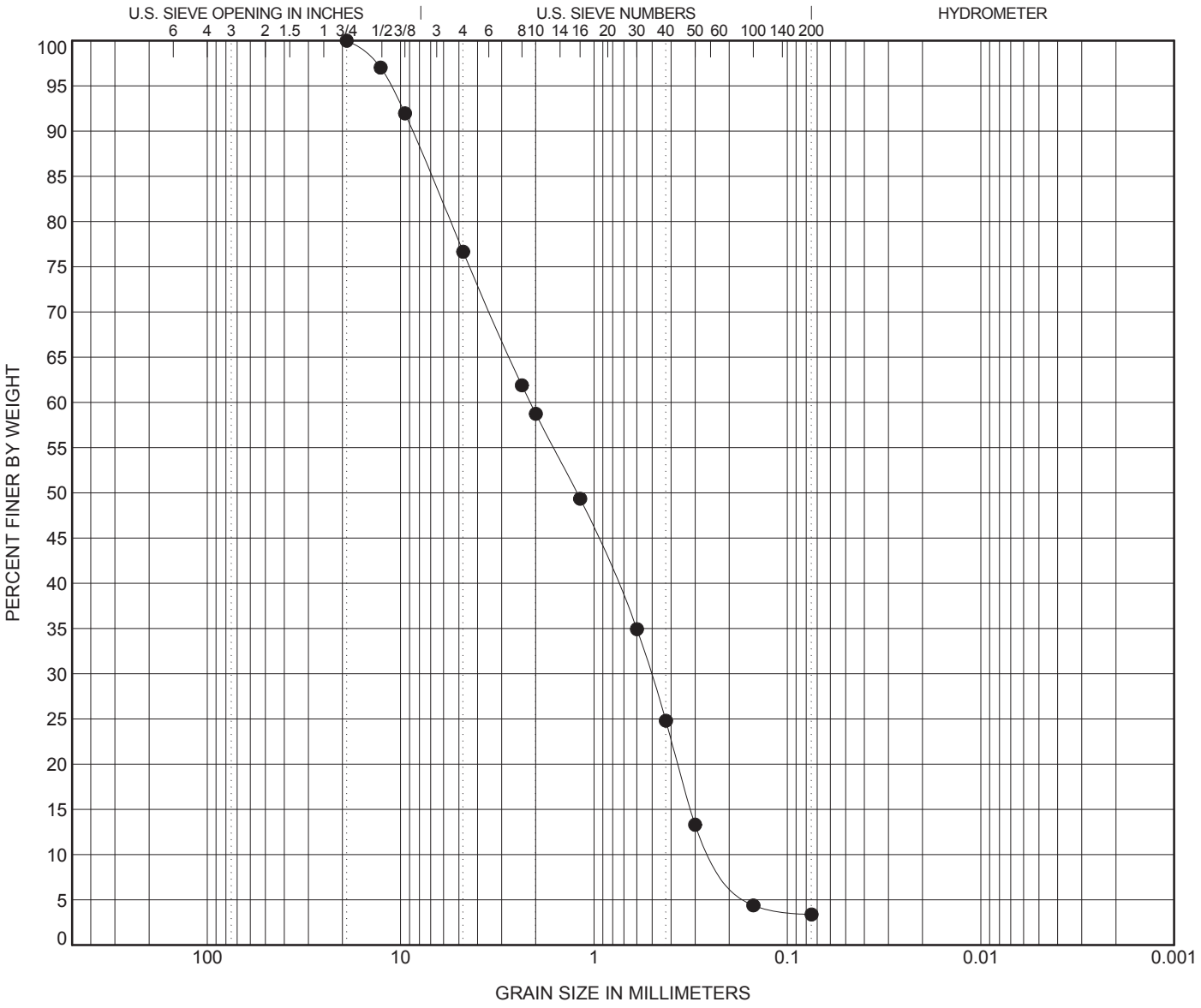
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **P-1**	**2.5**	**19**	**0.225**	**0.096**		**4.5**	**71.5**	**24.0**	

GRAIN SIZE DISTRIBUTION

CTI and Associates, Inc.

CLIENT Stantec **PROJECT NAME** Barton Dam Piezometer Installation

PROJECT NUMBER 3142040036 **PROJECT LOCATION** Ann Arbor, MI



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**P-1**	**13.5**	**SAND (SP)- gray, fine to coarse, with gravel, trace silt**				**0.52**	**9.21**

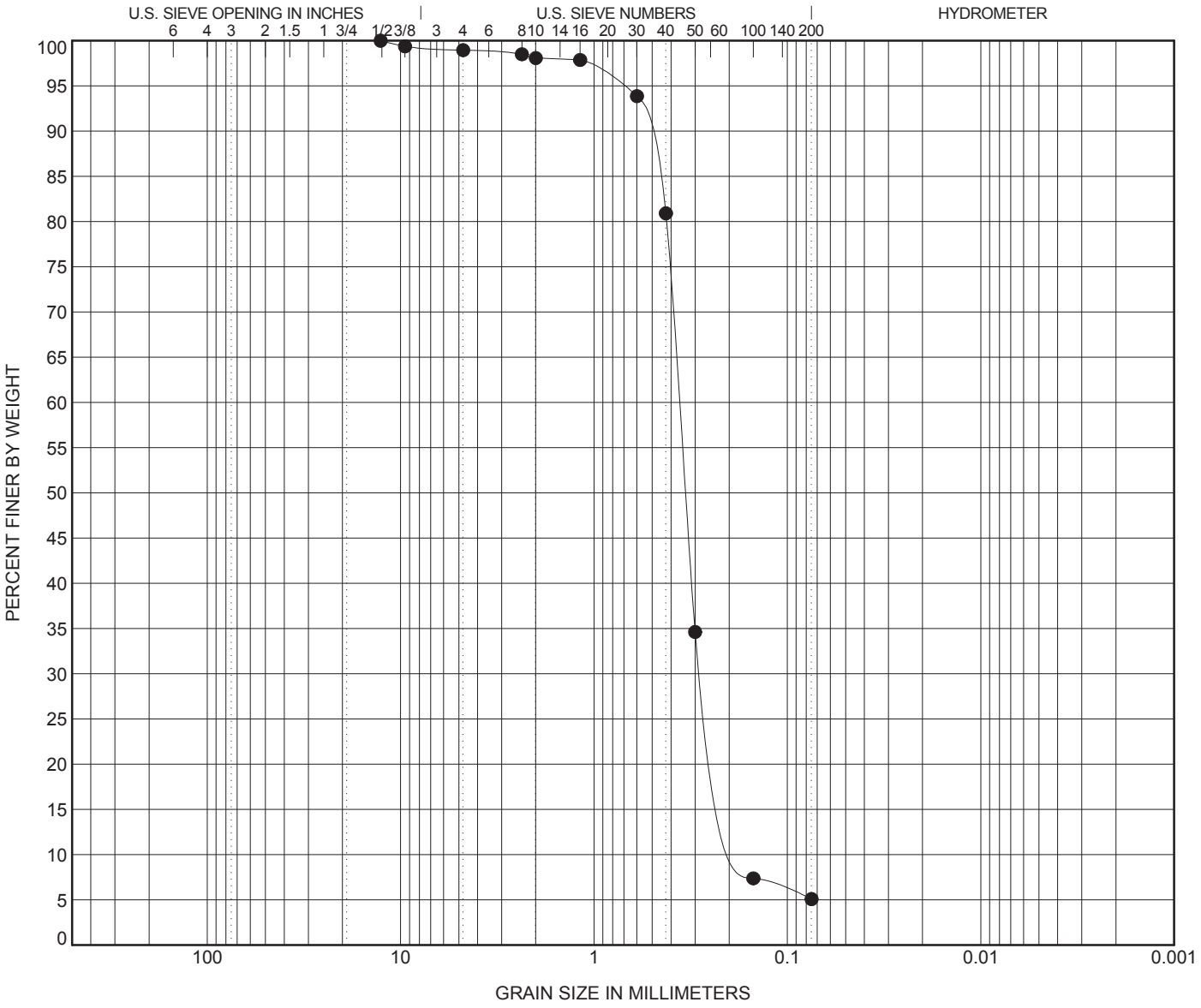
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**P-1**	**13.5**	**19**	**2.137**	**0.507**	**0.232**	**23.3**	**73.3**	**3.4**	

GRAIN SIZE DISTRIBUTION

CTI and Associates, Inc.

CLIENT Stantec **PROJECT NAME** Barton Dam Piezometer Installation

PROJECT NUMBER 3142040036 **PROJECT LOCATION** Ann Arbor, MI



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**P-1**	**23.5**	**SAND (SP)- gray, fine to medium, some silt, trace gravel**				**1.22**	**2.26**

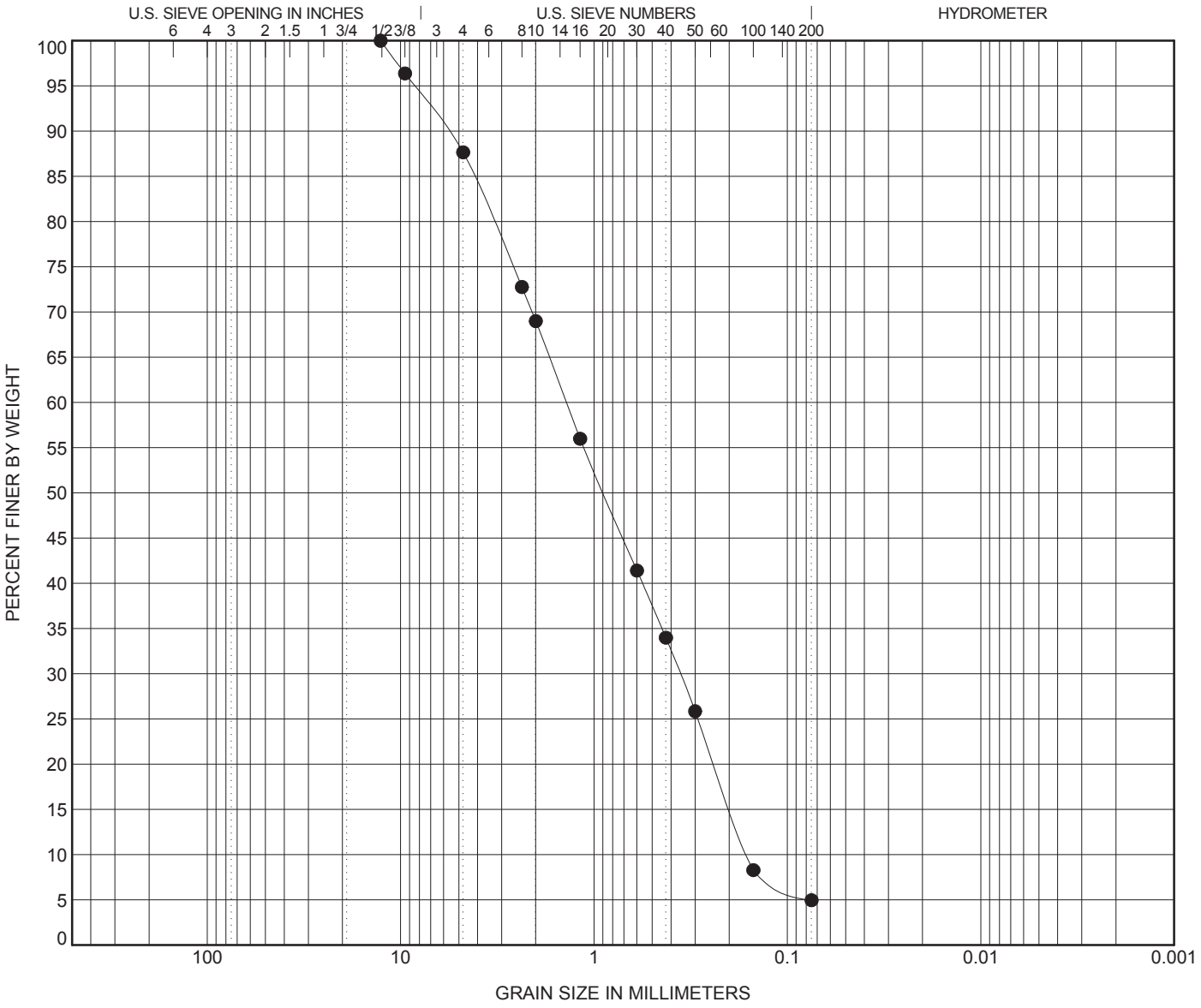
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**P-1**	**23.5**	**12.7**	**0.363**	**0.267**	**0.16**	**1.0**	**93.9**	**5.1**	

GRAIN SIZE DISTRIBUTION

CTI and Associates, Inc.

CLIENT Stantec **PROJECT NAME** Barton Dam Piezometer Installation

PROJECT NUMBER 3142040036 **PROJECT LOCATION** Ann Arbor, MI



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● **P-2**	**5.5**	**SAND (SP - FILL) - brown, fine to coarse, with gravel, some silt, occasional clay layers**				**0.58**	**8.65**

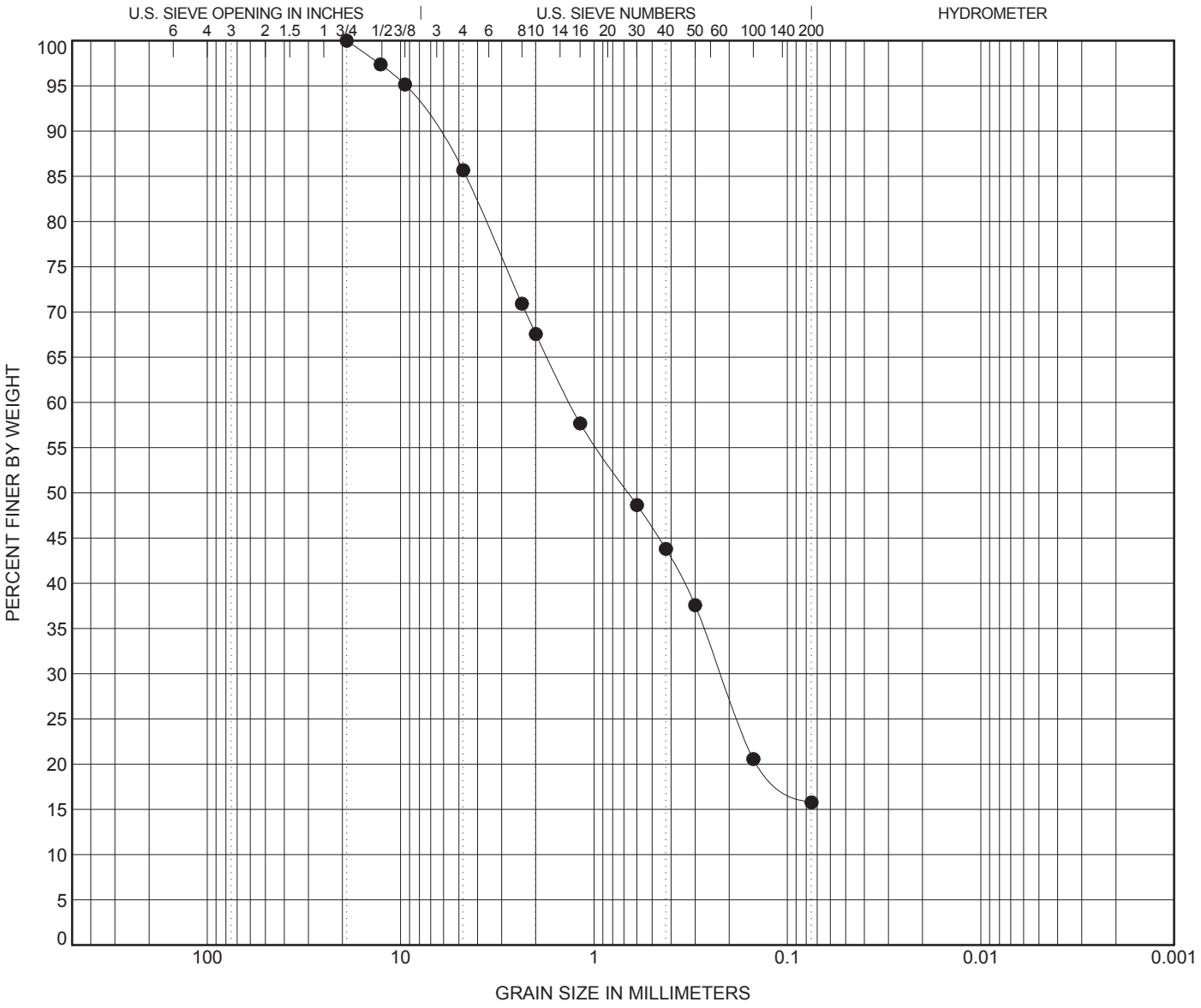
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **P-2**	**5.5**	**12.7**	**1.389**	**0.358**	**0.16**	**12.3**	**82.7**	**5.0**	

GRAIN SIZE DISTRIBUTION

CTI and Associates, Inc.

CLIENT Stantec **PROJECT NAME** Barton Dam Piezometer Installation

PROJECT NUMBER 3142040036 **PROJECT LOCATION** Ann Arbor, MI



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**P-2**	**7.0**	**SAND (SM - FILL) - gray, fine to coarse, with silt and gravel**					

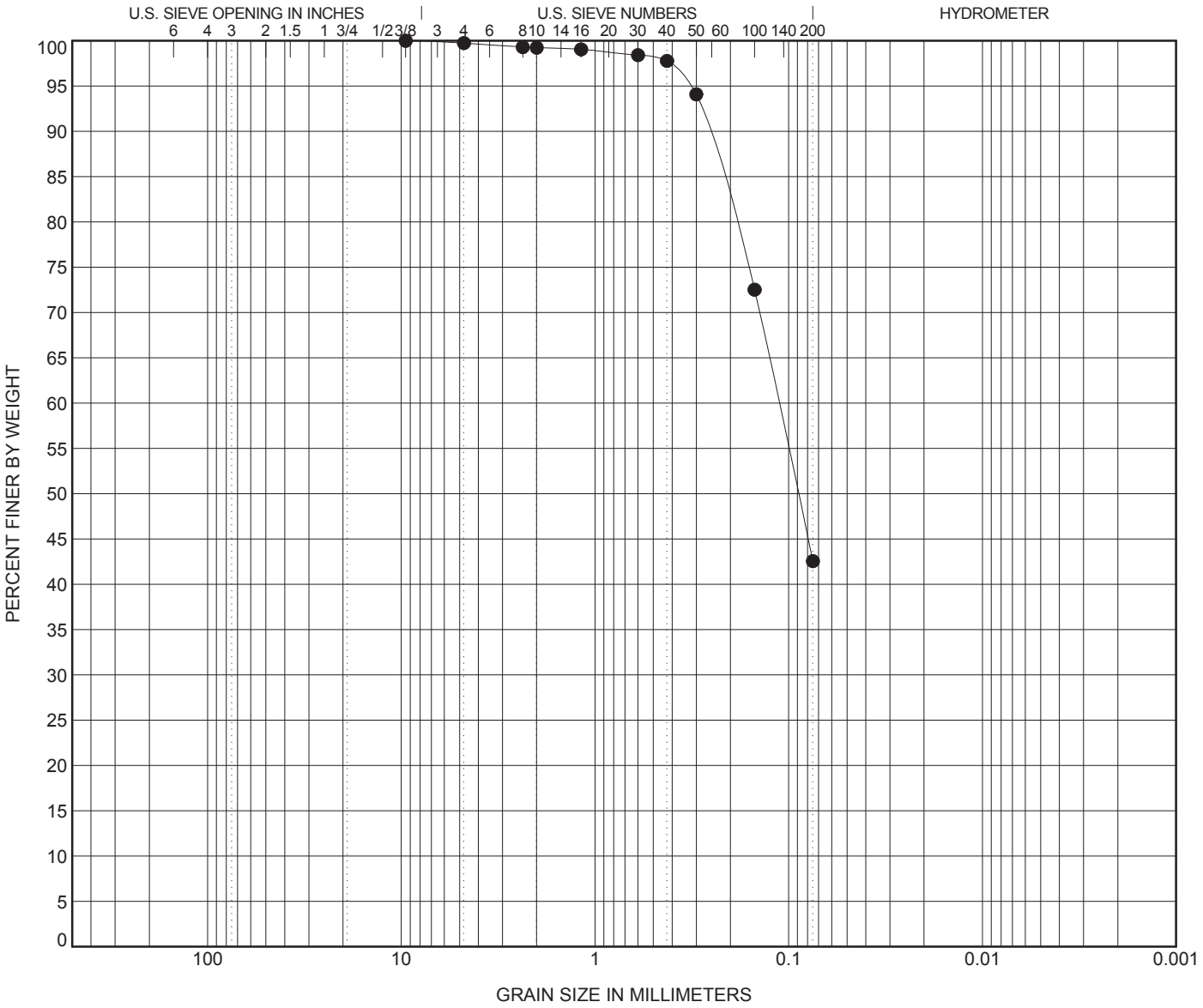
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**P-2**	**7.0**	**19**	**1.336**	**0.22**		**14.3**	**69.9**	**15.8**	

GRAIN SIZE DISTRIBUTION

CTI and Associates, Inc.

CLIENT Stantec **PROJECT NAME** Barton Dam Piezometer Installation

PROJECT NUMBER 3142040036 **PROJECT LOCATION** Ann Arbor, MI



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● **P-2**	**8.5**	**SILTY SAND (SM - FILL) - gray, fine, traces of gravel**					

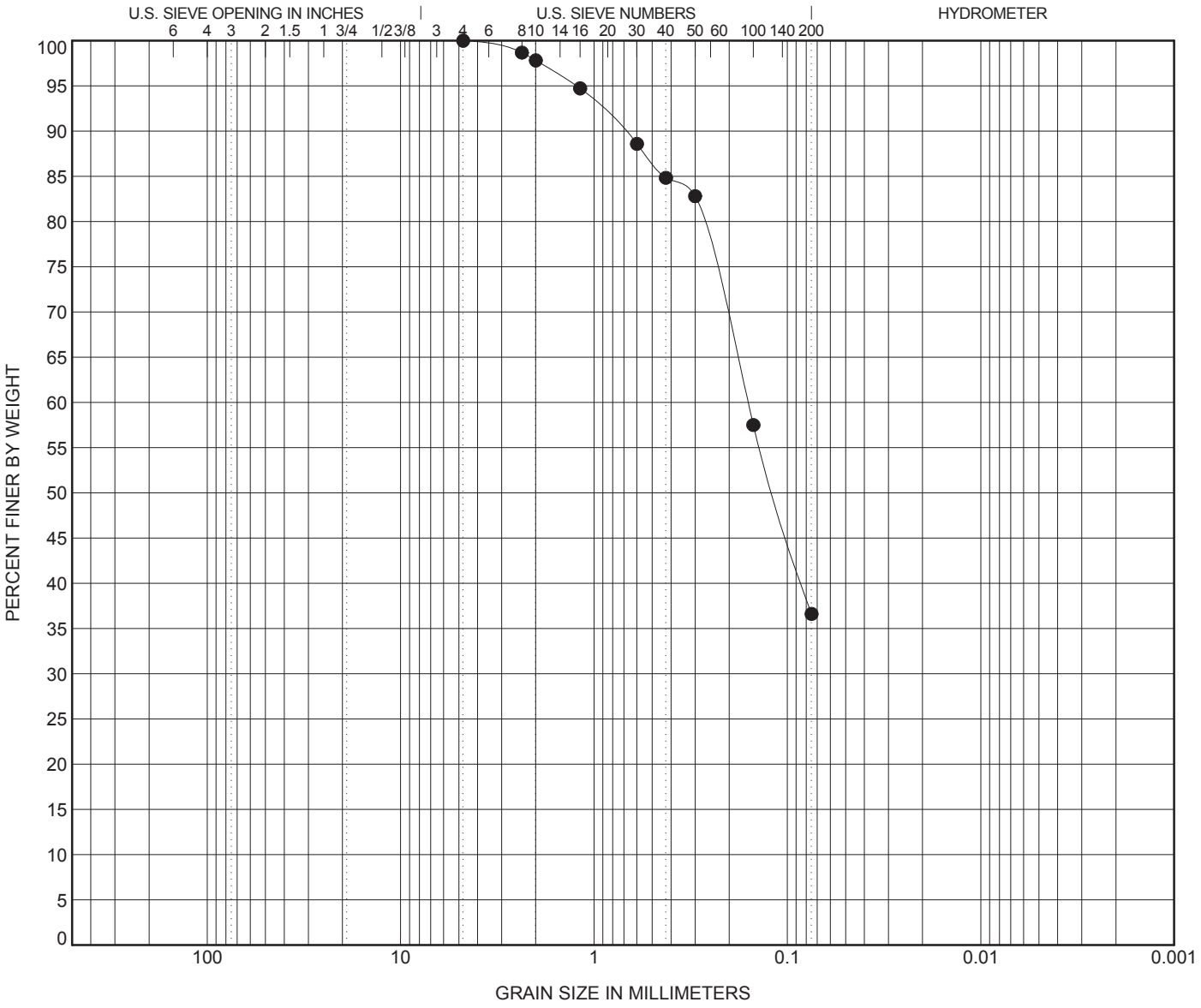
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **P-2**	**8.5**	**9.5**	**0.112**			**0.3**	**57.2**	**42.6**	

GRAIN SIZE DISTRIBUTION

CTI and Associates, Inc.

CLIENT Stantec **PROJECT NAME** Barton Dam Piezometer Installation

PROJECT NUMBER 3142040036 **PROJECT LOCATION** Ann Arbor, MI



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**P-2**	**10.0**	**SILTY SAND (SM - FILL) - gray, fine to medium**	**24**	**24**	**NP**		

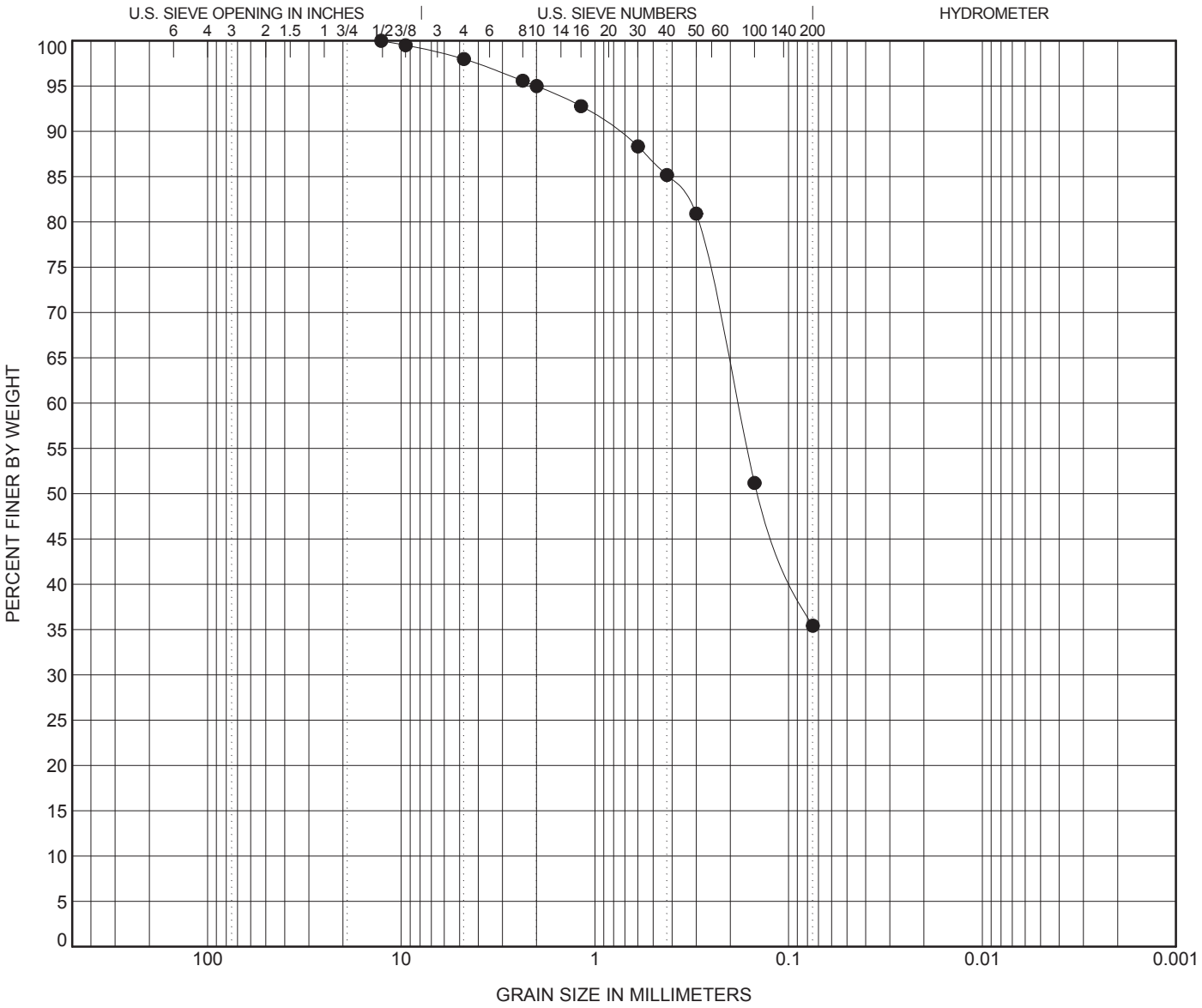
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**P-2**	**10.0**	**4.75**	**0.161**			**0.0**	**63.4**	**36.6**	

GRAIN SIZE DISTRIBUTION

CTI and Associates, Inc.

CLIENT Stantec **PROJECT NAME** Barton Dam Piezometer Installation

PROJECT NUMBER 3142040036 **PROJECT LOCATION** Ann Arbor, MI



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**P-3**	**4.0**	**SILTY SAND (SM - FILL) - dark gray, fine to medium, with organics, trace gravel**	**28**	**28**	**NP**		

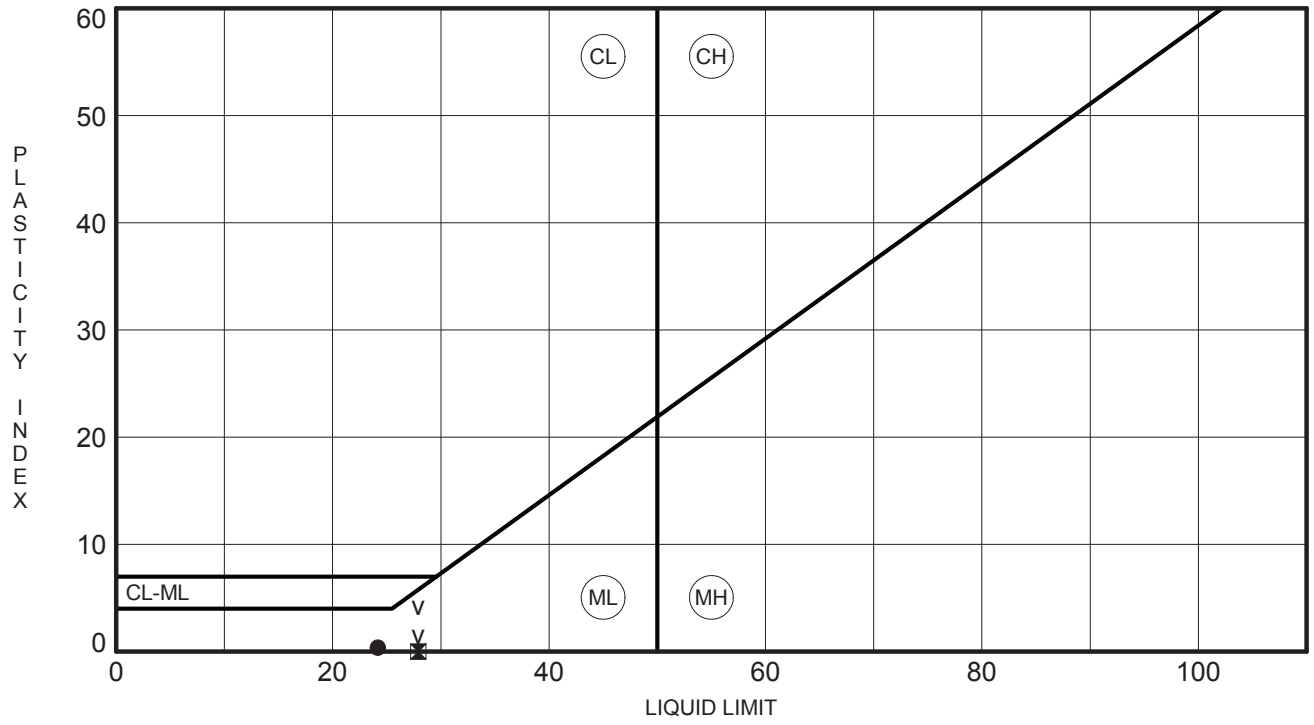
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**P-3**	**4.0**	**12.7**	**0.184**			**2.0**	**62.6**	**35.4**	

ATTERBERG LIMITS' RESULTS

CTI and Associates, Inc.

CLIENT Stantec **PROJECT NAME** Barton Dam Piezometer Installation

PROJECT NUMBER 3142040036 **PROJECT LOCATION** Ann Arbor, MI



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**P-2**	**10.0**	**24**	**24**	**NP**	**37**	**SILTY SAND (SM - FILL) - gray, fine to medium**
⧓	**P-3**	**4.0**	**28**	**28**	**NP**	**35**	**SILTY SAND (SM - FILL) - dark gray, fine to medium, trace gravel**

LOG OF TEST BORING NO: PB-1 (PZ-7)

NTH Consultants, Ltd.

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan
NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 798.1	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		797.8	TOPSOIL	0.3									
		796.1	FILL: Very Compact Brown CLAYEY SAND, Some Silt, Trace Gravel and Roots	2.0		LS-1	13 60	60/6"	13				
795						LS-2	13 12 10	22	9				
			FILL: Medium Compact Brown CLAYEY SAND, Some Silt, Trace Gravel and Bricks		5	LS-3	8 9 6	15	9				
790		790.1		8.0									
			Soft Dark Brown SILTY CLAY, Trace Sand and Organic Matter		10	LS-4	17 2 2	4	9		12.5	96.7	*1000
		786.1		12.0									
785			Very Loose Gray SANDY SILT, Little Clay, Trace Organic Matter		15	LS-5	1 1 2	3	16		53.6	59.1	
780		779.1		19.0									
			Very Stiff to Hard Gray SILTY CLAY, Trace Sand		20	LS-6	5 6 6	12	13				>*9000
775					25	LS-7	6 9 13	22	12				>*9000
		771.1		27.0									
770			Very Hard Dark Gray SILTY CLAY, Trace Sand and Gravel										
		768.1			30	LS-8	17 24 31	55	12				>*9000

Total Depth: *70 FT*
Drilling Start Date: *10/24/17*
Drilling End Date: *10/25/17*
Inspector: *G. Kachl*
Contractor: *Stearns Drilling*
Driller: *M. Hefferan*
Drilling Method:
CME LC-61 drilling rig using 4-1/4" ID hollow stem auger to EOB.
Plugging Procedure:
Piezometer PZ-7 (PB-1) installed

Water Level Observation:
Groundwater encountered at 14 ft bgs; at 16 ft bgs upon completion.

Notes:
** = pocket penetrometer value*
WOH = weight of hammer

Approximate GPS Coordinates:
N: 295450 E: 13288264

Figure No. 3

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-1 (PZ-7)

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE					SOIL SAMPLE DATA								
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 798.1	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
765			Very Hard Dark Gray SILTY CLAY, Trace Sand and Gravel		35	LS-9	22 25 30	55	13				>*9000
		761.1		37.0									
760					40	LS-10	18 27 24	51			9.4	130.2	
755			Very Hard Gray SILTY CLAY, Little Sand, Trace Gravel		45	LS-11	12 36 55	91	17				>*9000
750					50	LS-12	17 42 42	84	13		7.9	129.9	>*9000
		746.1		52.0									
745			Medium Compact Gray SILTY SAND, Trace Clay		55	LS-13	11 11 17	28	20		9	119.7	*9000
		743.6		54.5									
			Hard Gray SILTY CLAY, Trace Sand										
		741.1		57.0									
740					60	LS-14	15 26 31	57	15		11.9	123.1	
735			Very Compact Gray SAND, Trace Clay, Silt and Gravel		65	LS-15	16 28 32	60	15				
		731.1		67.0									

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-1 (PZ-7)

NTH Consultants, Ltd.

Project Name: Barton Dam
NTH Proj. No.: 61-160089-01
Project Location: Ann Arbor, Michigan
Checked By:

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 798.1	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
730													
			Very Hard Gray SILTY CLAY, Little Sand				14 22 37						
		728.1		70.0	70	LS-16		59					
			END OF BORING AT 70.0 FEET.										
725													
720													
715													
710													
705													
700													
695													

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-2 (PZ-8)

NTH Consultants, Ltd.

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan
NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 798.5	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		798.2	TOPSOIL	0.3									
			FILL: Medium Compact to Compact Brown CLAYEY SAND, Little Silt, Trace Gravel and Organic Matter			LS-1	3 15 22	37	10				
795													
					5	LS-2	15 13 11	24	10		15.2		
		793.0		5.5									
			FILL: Stiff Gray SANDY CLAY, Little Silt, Trace Gravel			LS-3	5 5 4	9	11		9.4	124.9	*6000
		790.5		8.0									
790			Loose Brown CLAYEY SAND, Little Silt, Trace Organic Matter		10	LS-4	20 7 3	10	7				
		786.0		12.5									
785			Very Loose Gray SILTY SAND, Trace Clay and Gravel		15	LS-5	1 1 1	2			62.4		
		781.5		17.0									
780			Very Stiff Gray SILTY CLAY, Little Sand, Trace Gravel										
		778.5		20.0	20	LS-6	6 7 11	18	8				*5000
			END OF BORING AT 20.0 FEET.										
775													
770													

Total Depth: *20 FT*
Drilling Start Date: *10/23/17*
Drilling End Date: *10/24/17*
Inspector: *G. Kachl*
Contractor: *Stearns Drilling*
Driller: *M. Hefferan*
Drilling Method:
CME LC-61 drilling rig using 4-1/4" ID hollow stem auger to EOB.
Plugging Procedure:
Piezometer PZ-8 (PB-2) installed

Water Level Observation:
Groundwater encountered at 13.5 ft bgs; at 13.5 ft bgs upon completion.

Notes:
** = pocket penetrometer value*
WOH = weight of hammer

Approximate GPS Coordinates:
N: 295445 E: 13288261

Figure No. 4

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-3 (PZ-9)

NTH Consultants, Ltd.

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan
NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE					SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 786.6	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
785		785.6	GRAVEL	1.0									
			Very Soft Black PEAT			LS-1	WOH WOH WOH	0	4		237.7	21.0	
		783.6		3.0		LS-2	WOH 2 2	4	12		56.6	63.2	
		782.1	Medium Black SILTY CLAY, Little Sand, Trace Gravel and Organic Matter	4.5	5	LS-3	8 14 5	19	17		14.9	119.2	
		780.6	Medium Compact Gray GRAVELLY SAND, Trace Clay and Silt	6.0									
780		779.6	BOULDER	7.0									
					10	LS-4	10 8 8	16	12		14.8		
775					15	LS-5	8 7 8	15	7				
770			Medium Compact Brown and Gray SAND, Trace Clay, Silt and Gravel		20	LS-6	11 12 16	28	12				
765					25	LS-7	12 13 13	26	11		18.3	110.6	
760		757.1		29.5	30	LS-8	13 12 15	27	8				*9000

Total Depth: *50 FT*
Drilling Start Date: *10/27/17*
Drilling End Date: *10/31/17*
Inspector: *G. Kachl*
Contractor: *Stearns Drilling*
Driller: *M. Hefferan*
Drilling Method:
CME LC-61 drilling rig using 10-1/4" ID hollow stem auger to 5'; 3-1/4" hollow stem auger thereafter.
Plugging Procedure:
Piezometer PZ-9 (PB-3) installed

Water Level Observation:
Groundwater encountered at 1ft below ground surface.

Notes:
** = pocket penetrometer value*
WOH = weight of hammer

Approximate GPS Coordinates:
N: 295573 E: 13288352

Figure No. 5

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-3 (PZ-9)

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE					SOIL SAMPLE DATA								
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 786.6	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
755					35	LS-9	13 22 27	49	7				>*9000
750			Hard Gray SILTY CLAY, Little Sand, Trace Gravel		40	LS-10	10 19 30	49	10		10.4	133.6	>*9000
745					45	LS-11	13 25 46	71	19				>*9000
740		739.1		47.5									
			Very Compact SILTY SAND (Occasional Seams of Silty Clay)										
		737.1		49.5									
		736.6	Compact CLAYEY SILT	50.0	50	LS-12	11 20 30	50	15		16.2	115.4	
735			END OF BORING AT 50.0 FEET.										
730													
725													
720													

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-4 (PZ-10)

NTH Consultants, Ltd.

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan

NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 786.7	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		785.7	FILL: GRAVEL	1.0									
785			Very Soft Black SANDY CLAY, Trace Organic Matter			LS-1	WOH WOH WOH	0	2				
		783.7		3.0		LS-2	1 2 6	8	9				
			Loose Black and Brown SAND, Trace Clay, Silt and Fibrous Organic Matter		5	LS-3	5 4 4	8	11		31.8	88.0	
		780.7		6.0									
780			Medium Compact Gray SAND, Trace Silt, Gravel and Organic Matter			LS-4	6 7 8	15	15				
		776.7		10.0	10	LS-5	7 7 8	15	15				
			END OF BORING AT 10.0 FEET.										
775													
770													
765													
760													

Total Depth: *10 FT*
Drilling Start Date: *10/26/17*
Drilling End Date: *10/26/17*
Inspector: *G. Kachl*
Contractor: *Stearns Drilling*
Driller: *M. Hefferan*
Drilling Method:
CME LC-61 drilling rig using 10-1/4" ID hollow stem auger to 5'; 3-1/4" hollow stem auger thereafter.
Plugging Procedure:
Piezometer PZ-10 (PB-4) installed

Water Level Observation:
Groundwater encountered at 1ft below ground surface.

Notes:
** = pocket penetrometer value*
WOH = weight of hammer

Approximate GPS Coordinates:
N: 295570 E: 13288355

Figure No. 6

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-5 (PZ-11)

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 783.1	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		782.1	FILL: GRAVEL	1.0									
780		780.1	Soft Gray SILTY CLAY, Little Sand, Trace Organic Matter	3.0		LS-1	5 4 2	6	4		73.9		
		779.1	Medium Compact SILTY SAND	4.0		LS-2	12 8 12	20	4				
775		775.1	Loose Gray SILTY SAND, Trace Clay and Gravel (Cobbles encountered at 8.0')	8.0	5	LS-3	12 3 6	9	16		18.6	111.0	
			END OF BORING AT 8.0 FEET.										
770													
765													
760													
755													

Total Depth: *8 FT*
Drilling Start Date: *10/30/17*
Drilling End Date: *10/30/17*
Inspector: *G. Kachl*
Contractor: *Stearns Drilling*
Driller: *M. Hefferan*
Drilling Method:
CME LC-61 drilling rig using 10-1/4" ID hollow stem auger to 5'; 3-1/4" hollow stem auger thereafter.
Plugging Procedure:
Piezometer PZ-11 (PB-5) installed

Water Level Observation:
Groundwater encountered at ground surface.

Notes:
** = pocket penetrometer value*
WOH = weight of hammer

Approximate GPS Coordinates:
N: 295607 E: 13288400

Figure No. 7

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-7 (PZ-12)

NTH Consultants, Ltd.

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan
NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE					SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 801.9	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		801.4	TOPSOIL	0.5									
800						LS-1	3 3 3	6	9				
					5	LS-2	5 5 4	9	12		3.7	110.3	
			FILL: Loose to Medium Compact Dark Brown SILTY SAND, Trace Clay and Gravel			LS-3	5 6 5	11	12				
795					10	LS-4	3 3 4	7	9		9.4	107.3	
790		789.9		12.0									
			FILL: Very Stiff Brown SILTY CLAY, Little Sand, Trace Gravel		15	LS-5	5 7 8	15	15		10.4	122.5	*9000
785		783.9		18.0									
					20	LS-6	8 4 3	7					
780			Loose to Medium Compact Gray SAND, Trace Silt		25	LS-7	2 5 16	21	18		16.2	113.4	
775													
		771.9			30	LS-8	11 9 11	20	18				

Total Depth: *70 FT*
Drilling Start Date: *10/25/17*
Drilling End Date: *10/26/17*
Inspector: *G. Kachl*
Contractor: *Stearns Drilling*
Driller: *M. Hefferan*
Drilling Method:
CME LC-61 drilling rig using 4-1/4" ID hollow stem auger to EOB.
Plugging Procedure:
Piezometer PZ-12 (PB-7) installed

Water Level Observation:
Groundwater encountered at 18 ft bgs; at 12 ft bgs upon completions.

Notes:
** = pocket penetrometer value*
WOH = weight of hammer

Approximate GPS Coordinates:
N: 295671 E: 13288439

Figure No. 9

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-7 (PZ-12)

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan

NTH Consultants, Ltd.
NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE					SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 801.9	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
770			Loose to Medium Compact Gray SAND, Trace Silt		35	LS-9	4 10 15	25	12				
765		764.9		37.0	40	LS-10	19 29 28	57	11		13.8	120.9	
760					45	LS-11	19 39 48	87	21				
755			Compact to Very Compact Gray SAND, Trace Clay, Silt and Gravel		50	LS-12	20 30 41	71	17				
750					55	LS-13	16 21 25	46	15		11.5	122.7	
745					60	LS-14	11 13 18	31	15				
740		739.9		62.0	65	LS-15	5 8 14	22	21				
735			Medium Compact Gray FINE SAND, Trace Clay and Silt										

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-7 (PZ-12)

NTH Consultants, Ltd.

Project Name: Barton Dam
NTH Proj. No.: 61-160089-01
Project Location: Ann Arbor, Michigan
Checked By:

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 801.9	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		733.9	Medium Compact Gray FINE SAND, Trace Clay and Silt				6 7 14						
		731.9		70.0	70	LS-16		21	9				
			END OF BORING AT 70.0 FEET.										
730													
725													
720													
715													
710													
705													
700													

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-8 (PZ-13)

NTH Consultants, Ltd.

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan

NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 801.9	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		801.7	TOPSOIL	0.2									
800			FILL: Loose Brown CLAYEY SAND, Little Silt, Trace Gravel and Organic Matter			LS-1	3 3 2	5	7				
					5	LS-2	6 4 4	8	7				
795						LS-3	4 3 5	8	9				
		793.9		8.0									
			FILL: Stiff Brown SILTY CLAY, Little Sand, Trace Organic Matter		10	LS-4	3 3 3	6	15				5000
790		789.9		12.0									
			FILL: Medium Brown SANDY CLAY, Little Silt, Trace Gravel										
		786.9		15.0	15	LS-5	1 3 3	6	15		16.9	115.5	1140**
			END OF BORING AT 15.0 FEET.										
785													
780													
775													

Total Depth: *15 FT*
Drilling Start Date: *10/25/17*
Drilling End Date: *10/25/17*
Inspector: *G. Kachl*
Contractor: *Stearns Drilling*
Driller: *M. Hefferan*
Drilling Method:
CME LC-61 drilling rig using 4-1/4" ID hollow stem auger to EOB.
Plugging Procedure:
Piezometer PZ-13 (PB-8) installed

Water Level Observation:
No groundwater encountered; borehole dry upon completion.

Notes:
** = pocket penetrometer value*
*** = low failure strain*
WOH = weight of hammer

Approximate GPS Coordinates:
N: 295679 E: 13288427

Figure No. 10

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-9 (PZ-14)

NTH Consultants, Ltd.

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan

NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 787.6	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		787.1	TOPSOIL	0.5									
			FILL: Loose Brown SAND, Trace Gravel			LS-1	2 3 3	6	6				
785		785.1		2.5		LS-2	4 4 4	8	8				
			FILL: Medium Brown SANDY CLAY, Little Silt, Trace Gravel			LS-3	4 4 3	7	7		16.3	92.8	
		781.6		6.0	5	LS-4	3 6 8	14	6				
780		779.1	Medium Compact Brown GRAVELLY SAND, Trace Clay, Silt and Occasional Seams of Organic Matter	8.5		LS-5	5 6 6	12	14		11.8	119.2	
			Compact SAND, Trace Clay, Silt, Gravel and Organic Matter		10	LS-6	11 16 16	32	17				
		776.6		11.0									
775			Hard Gray SILTY CLAY, Little Sand										
		772.6		15.0	15	LS-7	6 8 12	20	16				*9000
			END OF BORING AT 15.0 FEET.										
770													
765													
760													

Total Depth: *15 FT*
Drilling Start Date: *10/27/17*
Drilling End Date: *11/1/17*
Inspector: *G. Kachl*
Contractor: *Stearns Drilling*
Driller: *M. Hefferan*
Drilling Method:
CME LC-61 drilling rig using 10-1/4" ID hollow stem auger to 5'; 3-1/4" hollow stem auger thereafter.
Plugging Procedure:
Piezometer PZ-14 (PB-9) installed

Water Level Observation:
Groundwater encountered at 7 ft bgs; at 6 ft bgs upon completion.

Notes:
** = pocket penetrometer value*
WOH = weight of hammer

Approximate GPS Coordinates:
N: 295516 E: 13288606

Figure No. 11

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

LOG OF TEST BORING NO: PB-10 (PZ-15)

NTH Consultants, Ltd.

Project Name: Barton Dam
Project Location: Ann Arbor, Michigan

NTH Proj. No.: 61-160089-01
Checked By:

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 790.0	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
790		789.5	TOPSOIL	0.5		LS-1	1 4 10	14	9				
			FILL: Medium Compact Brown SAND, Trace Clay, Silt and Gravel			LS-2	9 9 10	19	13				
						LS-3	10 10 6	16	13				
785		785.0		5.0	5								
			FILL: Medium Brown SANDY CLAY, Little Silt, Trace Gravel and Occasional Seams of Organic Matter			LS-4	6 3 3	6	12		17.8	99.4	
						LS-5	1 2 4	6	8				
		782.0		8.0									
780			Loose Gray GRAVELLY SAND, Little Silt, Trace Clay, Occasional Seams of Organic Matter		10	LS-6	5 3 3	6	10		13.2	124.4	
		777.0		13.0									
			Very Stiff to Hard Gray SILTY CLAY, Little Sand, Trace Gravel										
775		775.0		15.0	15	LS-7	3 7 8	15					*9000
			END OF BORING AT 15.0 FEET.										
770													
765													
760													

Total Depth: *15 FT*
Drilling Start Date: *10/27/17*
Drilling End Date: *10/27/17*
Inspector: *G. Kachl*
Contractor: *Stearns Drilling*
Driller: *M. Hefferan*
Drilling Method:
CME LC-61 drilling rig using 10-1/4" ID hollow stem auger to 5'; 3-1/4" hollow stem auger thereafter.
Plugging Procedure:
Piezometer PZ-15 (PB-10) installed

Water Level Observation:
Groundwater encountered at 9.5 ft bgs; at 7 ft bgs upon completion.

Notes:
** = pocket penetrometer value*
WOH = weight of hammer

Approximate GPS Coordinates:
N: 295517 E: 13288623

Figure No. 12

LOG OF TEST BORING 61-160089-01.GPJ NTH CORPORATE.GDT 3/7/18

TABULATION OF LABORATORY TEST DATA

BORING / TEST PIT / PROBE DESIGNATION	SAMPLE NUMBER	DEPTH OF SAMPLE TIP (FT)	ELEVATION OF SAMPLE TIP (FT)	UNCONFINED COMPRESSIVE STRENGTH (PSF)	FAILURE STRAIN (%)	NATURAL WATER CONTENT (% OF DRY WEIGHT)	IN-PLACE DRY DENSITY (LBS/CU.FT)	PERMEABILITY (CM/SEC)	PARTICLE SIZE DISTRIBUTION (%)							ATTERBERG LIMITS (%)			APPARENT SPECIFIC GRAVITY	LOSS ON IGNITION (%)	UNIFIED SOIL CLASSIFICATION
									COLLOIDS	CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
PB-1	LS-4	10.0	788.1	--	--	12.5	96.7	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-5	15.0	783.1	--	--	53.6	59.1	----	← 13		56	30	1	0	0	--	--	--	--	--	--
	LS-10	40.0	758.1	--	--	9.4	130.2	----	← 23		53	20	3	0	1	--	--	--	--	--	--
	LS-12	50.0	748.1	--	--	7.9	129.9	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-13	55.0	743.1	--	--	9.0	119.7	----	← 23		55	19	2	0	1	--	--	--	--	--	--
	LS-14	60.0	738.1	--	--	11.9	123.1	----	← 6		12	51	19	8	4	--	--	--	--	--	--
PB-2	LS-2	5.0	793.5	--	--	15.2	--	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-3	7.5	791.0	--	--	9.4	124.9	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-5	15.0	783.5	--	--	62.4	--	----	--	--	--	--	--	--	--	--	--	--	--	--	--
PB-3	LS-1	2.5	784.1	--	--	237.7	21.0	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-2	4.0	782.6	--	--	56.6	63.2	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-3	5.5	781.1	--	--	14.9	119.2	----	← 5		10	25	28	7	25	--	--	--	--	--	--
	LS-4	10.0	776.6	--	--	14.8	--	----	← 4		7	43	41	2	3	--	--	--	--	--	--
	LS-7	25.0	761.6	--	--	18.3	110.6	----	← 3		6	78	12	1	0	--	--	--	--	--	--
	LS-10	40.0	746.6	--	--	10.4	133.6	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-12	50.0	736.6	--	--	16.2	115.4	----	← 3		15	74	8	0	0	--	--	--	--	--	--
PB-4	LS-3	5.5	781.2	--	--	31.8	88.0	----	--	--	--	--	--	--	--	--	--	--	--	7.0	--
PB-5	LS-1	3.0	780.1	--	--	73.9	--	----	--	--	--	--	--	--	--	--	--	--	--	3.2	--
	LS-3	6.0	777.1	--	--	18.6	111.0	----	← 9		32	48	6	1	4	--	--	--	--	--	--
PB-6	LS-2	3.0	780.0	980	10.5	74.4	53.3	----	--	--	--	--	--	--	--	--	--	--	--	9.0	--
	LS-3	4.5	778.5	300	14.7	31.5	90.9	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-4	6.0	777.0	--	--	16.7	111.8	----	← 4		4	27	41	9	15	--	--	--	--	--	--

FIGURE NO. 22

TABULATION OF LABORATORY TEST DATA

BORING / TEST PIT / PROBE DESIGNATION	SAMPLE NUMBER	DEPTH OF SAMPLE TIP (FT)	ELEVATION OF SAMPLE TIP (FT)	UNCONFINED COMPRESSIVE STRENGTH (PSF)	FAILURE STRAIN (%)	NATURAL WATER CONTENT (% OF DRY WEIGHT)	IN-PLACE DRY DENSITY (LBS/CU.FT)	PERMEABILITY (CM/SEC)	PARTICLE SIZE DISTRIBUTION (%)							ATTERBERG LIMITS (%)			APPARENT SPECIFIC GRAVITY	LOSS ON IGNITION (%)	UNIFIED SOIL CLASSIFICATION
									COLLOIDS	CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
PB-7	LS-2	5.0	796.9	--	--	3.7	110.3	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-4	10.0	791.9	--	--	9.4	107.3	----	← 9		12	33	24	13	9	--	--	--	--	--	--
	LS-5	15.0	786.9	--	--	10.4	122.5	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-7	25.0	776.9	--	--	16.2	113.4	----	← 3		5	62	27	3	0	--	--	--	--	--	--
	LS-10	40.0	761.9	--	--	13.8	120.9	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-13	55.0	746.9	--	--	11.5	122.7	----	← 6		11	37	31	11	4	--	--	--	--	--	--
PB-8	LS-5	15.0	786.9	1140	5.1	16.9	115.5	----	← 13		19	28	19	11	10	--	--	--	--	--	--
PB-9	LS-3	4.5	783.1	--	--	16.3	92.8	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-5	7.5	780.1	--	--	11.8	119.2	----	← 9		11	16	31	19	14	--	--	--	--	--	--
PB-10	LS-4	6.0	784.0	--	--	17.8	99.4	----	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-6	10.0	788.0	--	--	13.2	124.4	----	← 7		13	15	30	16	19	--	--	--	--	--	--

FIGURE NO. 22

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

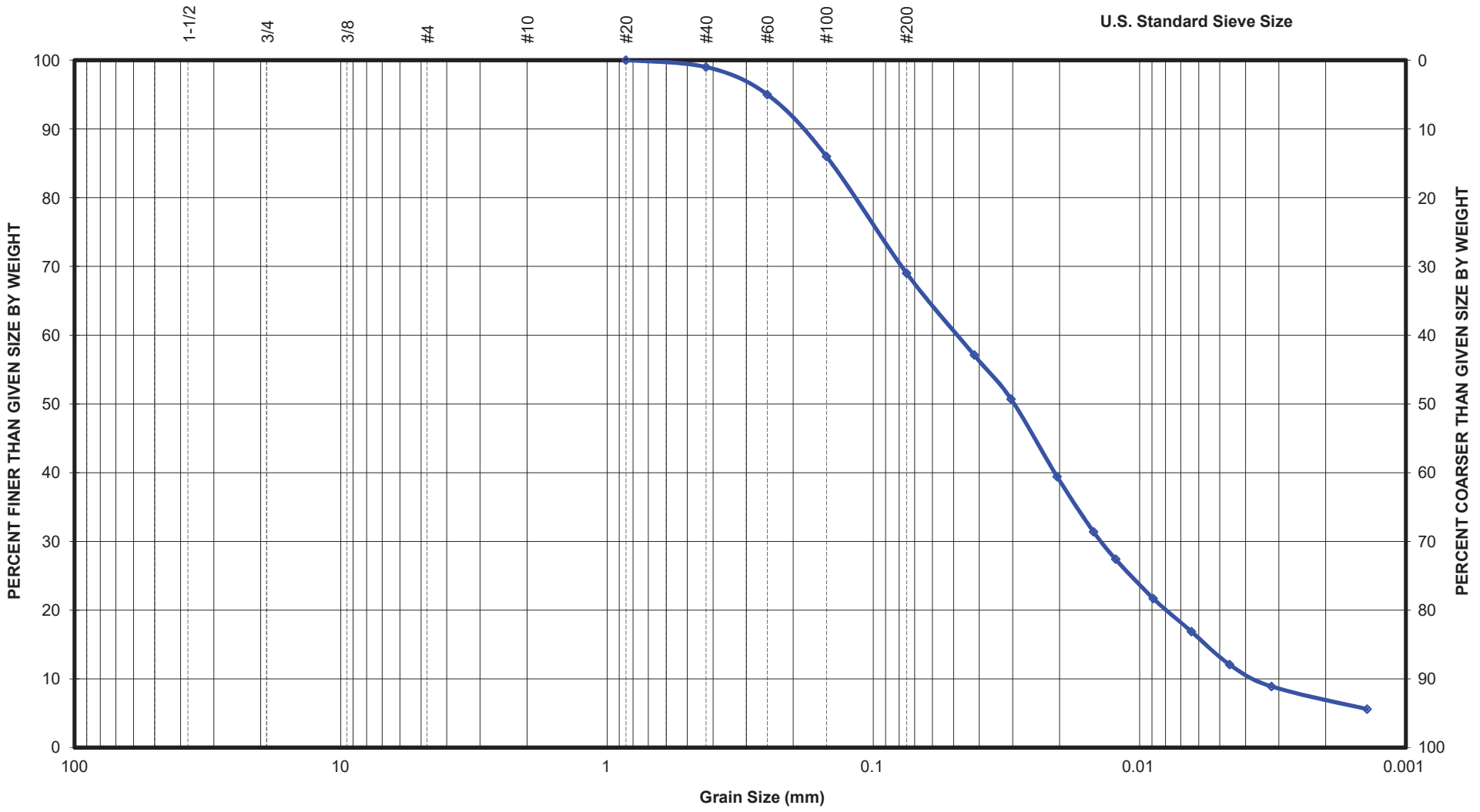
Project No. 61-160089-01 **Project Name** Barton Dam

Project Location Ann Arbor, MI **Source** Test Boring

Boring No. PB-1 **Sample No.** LS-5 **Sample Depth** 15.0 **Sample Elev. (Tip)** 783.1

Sample Description Very Loose Gray SANDY SILT, Little Clay

Sampled By G. Kachl **Date** 10/24/2017 **Tested By** E. Chapman **Date** 12/21/2017 **LWO No.**



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 23

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

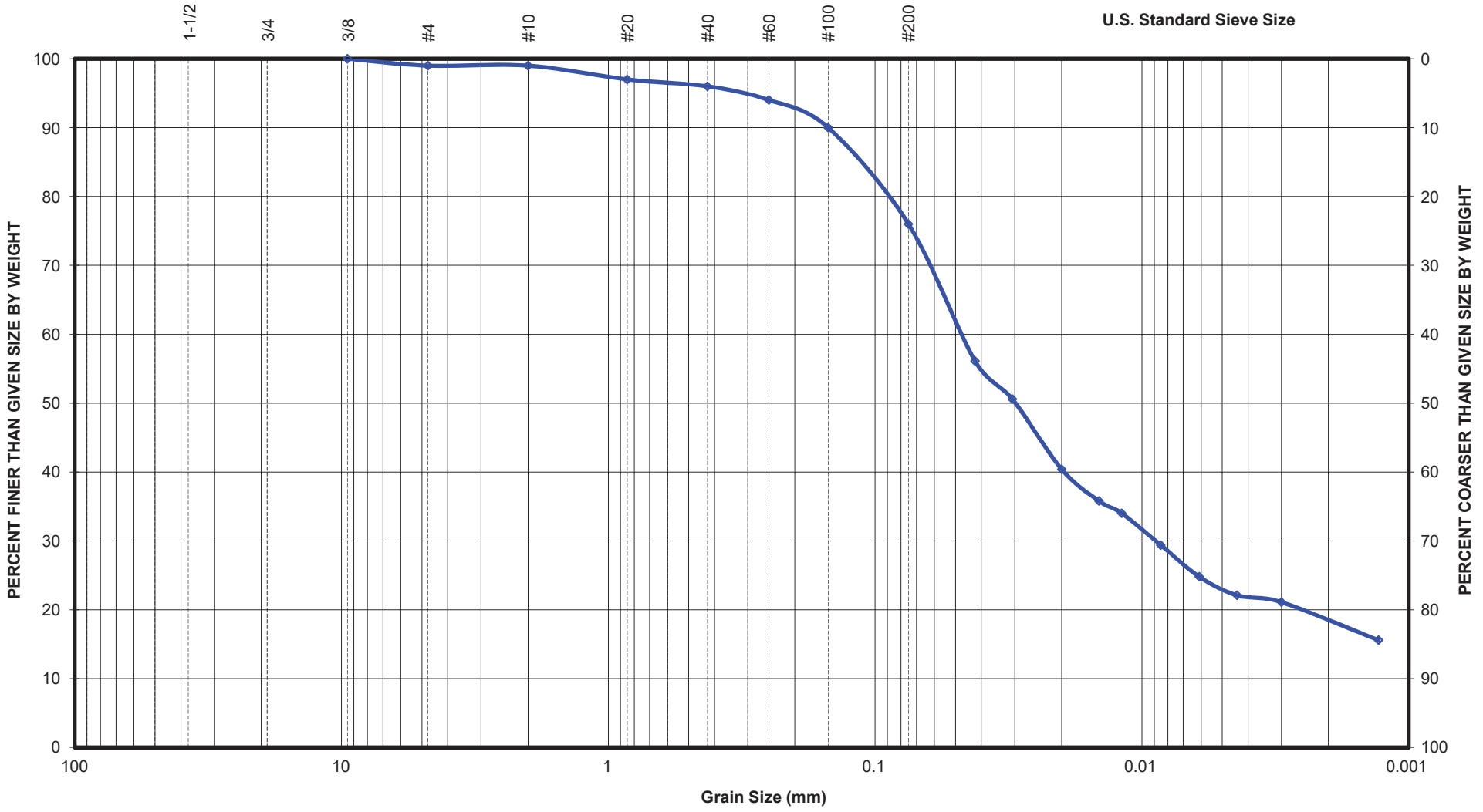
Project No. 61-160089-01 **Project Name** Barton Dam

Project Location Ann Arbor, MI **Source** Test Boring

Boring No. PB-1 **Sample No.** LS-10 **Sample Depth** 40.0 **Sample Elev. (Tip)** 758.1

Sample Description Very Hard Gray SILTY CLAY, Little Sand, Trace Gravel

Sampled By G. Kachl **Date** 10/24/2017 **Tested By** E. Chapman **Date** 12/21/2017 **LWO No.**

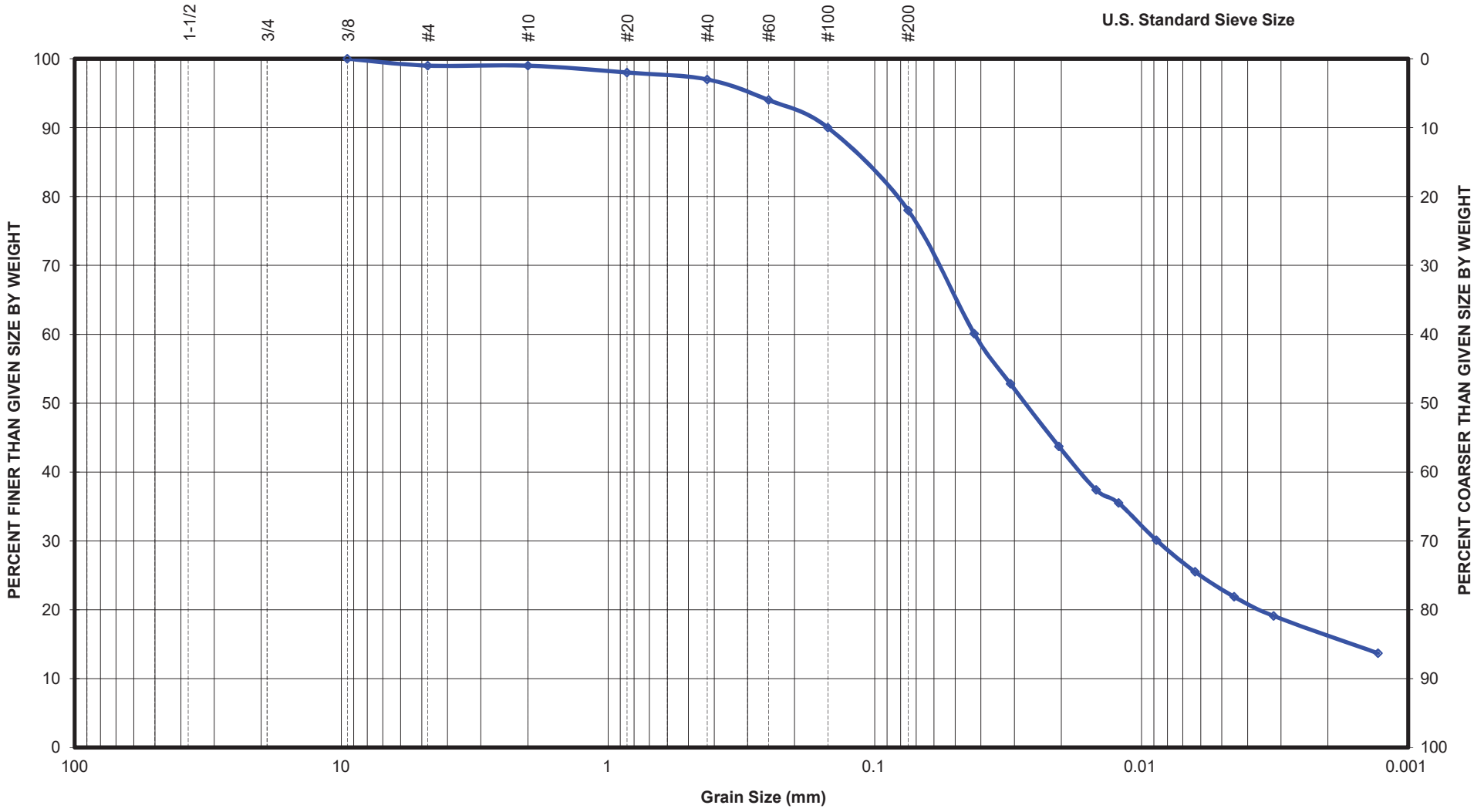


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 24

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089-01	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	Test Boring
Boring No.	PB-1	**Sample No.**	LS-13	**Sample Depth**	55.0	**Sample Elev. (Tip)**	743.1
Sample Description	Hard Gray SILTY CLAY, Trace Sand						
Sampled By	G. Kachl	**Date**	10/24/2017	**Tested By**	E. Chapman	**Date**	12/21/2017



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 25

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

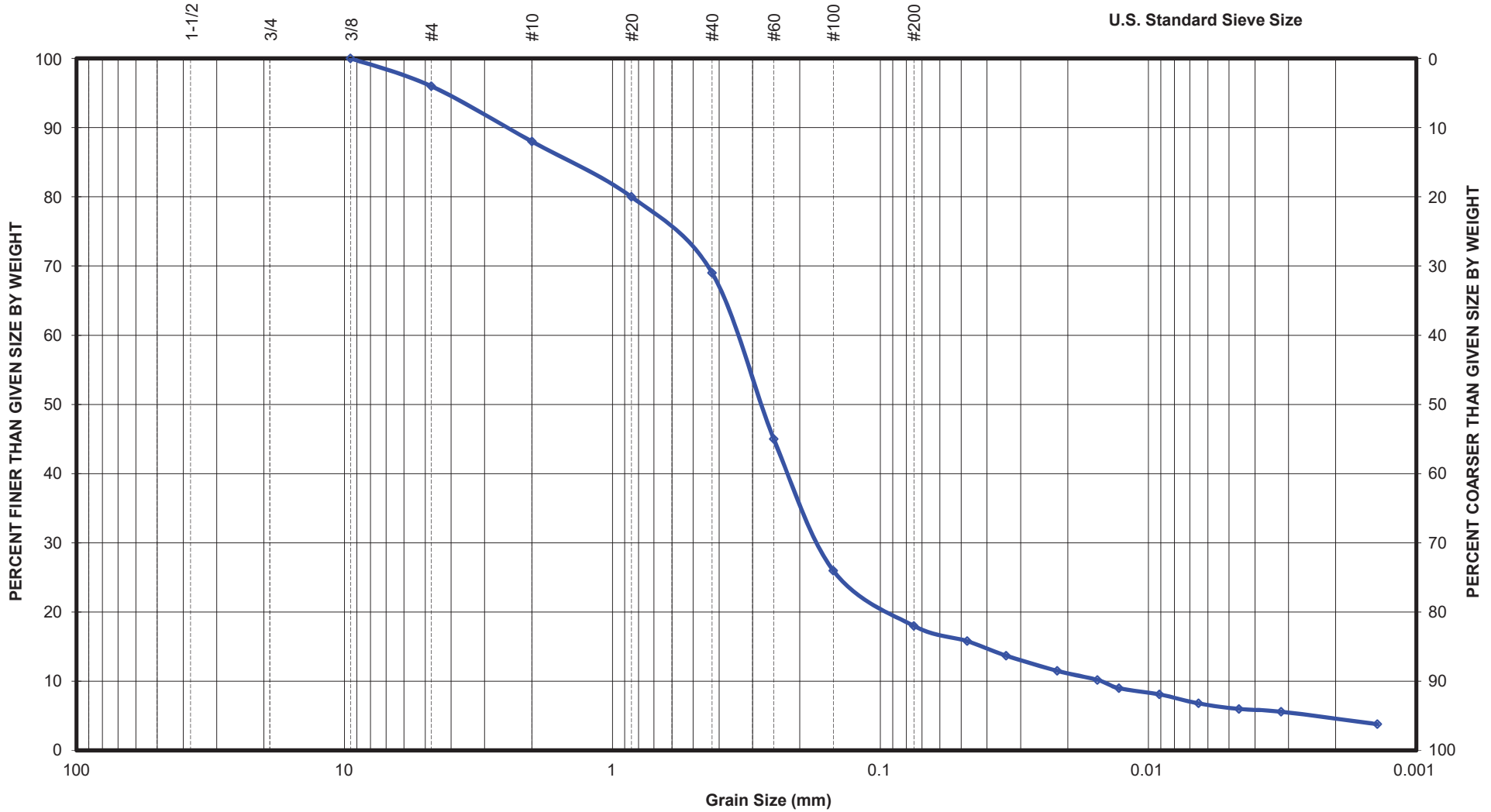
Project No. 61-160089-01 **Project Name** Barton Dam

Project Location Ann Arbor, MI **Source** Test Boring

Boring No. PB-1 **Sample No.** LS-14 **Sample Depth** 60.0 **Sample Elev. (Tip)** 738.1

Sample Description Very Compact Gray SAND, Trace Clay, Silt and Gravel

Sampled By G. Kachl **Date** 10/24/2017 **Tested By** E. Chapman **Date** 12/21/2017 **LWO No.**

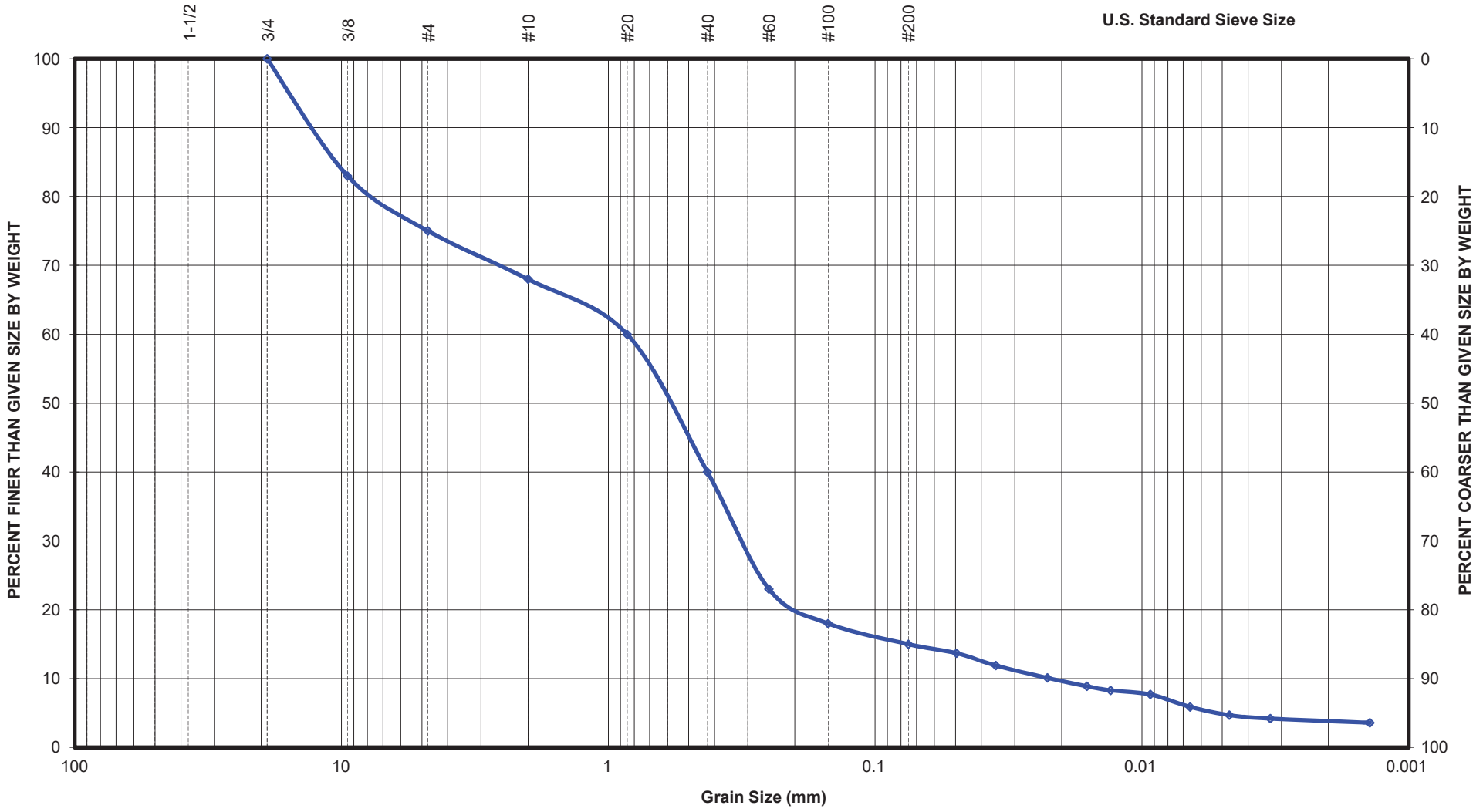


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 26

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089-01	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	Test Boring
Boring No.	PB-3	**Sample No.**	LS-3	**Sample Depth**	5.5	**Sample Elev. (Tip)**	781.1
Sample Description	Medium Compact Gray GRAVELLY SAND, Trace Clay and Silt						
Sampled By	G. Kachl	**Date**	10/27/2017	**Tested By**	E. Chapman	**Date**	12/21/2017

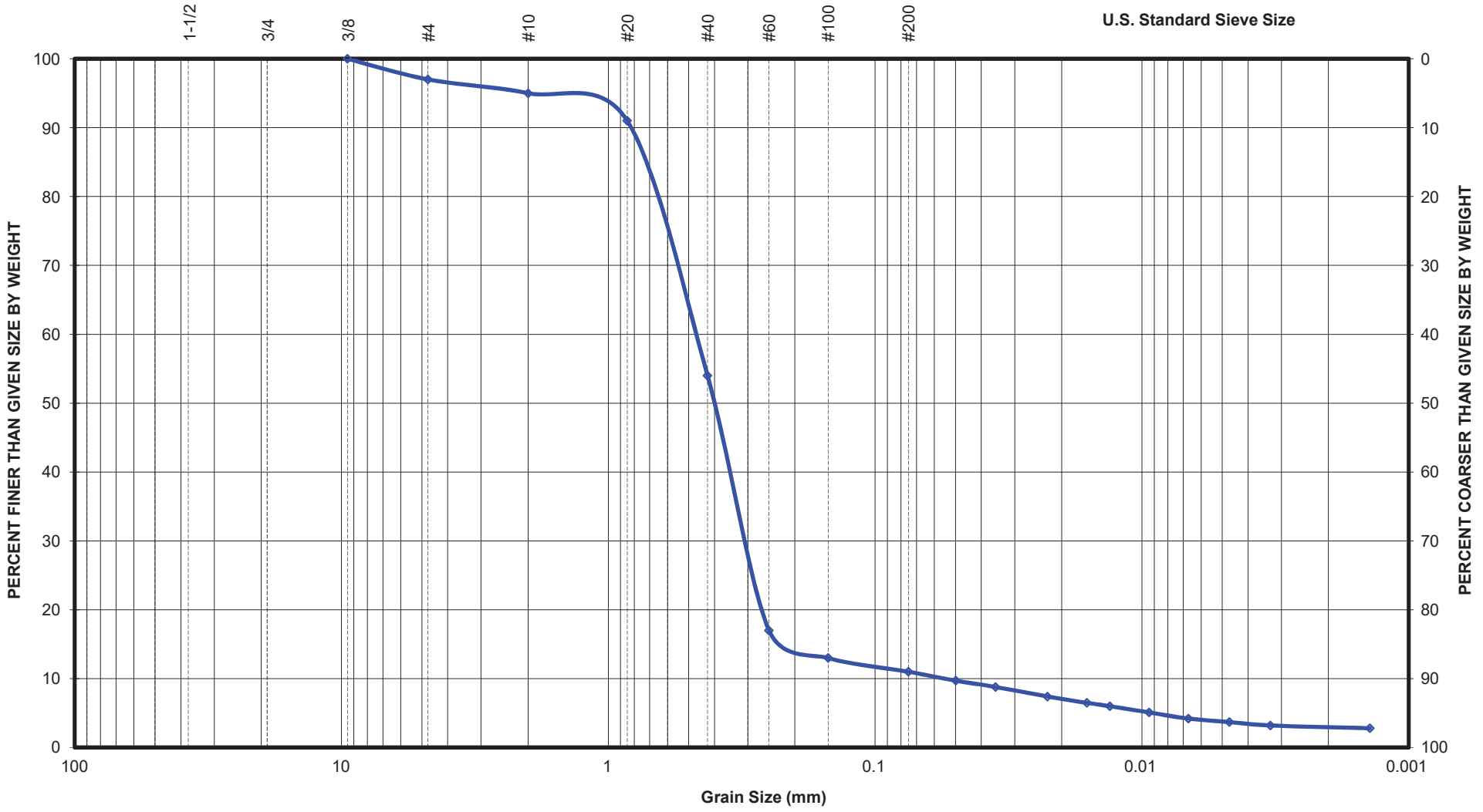


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 27

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089-01	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	Test Boring
Boring No.	PB-3	**Sample No.**	LS-4	**Sample Depth**	10.0	**Sample Elev. (Tip)**	776.6
Sample Description	Medium Compact Brown and Gray SAND, Trace Clay, Silt and Gravel						
Sampled By	G. Kachl	**Date**	10/27/2017	**Tested By**	E. Chapman	**Date**	12/21/2017

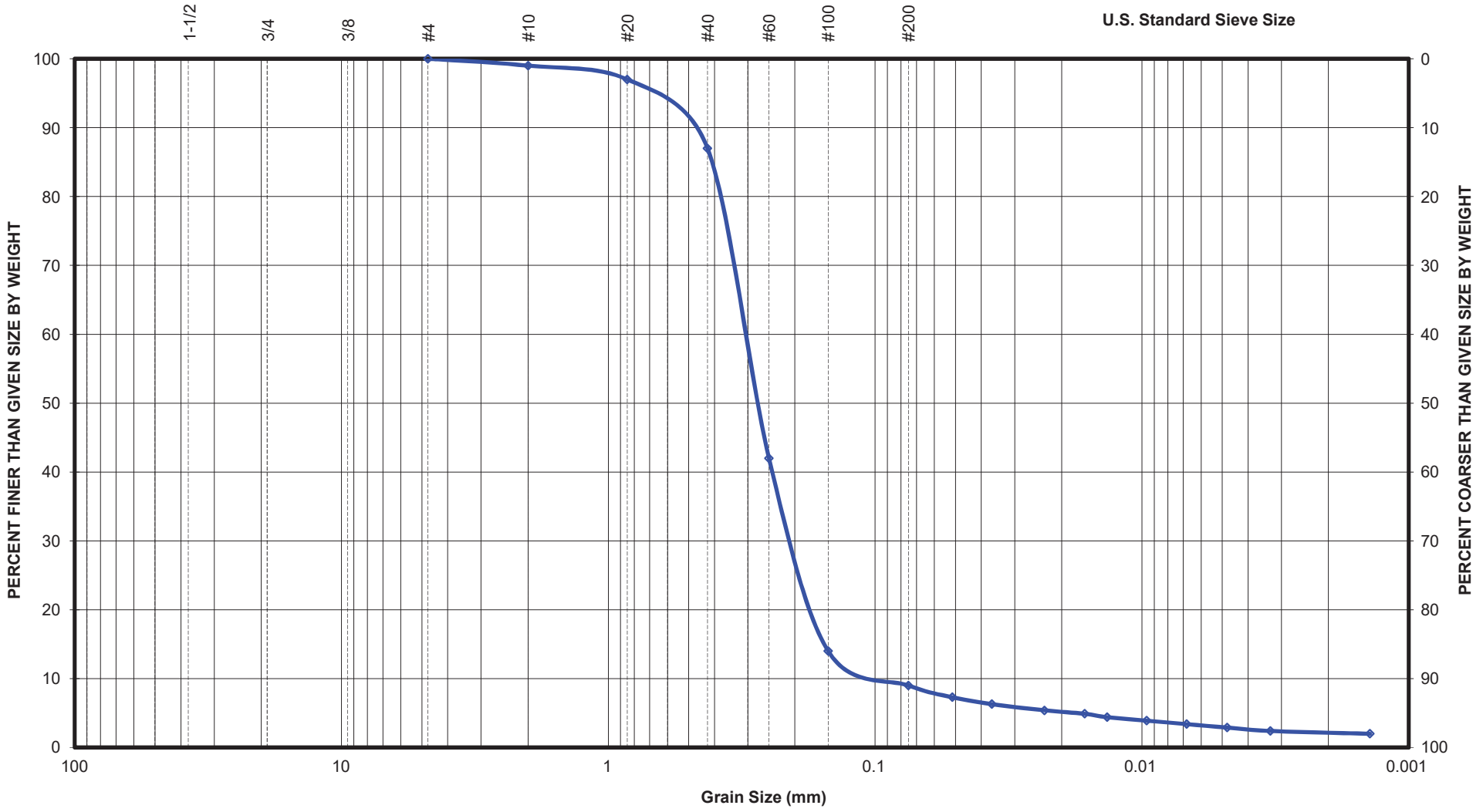


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 28

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089-01	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	Test Boring
Boring No.	PB-3	**Sample No.**	LS-7	**Sample Depth**	25.0	**Sample Elev. (Tip)**	761.6
Sample Description	Medium Compact Brown and Gray SAND, Trace Clay, Silt and Gravel						
Sampled By	G. Kachl	**Date**	10/27/2017	**Tested By**	E. Chapman	**Date**	12/21/2017

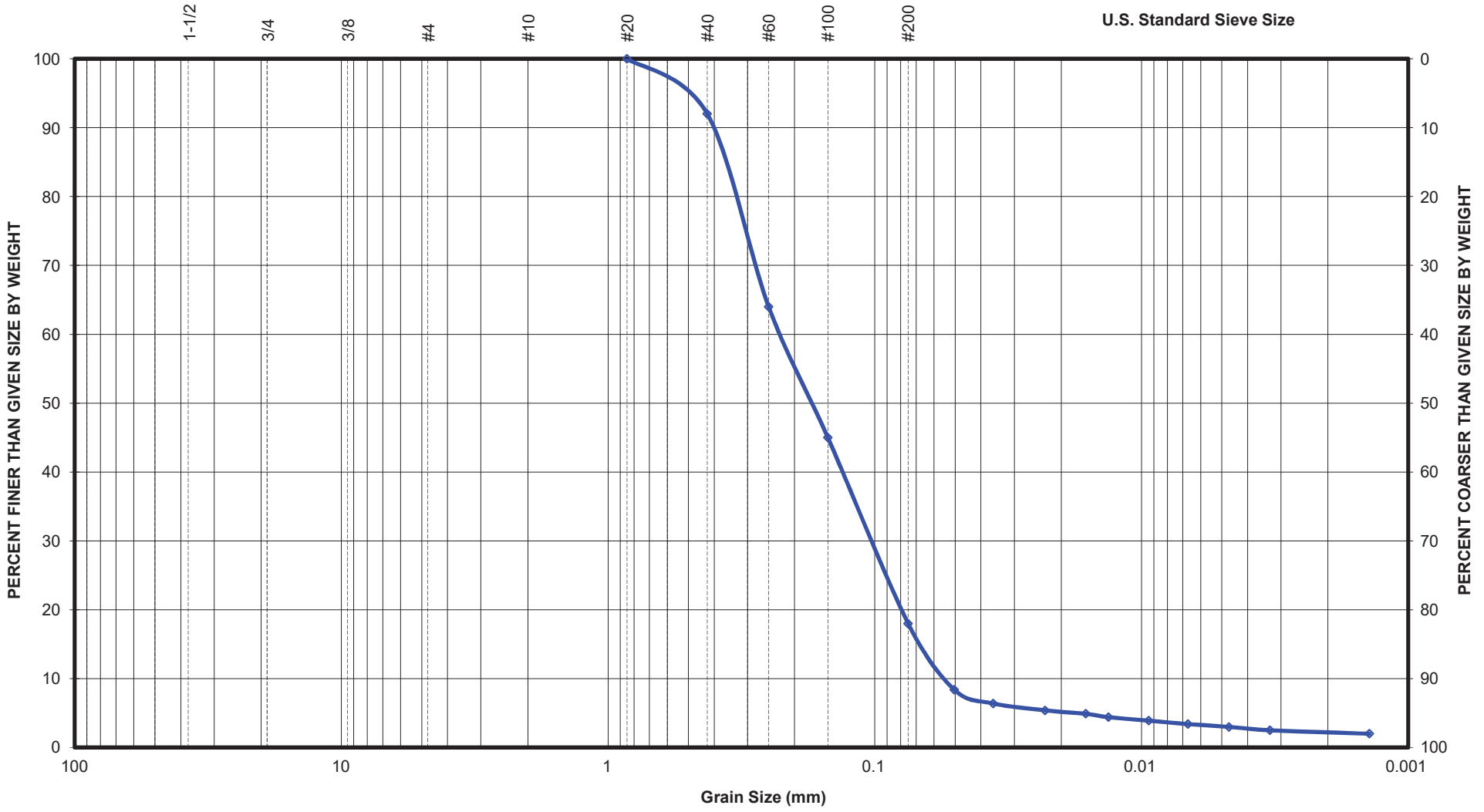


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 29

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089-01	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	Test Boring
Boring No.	PB-3	**Sample No.**	LS-12	**Sample Depth**	50.0	**Sample Elev. (Tip)**	736.6
Sample Description	Compact CLAYEY SILT						
Sampled By	G. Kachl	**Date**	10/27/2017	**Tested By**	E. Chapman	**Date**	12/21/2017



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 30

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

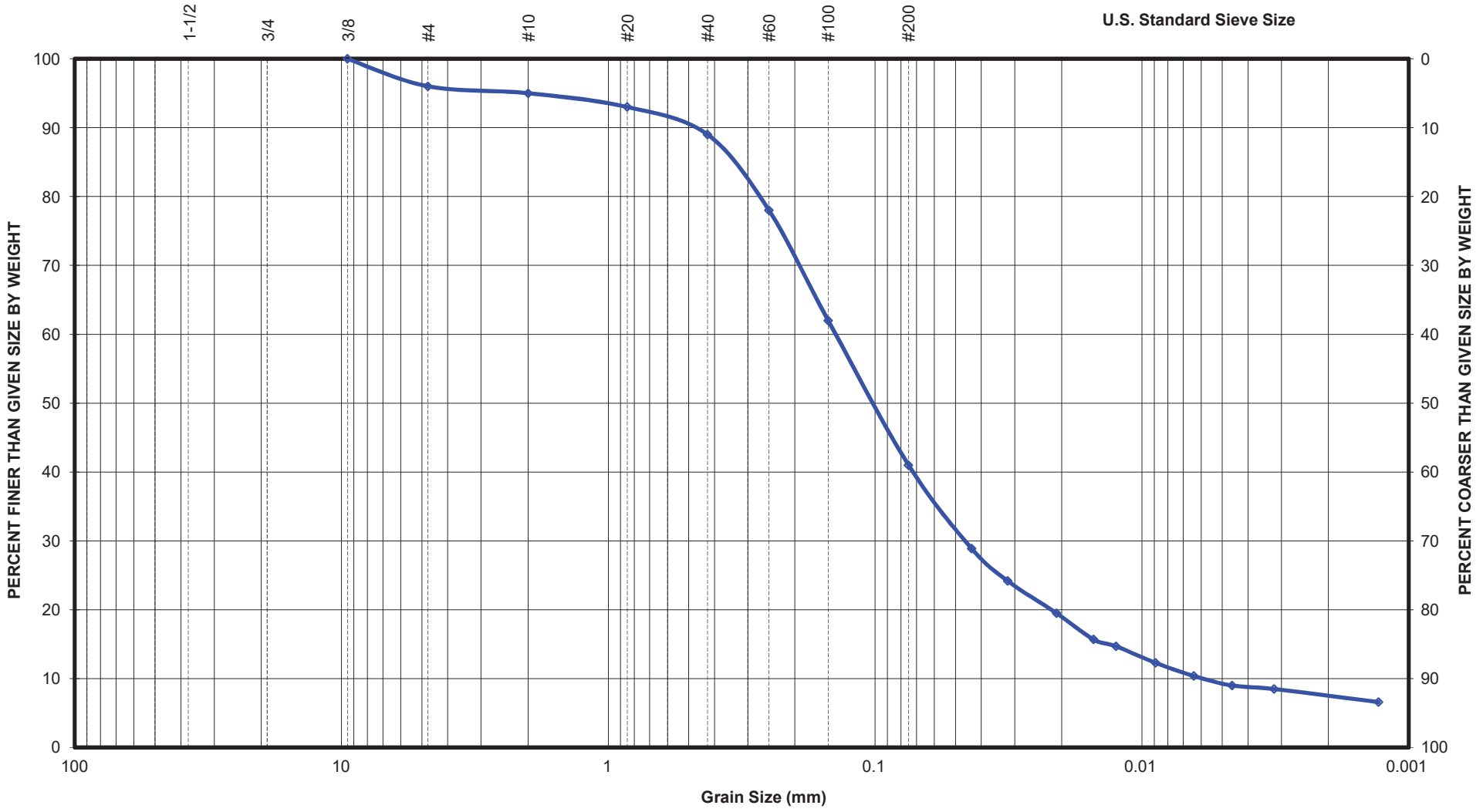
Project No. 61-160089-01 **Project Name** Barton Dam

Project Location Ann Arbor, MI **Source** Test Boring

Boring No. PB-5 **Sample No.** LS-3 **Sample Depth** 6.0 **Sample Elev. (Tip)** 777.1

Sample Description Loose Gray SILTY SAND, Trace Clay and Gravel

Sampled By G. Kachl **Date** 10/30/2017 **Tested By** E. Chapman **Date** 12/21/2017 **LWO No.**

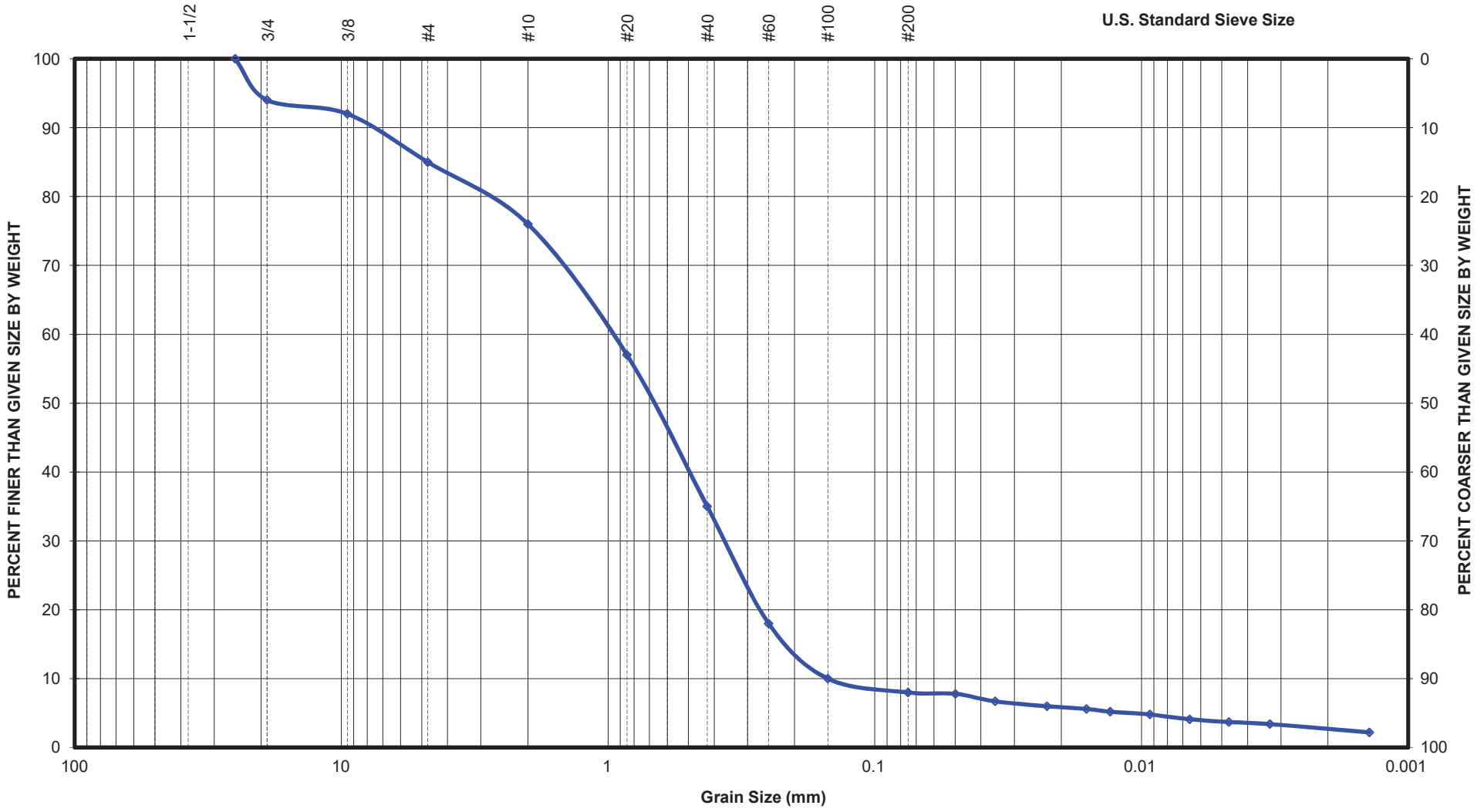


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 31

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089-01	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	Test Boring
Boring No.	PB-6	**Sample No.**	LS-4	**Sample Depth**	6.0	**Sample Elev. (Tip)**	777
Sample Description	Medium Compact Brown GRAVELLY SAND, Trace Clay and Silt						
Sampled By	G. Kachl	**Date**	10/20/2017	**Tested By**	E. Chapman	**Date**	12/21/2017

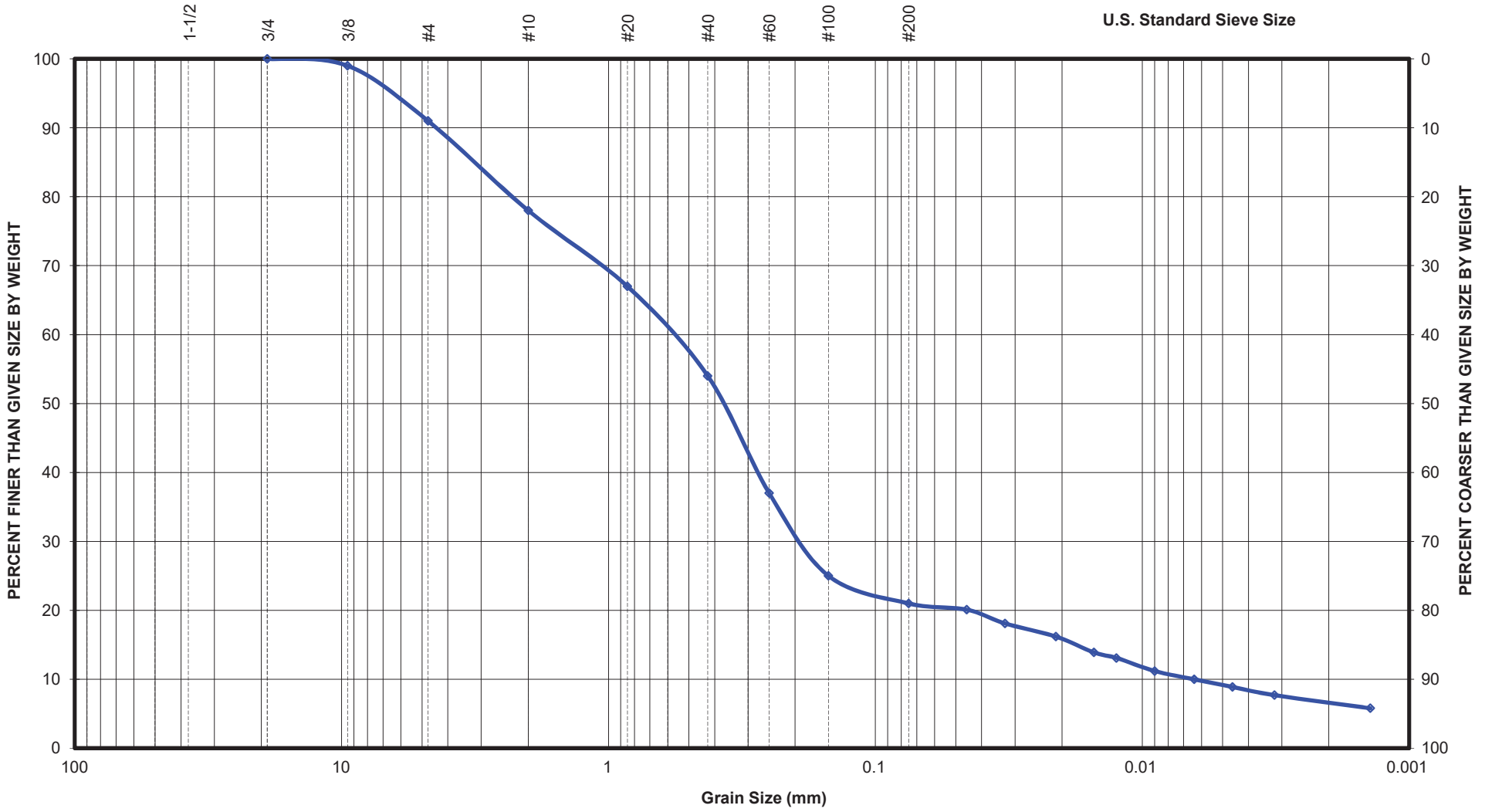


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 32

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089-01	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	Test Boring
Boring No.	PB-7	**Sample No.**	LS-4	**Sample Depth**	10.0	**Sample Elev. (Tip)**	791.9
Sample Description	FILL: Loose to Medium Compact Dark Brown SILTY SAND, Trace Clay and Gravel						
Sampled By	G. Kachl	**Date**	10/25/2017	**Tested By**	E. Chapman	**Date**	12/21/2017	**LWO No.**	

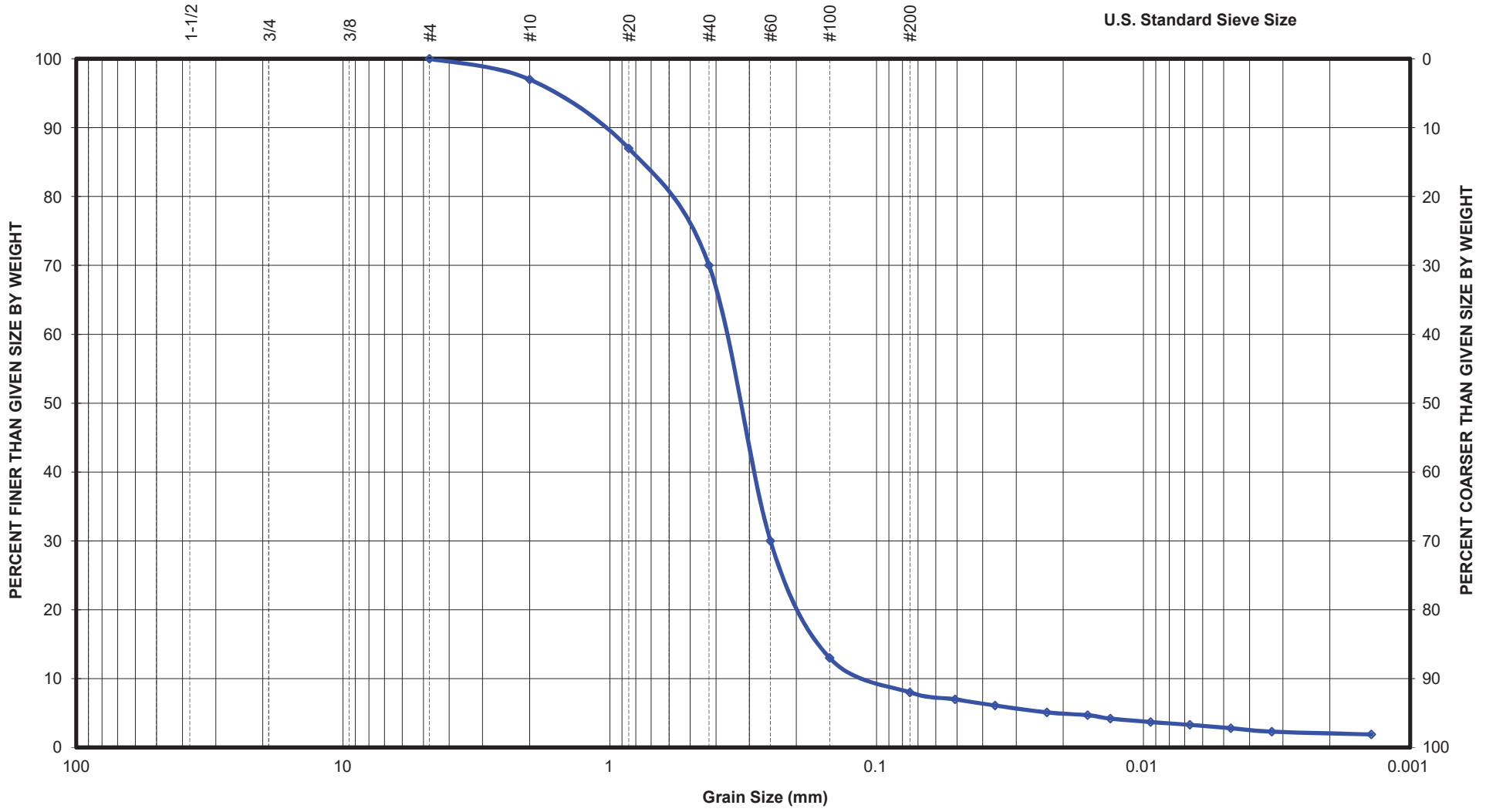


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 33

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089-01	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	Test Boring
Boring No.	PB-7	**Sample No.**	LS-7	**Sample Depth**	25.0	**Sample Elev. (Tip)**	776.9
Sample Description	Loose to Medium Compact Gray SAND, Trace Silt						
Sampled By	G. Kachl	**Date**	10/25/2017	**Tested By**	E. Chapman	**Date**	12/21/2017



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 34

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

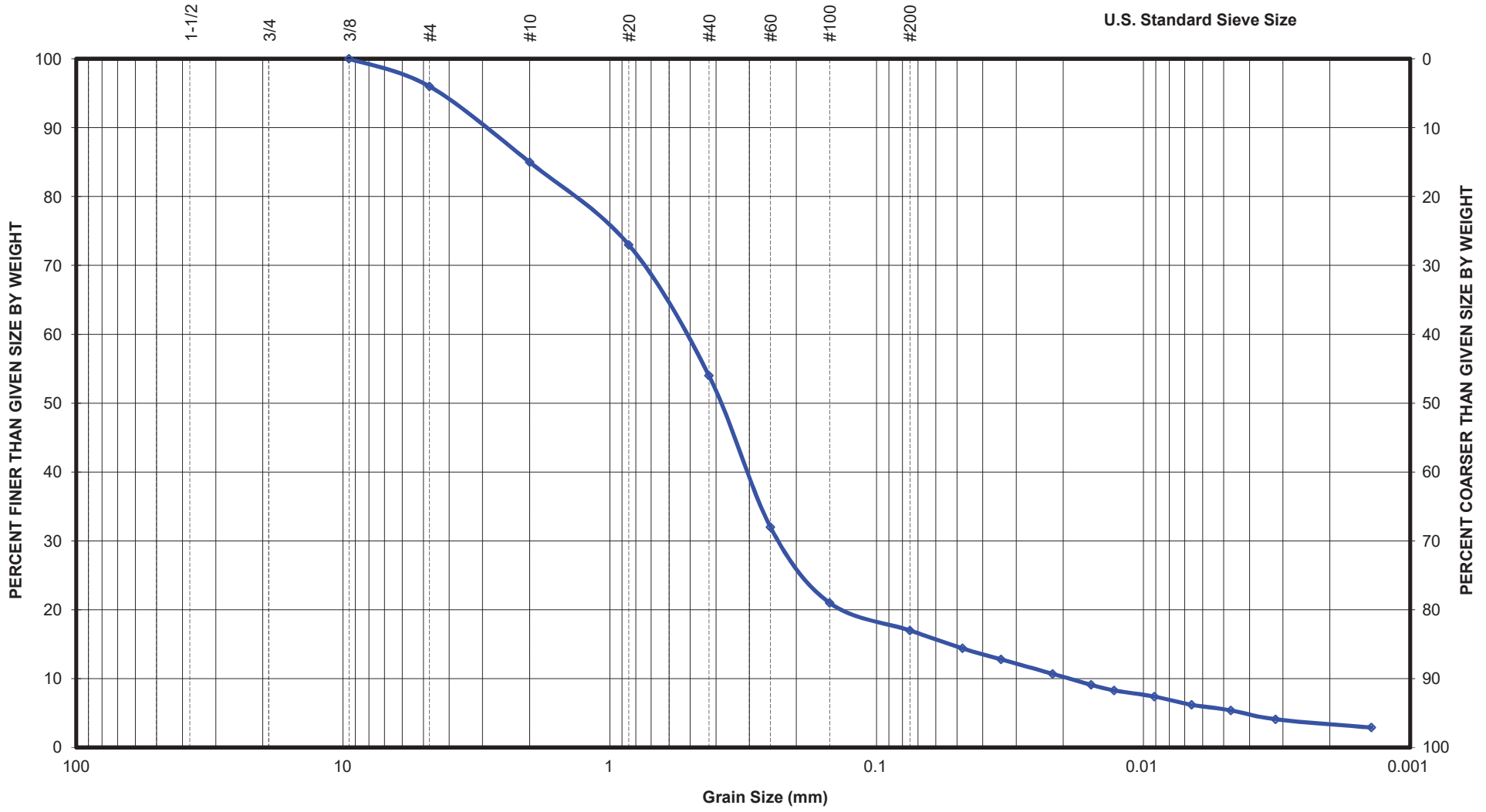
Project No. 61-160089-01 **Project Name** Barton Dam

Project Location Ann Arbor, MI **Source** Test Boring

Boring No. PB-7 **Sample No.** LS-13 **Sample Depth** 55.0 **Sample Elev. (Tip)** 746.9

Sample Description Compact to Very Compact Gray SAND, Trace Clay, Silt and Gravel

Sampled By G. Kachl **Date** 10/25/2017 **Tested By** E. Chapman **Date** 12/21/2017 **LWO No.**

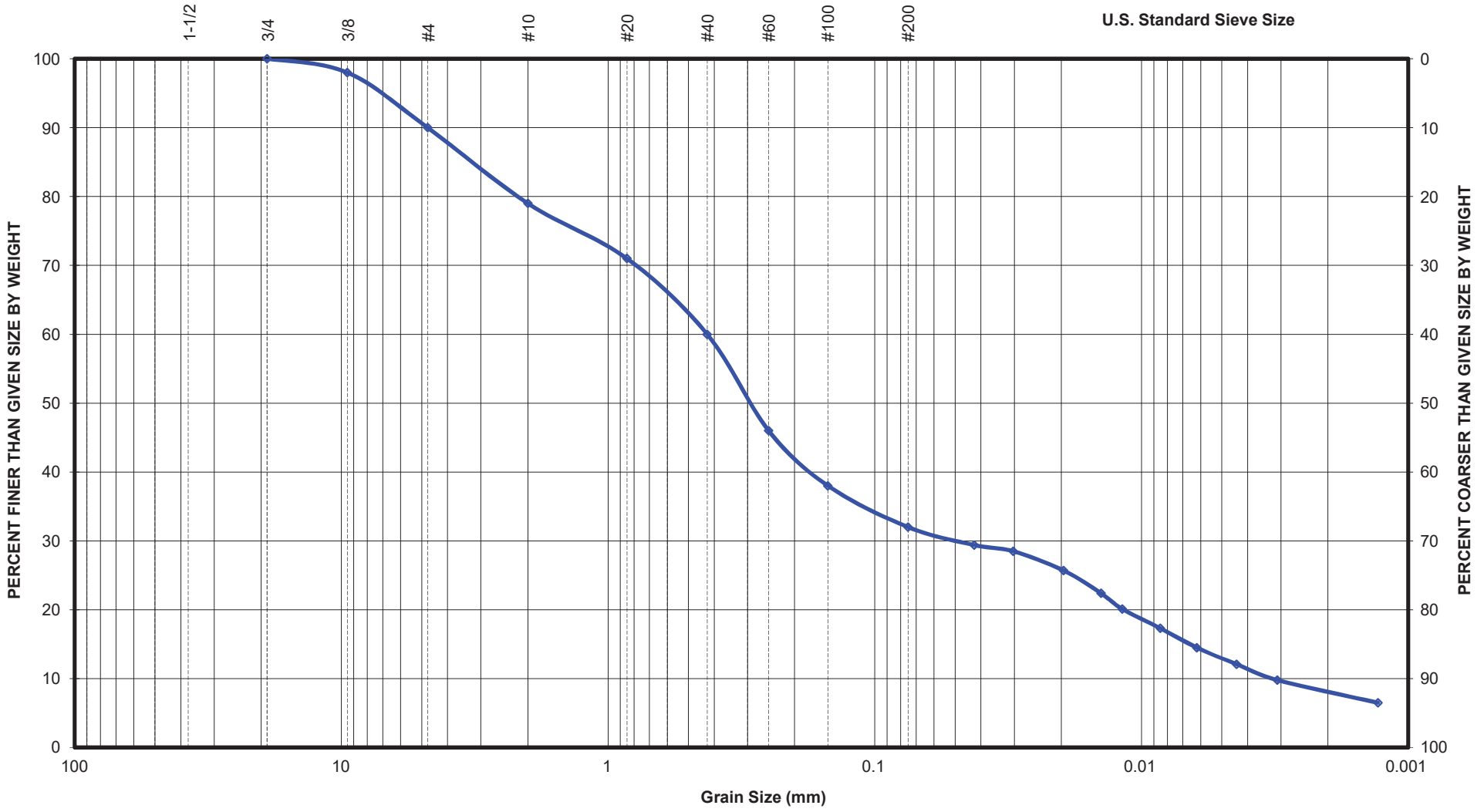


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 35

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089-01	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	Test Boring
Boring No.	PB-8	**Sample No.**	LS-5	**Sample Depth**	15.0	**Sample Elev. (Tip)**	786.9
Sample Description	FILL: Medium Brown SANDY CLAY, Little Silt, Trace Gravel						
Sampled By	G. Kachl	**Date**	10/25/2017	**Tested By**	E. Chapman	**Date**	12/21/2017



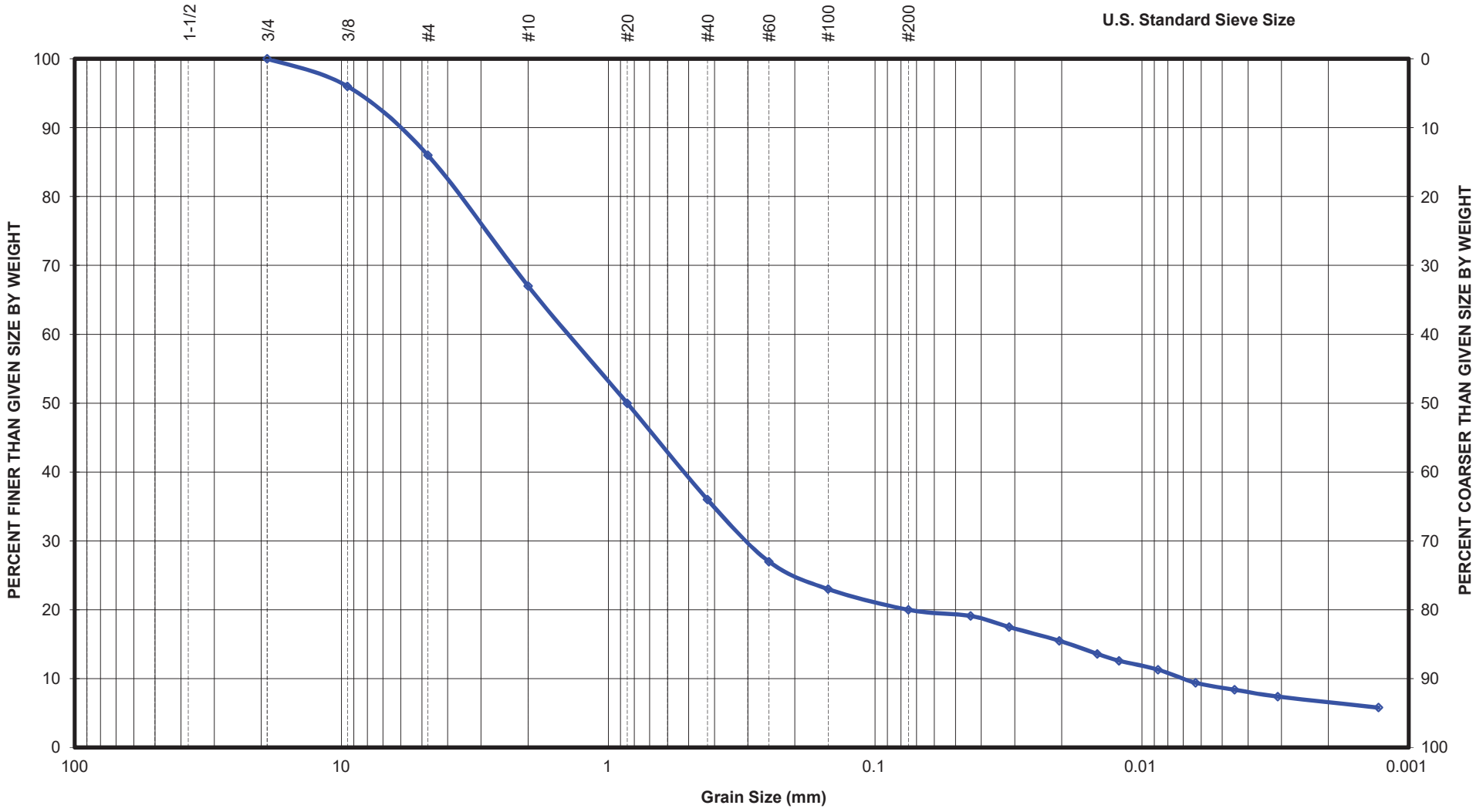
Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 36

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089-01	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	Test Boring
Boring No.	PB-9	**Sample No.**	LS-5	**Sample Depth**	7.5	**Sample Elev. (Tip)**	780.1
Sample Description	Medium Compact Brown GRAVELLY SAND, Trace Clay, Silt and Occasional Seams of Organic Matter						
Sampled By	G. Kachl	**Date**	10/27/2017	**Tested By**	E. Chapman	**Date**	12/21/2017

LWO No.



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 37

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

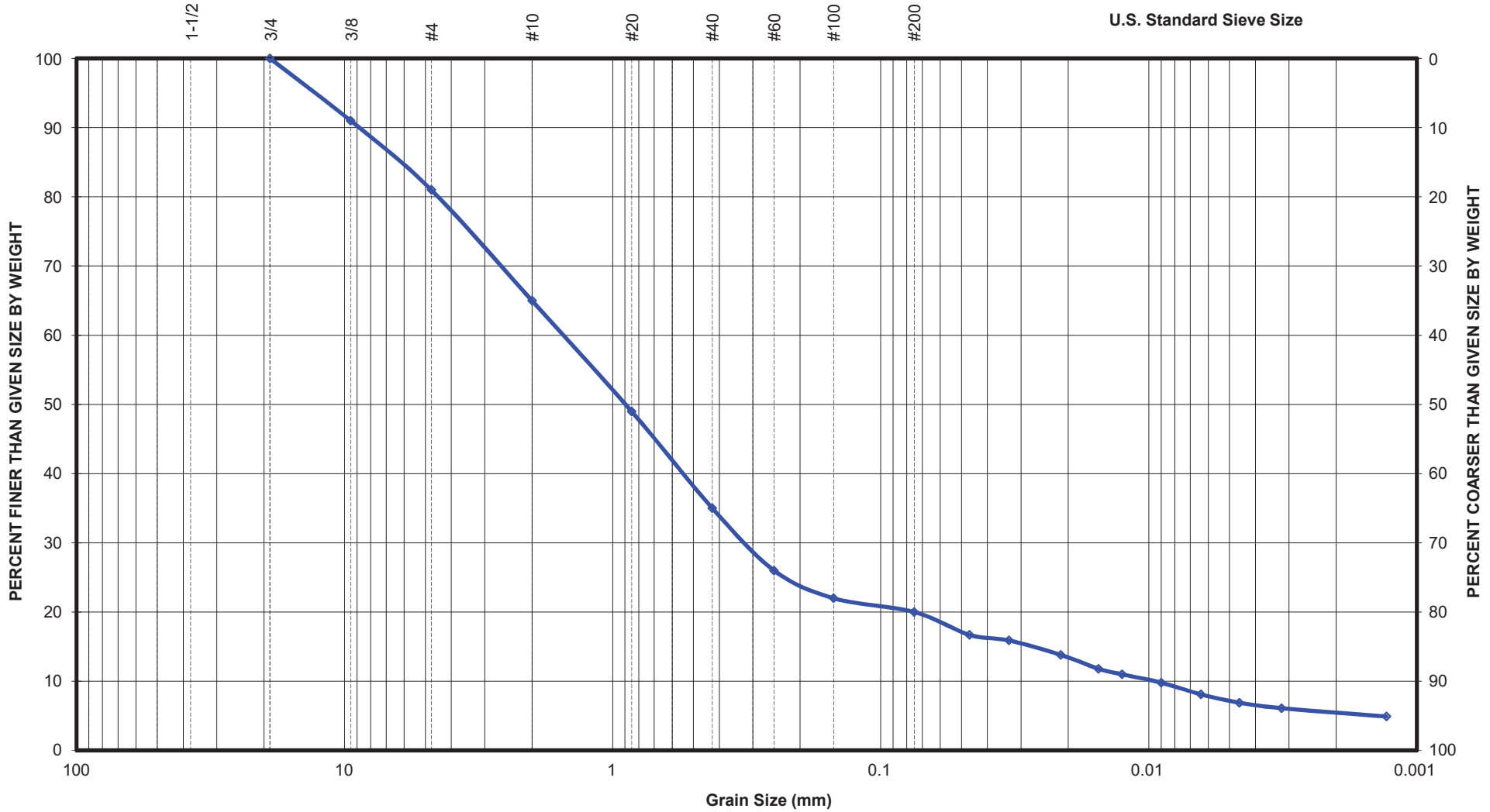
Project No. 61-160089-01 **Project Name** Barton Dam

Project Location Ann Arbor, MI **Source** Test Boring

Boring No. PB-10 **Sample No.** LS-6 **Sample Depth** 10.0 **Sample Elev. (Tip)** 780

Sample Description Loose Gray GRAVELLY SAND, Little Silt, Trace Clay, Occasional Seams of Organic Matter

Sampled By G. Kachl **Date** 10/27/2017 **Tested By** E. Chapman **Date** 12/21/2017 **LWO No.**



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 38

LOG OF TEST BORING NO: TB-2202

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: D. Nymberg

ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 775.0 (±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
775			SUBSURFACE PROFILE			SOIL SAMPLE DATA							
		772.0	FILL: Stiff Dark Brown SILTY CLAY with Trace of Sand and Gravel	3.0		LS-1	4 6 7	13	8				
770		769.5	FILL: Very Compact Dark Gray SILTY SAND with Trace of Clay, Gravel, and Cobbles	5.5	5	LS-2	12 63 29	92	7		14.8	118.0	
		767.0	Medium Compact Gray GRAVELLY SAND with Trace of Clay and Silt	8.0		LS-3	9 8 9	17	8				
765					10	LS-4	7 14 9	23	9		10.5	131.3	7,560
760			Very Stiff to Hard Gray SILTY CLAY with Trace of Sand and Gravel		15	LS-5	7 18 21	39	13				
755		755.0		20.0	20	LS-6	12 12 29	41	7				
			END OF BORING AT 20.0 FEET.										
750													
745													

Total Depth: *20 FT*
Drilling Start Date: *8/30/22*
Drilling End Date: *8/30/22*
Inspector: *G. Kachl*
Contractor: *DLZ-American Drilling Company*
Driller: *K. Conrad*
Drilling Method:
CME-55 ATV mounted drilling rig using 3-1/4" ID HSA to EOB.

Plugging Procedure:
Boring backfilled with cement bentonite grout.

Water Level Observation:
Groundwater encountered at 3.5' during drilling. Groundwater not recorded upon completion of drilling.

Notes:

Approximate GPS Coordinates:
N: 295122.3554 E: 13288831.81

Figure No. 1

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

LOG OF TEST BORING NO: TB-2203

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: L. Granger

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 782.0(±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
780		779.0	TOPSOIL: Medium Compact Dark Brown CLAYEY SAND with Little Silt, Trace of Gravel, and Organics (Roots)	3.0		LS-1	6 11 9	20	5				
					5	LS-2	9 15 20	35	7				
775		774.0	FILL: Medium Compact to Compact Brown GRAVELLY SAND with Trace of Clay and Silt	8.0		LS-3	7 14 14	28	9		7.6	138.8	
		772.5	FILL: Very Compact Brown GRAVELLY SAND with Trace of Clay and Silt	9.5	10	LS-4	54 41 19	60	8				
770					15	LS-5	6 10 16	26	11		10.0	133.9	15,780
765			Hard Gray SILTY CLAY with Trace of Sand and Gravel with Occasional Sand and Gravelly Sand Seams and Layers		20	LS-6	5 16 19	35	16				*9,000
760					25	LS-7	10 18 20	38	16		9.1	136.5	18,420
755		755.0		27.0									
		752.0	Very Stiff to Hard Gray SILTY CLAY with Trace of Sand and Gravel with Occasional Silt and Sand Seams and Layers		30	LS-8	4 9 16	25	17		15.5	118.7	*7,500

Total Depth: *50 FT*
Drilling Start Date: *9/2/22*
Drilling End Date: *9/2/22*
Inspector: *G. Kachl*
Contractor: *DLZ-American Drilling Company*
Driller: *K. Conrad*
Drilling Method:
CME-55 ATV mounted drilling rig using 3-1/4" ID HSA to EOB.

Plugging Procedure:
Boring backfilled with cement bentonite grout.

Water Level Observation:
Groundwater encountered at 5' during drilling. Groundwater measured at 45' upon completion of drilling.

Notes:
** - Pocket Penetrometer Value*

Approximate GPS Coordinates:
N: 295294.8771 E: 13288696.38

Figure No. 2

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

LOG OF TEST BORING NO: TB-2203

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: L. Granger

SUBSURFACE PROFILE					SOIL SAMPLE DATA								
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 782.0 (±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
750					35	LS-9	4 11 15	26	17				*8,000
745			Very Stiff to Hard Gray SILTY CLAY with Trace of Sand and Gravel with Occasional Silt and Sand Seams and Layers		40	LS-10	9 17 22	39	17		15.4	119.4	6,840
740					45	LS-11	7 13 27	40	13				*9,000
735		732.0		50.0	50	LS-12	12 24 29	53	16				*9,000
730			END OF BORING AT 50.0 FEET.										
725													
720													
715													

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

LOG OF TEST BORING NO: TB-2204

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: L. Granger

ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 785.0 (±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
785													
			TOPSOIL: Loose to Very Loose Dark Brown SILTY SAND with Trace of Clay, Gravel, and Organics (Grass and Roots)			LS-1	3 3 4	7	3				
780						LS-2	2 2 2	4	3		21.3		
		779.5	Organic Content: 7.6% (at 5 FT)	5.5	5								
			Medium Compact Gray GRAVELLY SAND with Occasional Silt Layers			LS-3	12 10 6	16	15		11.4	131.9	
		777.0		8.0									
775			Hard Gray SILTY CLAY with Trace of Sand and Gravel with Occasional Gravelly Sand Seams		10	LS-4	1 4 4	8	12		11.3	129.8	11,720
		772.0		13.0									
770			Medium Compact Gray SILT with Trace of Clay and Sand		15	LS-5	6 13 13	26	17		13.4	125.9	*1,500
		766.0		19.0									
765			Very Stiff to Hard Gray SILTY CLAY with Trace of Sand and Gravel with Occasional Silt and Sandy Gravel Seams		20	LS-6	6 13 13	26	17				
760					25	LS-7	5 7 9	16	17		11.6	130.8	11,660
755		755.0			30	LS-8	6 9 11	20	17				*8,400

Total Depth: *40 FT*
Drilling Start Date: *9/6/22*
Drilling End Date: *9/6/22*
Inspector: *G. Kachl*
Contractor: *DLZ-American Drilling Company*
Driller: *K. Conrad*
Drilling Method:
CME-55 ATV mounted drilling rig using 3-1/4" ID HSA to EOB.

Plugging Procedure:
Boring backfilled with cement bentonite grout.

Water Level Observation:
Groundwater not encountered during drilling. Groundwater measured at 29' at 1.5 hours after completion of drilling.

Notes:
** - Pocket Penetrometer Value*

Approximate GPS Coordinates:
N: 295472.0555 E: 13288564.74

Figure No. 3

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

LOG OF TEST BORING NO: TB-2204

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: L. Granger

SUBSURFACE PROFILE					SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 785.0 (±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
755													
750			Very Stiff to Hard Gray SILTY CLAY with Trace of Sand and Gravel with Occasional Silt and Sandy Gravel Seams		35	LS-9	3 6 7	13	17				*8,000
745		745.0		40.0	40	LS-10	3 9 14	23	16				*7,000
			END OF BORING AT 40.0 FEET.										
740													
735													
730													
725													
720													

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

LOG OF TEST BORING NO: TB-2205

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: L. Granger

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 802.0(±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
800		799.0	FILL: Medium Compact Brown GRAVELLY SAND with Little Clay, Trace of Silt, and Organics (Roots)	3.0		LS-1	7 8 6	14	7				
		796.5	FILL: Very Compact Brown GRAVELLY SAND with Little Silt and Trace of Clay	5.5	5	LS-2	20 36 44	80	4				
795						LS-3	7 11 10	21	7				
					10	LS-4	4 4 3	7	7		11.4	121.3	
790			FILL: Loose to Medium Compact Brown GRAVELLY SAND with Trace of Clay and Silt			LS-5	1 4 4	8	5		12.4	115.2	
					15	LS-6	6 8 9	17	5		12.0	99	
		786.5		15.5									
785			FILL: Loose to Very Loose Dark Brown CLAYEY SAND with Little Silt and Trace of Gravel			LS-7	2 1 1	2	2				
					20	LS-8	3 5 3	8	0.5				
		781.5		20.5									
780		779.0	Medium Dark Brown to Black SANDY CLAY with Little Silt, Trace of Gravel, and Organics (Shells)	23.0		LS-9	1 3 4	7	7		23.4	94.4	1,206
		776.5	Medium Compact Brown GRAVELLY SAND with Trace of Clay and Silt with Occasional Clay Layers	25.5	25	LS-10	5 10 14	24	10				
775						LS-11	11 22 20	42	8				
		772.0	Compact Gray SANDY GRAVEL with Trace of Clay and Silt		30	LS-12	8 21 24	45	9		7.5	148.3	

Total Depth: *90 FT*
Drilling Start Date: *9/1/22*
Drilling End Date: *9/1/22*
Inspector: *G. Kachl*
Contractor: *DLZ-American Drilling Company*
Driller: *K. Conrad*
Drilling Method:
CME-55 ATV mounted drilling rig using 3-1/4" ID HSA to EOB.

Plugging Procedure:
Boring backfilled with cement bentonite grout.

Water Level Observation:
Groundwater encountered at 25' during drilling. Due to the introduction of drilling fluid at 40', no meaningful groundwater measurements were obtainable upon completion.

Notes:
** - Pocket Penetrometer Value*

Approximate GPS Coordinates:
N: 295412.8493 E: 13288783.5

Figure No. 4

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

LOG OF TEST BORING NO: TB-2205

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: L. Granger

SUBSURFACE PROFILE					SOIL SAMPLE DATA								
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 802.0 (±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
770		770.0	Compact Gray SANDY GRAVEL with Trace of Clay and Silt	32.0									
			Hard Gray SILTY CLAY with Trace of Sand and Gravel with Occasional Sand Layers		35	LS-13	3 6 9	15	16		11.5	128.0	11,740
765		765.0		37.0									
			Very Loose Brown SAND with Trace of Silt with Occasional Gray Silt Layers		40	LS-14	1 1 1	2	4				
760		760.0		42.0									
			Compact Gray GRAVELLY SAND with Little Silt and Trace of Clay		45	LS-15	10 14 21	35	9		9.2	136.8	
755					50	LS-16	11 19 25	44	3				
		752.0		50.0									
750			Hard Gray SILTY CLAY with Trace of Sand and Gravel with Occasional Silt Seams and Layers		55	LS-17	10 22 23	45	9				*9,000
745					60	LS-18	9 15 18	33	14		12.7	126.2	10,220
740					65	LS-19	14 24 29	53	15				*9,000
735		734.2											

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

LOG OF TEST BORING NO: TB-2205

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: L. Granger

SUBSURFACE PROFILE					SOIL SAMPLE DATA								
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 802.0 (±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
					70	LS-20	21 22 35	57	17				*9,000
730					75	LS-21	15 26 34	60	17				*9,000
725			Hard Gray SILTY CLAY with Trace of Sand with Occasional Silt Seams and Layers		80	LS-22	19 31 39	70	18		13.0	124.4	8,440
720		720.0		82.0									
			Medium Compact Gray SILT with Trace of Clay and Fine Sand with Occasional Stiff Clay Layers		85	LS-23	1 5 9	14	16		18.7	113.3	2,340
715		715.0		87.0									
			Very Compact Gray SILT with Trace of Sand		90	LS-24	13 36 45	81					
		712.0		90.0									
			END OF BORING AT 90.0 FEET.										
710													
705													
700													

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

LOG OF TEST BORING NO: TB-2206

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: L. Granger

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 802.0(±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
		801.5	FILL: Medium Compact Brown SANDY GRAVEL with Trace of Organics (Vegetation)	0.5									
800		799.5	FILL: Medium Compact Brown GRAVELLY SAND with Trace of Silt	2.5		LS-1	4 9 17	26	3				
		798.5	FILL: Hard Brown SILTY CLAY with Trace of Sand and Gravel	3.5									
		797.0	FILL: Stiff Brown SANDY CLAY with Little Gravel and Trace of Silt with Occasional Peat Layers	5.0	5	LS-2	2 9 5	14	7.5				
		795.5	FILL: Medium Compact GRAVELLY SAND with Little Clay and Silt	6.5									
795						LS-3	4 8 10	18	12		9.5	128.4	4,020
			FILL: Stiff Brown and Gray SANDY CLAY with Little Silt and Trace of Gravel with Interbedded Sand Seams		10	LS-4	4 6 10	16	10				*3,500
790						LS-5	3 10 10	20	9		5.7	121.5	*2,500
		789.0		13.0									
			FILL: Loose Brown and Gray CLAYEY SAND with Little Gravel and Trace of Silt		15	LS-6	1 2 4	6	6		11.6	109.7	
		785.5		16.5									
785		784.5	FILL: Very Loose Gray GRAVELLY SAND with Trace of Clay and Silt	17.5		LS-7	4 2 2	4	9		16.6	118.7	
		782.0	Soft Dark Brown to Black SANDY CLAY with Trace of Silt and Gravel	20.0	20	LS-8	2 3 4	7	13		19.7	112.4	760
780						LS-9	4 14 20	34	13				
			Medium Compact to Compact GRAVELLY SAND with Trace of Clay and Silt		25	LS-10	4 7 12	19	6				
		776.0		26.0									

Total Depth: *90 FT*
Drilling Start Date: *8/31/22*
Drilling End Date: *8/31/22*
Inspector: *G. Kachl*
Contractor: *DLZ-American Drilling Company*
Driller: *K. Conrad*
Drilling Method:
CME-55 ATV mounted drilling rig using 3-1/4" ID HSA to EOB.

Plugging Procedure:
Boring backfilled with cement bentonite grout.

Water Level Observation:
Groundwater encountered at 15.1' during drilling. Due to the introduction of drilling fluid at 23.5', no meaningful groundwater measurements were obtainable upon completion.

Notes:
** - Pocket Penetrometer Value*
*** - Low Failure Strain*

Approximate GPS Coordinates:
N: 295535.7307 E: 13288619.95

Figure No. 5

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

LOG OF TEST BORING NO: TB-2206

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: L. Granger

SUBSURFACE PROFILE						SOIL SAMPLE DATA							
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 802.0(±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
775						LS-11	4 7 12	19	11		12.3	129.2	5,920
			Very Stiff to Hard Gray SILTY CLAY with Trace of Sand and Gravel										
		772.0		30.0	30	LS-12	5 16 13	29	13				*>9,000
770													
					35	LS-13	7 10 13	23	12		10.7	130.6	16,720
765													
					40	LS-14	6 8 12	20	2				
			Very Stiff to Hard Gray SILTY CLAY with Trace of Sand and Gravel with Occasional Sand Layers and Silt Partings										
760													
					45	LS-15	5 7 9	16	18				*7,000
755													
					50	LS-16	3 7 12	19	15		17.6	113.5	9,240
750		749.5		52.5									
			Very Compact Gray SAND with Trace of Silt and Gravel		55	LS-17	2 4 81	85	4				
745		745.0		57.0									
			Very Compact Gray SILT with Trace of Sand with Interbedded Layers of Hard Silty Clay										
		743.5											

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

LOG OF TEST BORING NO: TB-2206

Project Name: Barton Dam
Project Location: Ann Arbor, MI

NTH Consultants, Ltd.
NTH Proj. No.: 62-210340-01
Checked By: L. Granger

SUBSURFACE PROFILE					SOIL SAMPLE DATA								
ELEV. (FT)	PRO-FILE	ELEV	GROUND SURFACE ELEVATION: 802.0 (±)	DEPTH	DEPTH (FT)	SAMPLE TYPE/NO.	BLOWS/ 6-INCHES	STD. PEN RESIST. (N)	REC (in)	FIELD TEST (ppm)	MOIST. CONTENT (%)	DRY DENSITY (PCF)	UNCONF. COMP ST (PSF)
					60	LS-18	16 49 56	105	15		17.5	116	
740		740.0	Very Compact Gray SILT with Trace of Sand with Interbedded Layers of Hard Silty Clay	62.0									
					65	LS-19	14 29 51	80	16		15.4	119.4	2,440**
735		735.0	Hard Gray SILTY CLAY with Trace of Sand and Gravel	67.0									
					70	LS-20	18 25 41	66	18				
730		730.0	Very Compact Gray SILT with Trace of Clay and Sand with Occasional Very Stiff Clay Seams	72.0									
					75	LS-21	13 29 51	80	18				*>9,000
725													
					80	LS-22	18 23 39	62	18				*>9,000
720			Hard Gray SILTY CLAY with Trace of Sand and Gravel with Occasional Silt Layers										
					85	LS-23	1 5 19	24	17				
715													
		712.0		90.0	90	LS-24	17 33 44	77	14				>*9000
			END OF BORING AT 90.0 FEET.										

LOG OF TEST BORING 62-210340-01.GPJ NTH CORPORATE.GDT 5/3/23

PROJECT NO: 62-210340-10	NTH CONSULTANTS, LTD.	SHEET 1 OF 2

LOG OF HAND AUGER BORINGS

HAB NO.	GROUND SURFACE ELEV.[4] (FT)	DEPTH (FT)	SOIL DESCRIPTION	REMARKS
HAB-2201		0-2.0	BROWN CLAYEY PEAT WITH TRACE SILT, SAND, AND ORGANIC MATTER (ROOTS)	B-1
		2.0-2.65	BROWN CLAYEY SILT WITH TRACE SAND, COBBLES, AND ORGANIC MATTER (ROOTS)	B-2
		2.65-2.8	DARK BROWN GRAVELLY SAND WITH LITTLE CLAY AND TRACE SILT	B-3
				GROUNDWATER ENCOUNTERED AT 2.2 FEET
				3 GALLONS OF GROUT USED
HAB-2202C		0-0.9	BROWN SAND WITH TRACE CLAY, SILT, GRAVEL, AND ORGANIC MATTER (ROOTS)	B-1
		0.9-1.8	BROWN SILTY CLAY WITH LITTLE SAND AND TRACE GRAVEL AND ORGANIC MATTER (ROOTS)	B-2
		1.8-3.2	SOFT DARK BROWN SILTY CLAY WITH LITTLE SAND AND TRACE GRAVEL	B-3
		3.2-3.5	SOFT DARK BROWN SILTY CLAY WITH LITTLE SAND AND TRACE GRAVEL AND ORGANIC MATTER (POSSIBLE PEAT)	B-4
				GROUNDWATER NOT ENCOUNTERED
				PP = 0.25 TSF
				3.5 GALLONS OF GROUT USED
HAB-2203		0-0.65	TOPSOIL: BROWN SAND WITH TRACE SILT, GRAVEL, AND ORGANIC MATTER	B-1
		0.65-2.15	BROWN SILTY SAND WITH TRACE GRAVEL	B-2
		2.15-3.05	STIFF BROWN SANDY CLAY WITH LITTLE SILT AND GRAVEL	B-3
				GROUNDWATER NOT ENCOUNTERED
				PP = 1.25 TSF
				4 GALLONS OF GROUT USED
HAB-2204A		0-2.0	BROWN GRAVELLY SAND WITH TRACE SILT	B-1
		2.0-2.2	DARK BROWN SAND WITH TRACE GRAVEL AND COBBLES	B-2
			COBBLES ENCOUNTERED AT BOTTOM OF CASING	B-3
				GROUNDWATER NOT ENCOUNTERED
				2 GALLONS OF GROUT USED
HAB-2204B		0-0.3	TOPSOIL: BROWN SAND	
		0.3-1.8	BROWN GRAVELLY SAND WITH TRACE SILT	B-1
				GROUNDWATER NOT ENCOUNTERED
				3 GALLONS OF GROUT USED

NOTES:

[1] DLZ INSTALLED 60-INCH-LONG, 4-INCH-INSIDE DIAMETER STEEL CASING USING A CME-55 ATV DRILLING RIG. HAND AUGER BORINGS WERE PERFORMED INSIDE CASING.
[2] HAND AUGER BORINGS BACKFILLED TO GROUND SURFACE WITH BENTONITE CEMENT GROUT AND TOPPED WITH BENTONITE CHIPS.
[3] SOIL CLASSIFICATION BASED SOLELY ON VISUAL OBSERVATION.
[4] GROUND SURFACE ELEVATIONS ARE ESTIMATED FROM 2022 SITE TOPOGRAPHIC SURVEY DATA (FROM DLZ).
[5] DEPTHS PRESENTED ARE MEASURED FROM GROUND SURFACE.
[6] PP REPRESENTS HAND PENETROMETER MEASUREMENT (POCKET PENETROMETER MEASUREMENT) IN TONS PER SQUARE FOOT.
[7] REVIEWED BY:

DRILLED BY: T. BREHMER **DATE:** 09/7/2022 **FIGURE NO: 6**

PROJECT NO: 62-210340-10	NTH CONSULTANTS, LTD.	SHEET 2 OF 2

LOG OF HAND AUGER BORINGS

HAB NO.	GROUND SURFACE ELEV.[4] (FT)	DEPTH (FT)	SOIL DESCRIPTION	REMARKS
HAB-		0-0.9	TOPSOIL: BROWN SILTY CLAY WITH LITTLE SAND AND TRACE ORGANIC MATTER (ROOTS)	B-1
2205		0.9-1.2	SOFT LIGHT AND DARK BROWN SANDY CLAY WITH LITTLE SILT AND TRACE GRAVEL	B-2
		1.2-2.5	BROWN SAND WITH TRACE SILT, GRAVEL, AND COBBLES	B-3
		2.5-3.3	BROWN SILTY CLAY WITH TRACE GRAVEL	B-4
		3.3-3.9	DARK GRAY SILTY SAND WITH TRACE GRAVEL	B-5
				GROUNDWATER NOT ENCOUNTERED
				5 GALLONS OF GROUT USED
HAB-		0-2.0	TOPSOIL: BROWN SAND WITH TRACE SILT, GRAVEL, AND ORGANIC MATTER (ROOTS)	B-1
2206		2.0-2.9	STIFF DARK AND LIGHT BROWN SANDY CLAY WITH LITTLE SILT AND TRACE GRAVEL	B-2
		2.9-3.4	BROWN AND GRAY CLAYEY SAND WITH LITTLE SILT AND TRACE GRAVEL	B-3
		3.4-4.0	GRAY COARSE SAND WITH TRACE CLAY, SILT, AND GRAVEL	B-4
				5 GALLONS OF GROUT USED
				PP = 1.25 TSF
				GROUNDWATER ENCOUNTERED AT 2.7 FEET

NOTES:

[1] DLZ INSTALLED 60-INCH-LONG, 4-INCH-INSIDE DIAMETER STEEL CASING USING A CME-55 ATV DRILLING RIG. HAND AUGER BORINGS WERE PERFORMED INSIDE CASING.
[2] HAND AUGER BORINGS BACKFILLED TO GROUND SURFACE WITH BENTONITE CEMENT GROUT AND TOPPED WITH BENTONITE CHIPS.
[3] SOIL CLASSIFICATION BASED SOLELY ON VISUAL OBSERVATION.
[4] GROUND SURFACE ELEVATIONS ARE ESTIMATED FROM 2022 SITE TOPOGRAPHIC SURVEY DATA (FROM DLZ).
[5] DEPTHS PRESENTED ARE MEASURED FROM GROUND SURFACE.
[6] PP REPRESENTS HAND PENETROMETER MEASUREMENT (POCKET PENETROMETER MEASUREMENT) IN TONS PER SQUARE FOOT.
[7] REVIEWED BY:

DRILLED BY: T. BREHMER **DATE:** 09/7/2022 **FIGURE NO: 6**

TABULATION OF LABORATORY TEST DATA

BORING / TEST PIT / PROBE DESIGNATION	SAMPLE NUMBER	DEPTH OF SAMPLE TIP (FT)	ELEVATION OF SAMPLE TIP (FT)	UNCONFINED COMPRESSIVE STRENGTH (PSF)	FAILURE STRAIN (%)	NATURAL WATER CONTENT (% OF DRY WEIGHT)	IN-PLACE DRY DENSITY (LBS/CU.FT)	PERMEABILITY (CM/SEC)	PARTICLE SIZE DISTRIBUTION (%)							ATTERBERG LIMITS (%)			APPARENT SPECIFIC GRAVITY	LOSS ON IGNITION (%)	UNIFIED SOIL CLASSIFICATION
									COLLOIDS	CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
TB-2202	LS-2	5.0	770.0	--	--	14.8	118.0	--	--	--	--	--	--	--	--	--	--	--	--	1.2	--
	LS-4	10.0	765.0	7,560	12	10.5	1313	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TN-2203	LS-3	7.5	774.5	--	--	7.6	138.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-5	15.0	767.0	15,780	9.9	10.0	133.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-7	25.0	757.0	18,420	8.6	9.1	136.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-8	30.0	752.0	--	--	15.5	118.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-10	40.0	742.0	6,840	6.5	15.4	119.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TB-2204	LS-2	5.0	780.0	--	--	21.3	--	--	--	--	--	--	--	--	--	--	--	--	--	7.6	--
	LS-3	7.5	777.5	--	--	11.4	131.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-4	10.0	775.0	11,720	14.2	11.3	129.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-5	15.0	770.0	--	--	13.4	125.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-7	25.0	760.0	11,660	15.0	11.6	130.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TB-2205	LS-4	10.0	792.0	--	--	11.4	121.3	--	--	7.1	11.3	22.3	28.0	13.9	17.5	--	--	--	--	--	--
	LS-5	12.5	789.0	--	--	12.4	115.2	--	--	9.1	10.5	17.1	21.2	10.6	31.6	--	--	--	--	--	--
	LS-6	15.0	787.0	--	--	12.0	99.0	--	--	7.5	10.5	15.6	25.7	13.4	27.4	--	--	--	--	--	--
	LS-9	22.5	779.5	1,206	3.3	23.4	94.4	--	--	--	--	--	--	--	--	--	--	--	--	4.9	--
	LS-12	30.0	772.0	--	--	7.5	148.3	--	←	9.9	→	11.6	15.8	9.6	53.1	--	--	--	--	--	--
	LS-13	35.0	767.0	11,740	13.1	11.5	128.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-15	45.0	757.0	--	--	9.2	136.8	--	--	6.2	13.6	29.3	10.5	8.3	32.0	--	--	--	--	--	--
	LS-18	60.0	742.0	10,220	9.8	12.7	126.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-22	80.0	722.0	8,440	4.4	13.0	124.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-23	85.0	717.0	2,340	3.3	18.7	113.3	--	--	11.1	80.8	8.0	0.1	--	--	--	--	--	--	--	--

FIGURE NO. 8

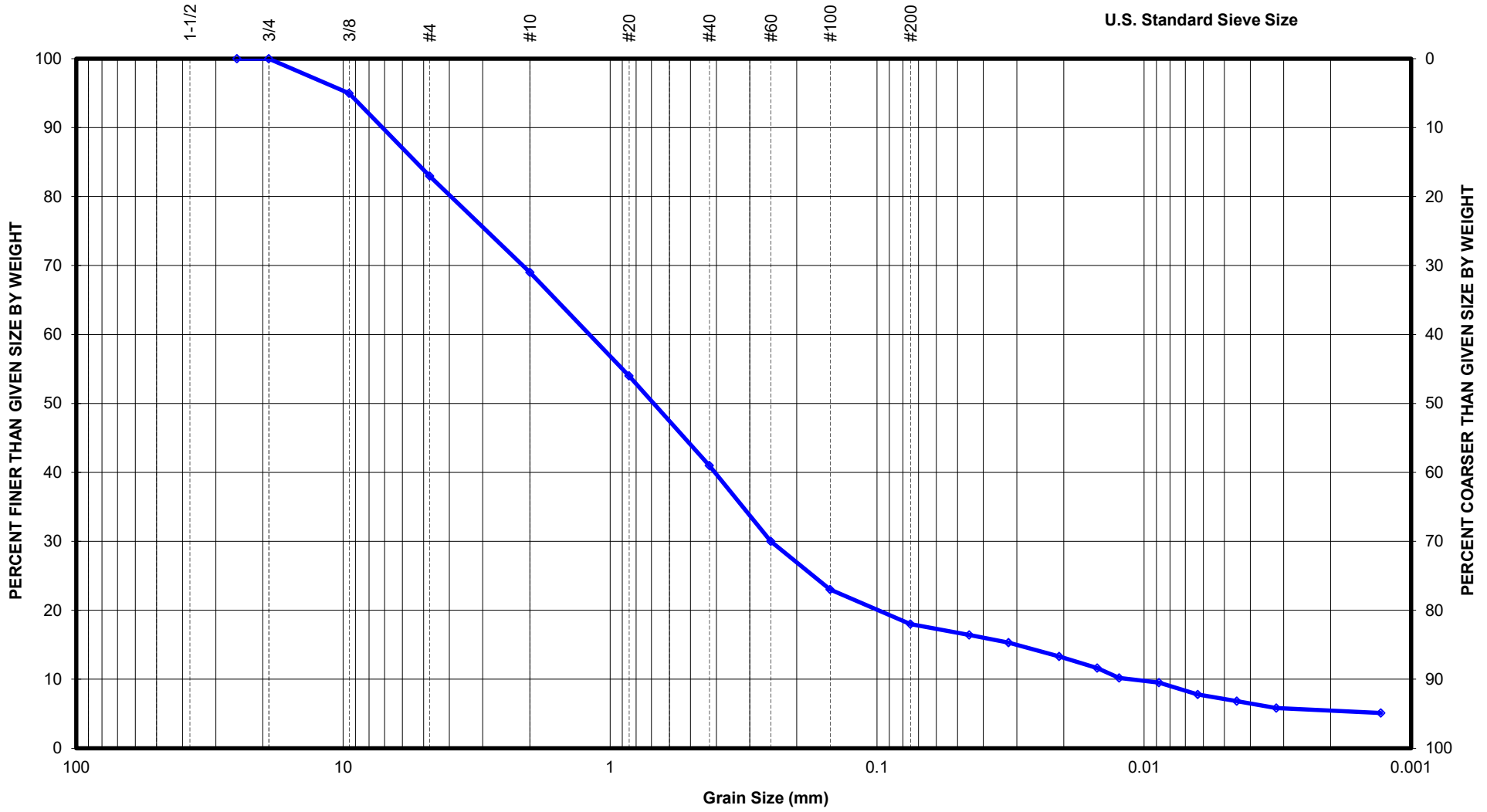
TABULATION OF LABORATORY TEST DATA

BORING / TEST PIT / PROBE DESIGNATION	SAMPLE NUMBER	DEPTH OF SAMPLE TIP (FT)	ELEVATION OF SAMPLE TIP (FT)	UNCONFINED COMPRESSIVE STRENGTH (PSF)	FAILURE STRAIN (%)	NATURAL WATER CONTENT (% OF DRY WEIGHT)	IN-PLACE DRY DENSITY (LBS/CU.FT)	PERMEABILITY (CM/SEC)	PARTICLE SIZE DISTRIBUTION (%)							ATTERBERG LIMITS (%)			APPARENT SPECIFIC GRAVITY	LOSS ON IGNITION (%)	UNIFIED SOIL CLASSIFICATION
									COLLOIDS	CLAY	SILT	FINE SAND	MEDIUM SAND	COARSE SAND	GRAVEL	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
TB-2206	LS-3	7.5	794.5	4,020	2.2	9.5	128.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-5	12.5	789.5	--	--	5.7	121.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-6	15.0	787.0	--	--	11.6	109.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-7	17.5	784.5	--	--	16.6	118.7	--	← 15.2 →			20.4	26.5	16.3	21.6	--	--	--	--	--	--
	LS-8	20.0	782.0	760	4.5	19.7	112.4	--	--	--	--	--	--	--	--	23	17	6	--	--	--
	LS-11	27.5	774.5	5,920	15.0	12.3	129.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-13	35.0	767.0	16,720	10.8	10.7	130.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-16	50.0	752.0	9,240	15.0	17.6	113.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	LS-18	60.0	742.0	--	--	17.5	116.0	--	--	8.3	89.2	2.3	0.1	--	--	--	--	--	--	--	--
	LS-19	65.0	737.0	2,440	4.3	15.4	119.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--

FIGURE NO. 8

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	62-210340	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	In-Situ
Boring No.	TB-2205	**Sample No.**	LS-4	**Sample Depth**	10.0	**Sample Elev. (Tip)**	0
Sample Description	Loose Brown GRAVELLY SAND with Trace of Clay and Silt with Peat in Cracks						
Sampled By	G. Kachl	**Date**	09/01/2022	**Tested By**	E. Chapman	**Date**	09/29/2022	**LWO No.**	22-0454-S13



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 9

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

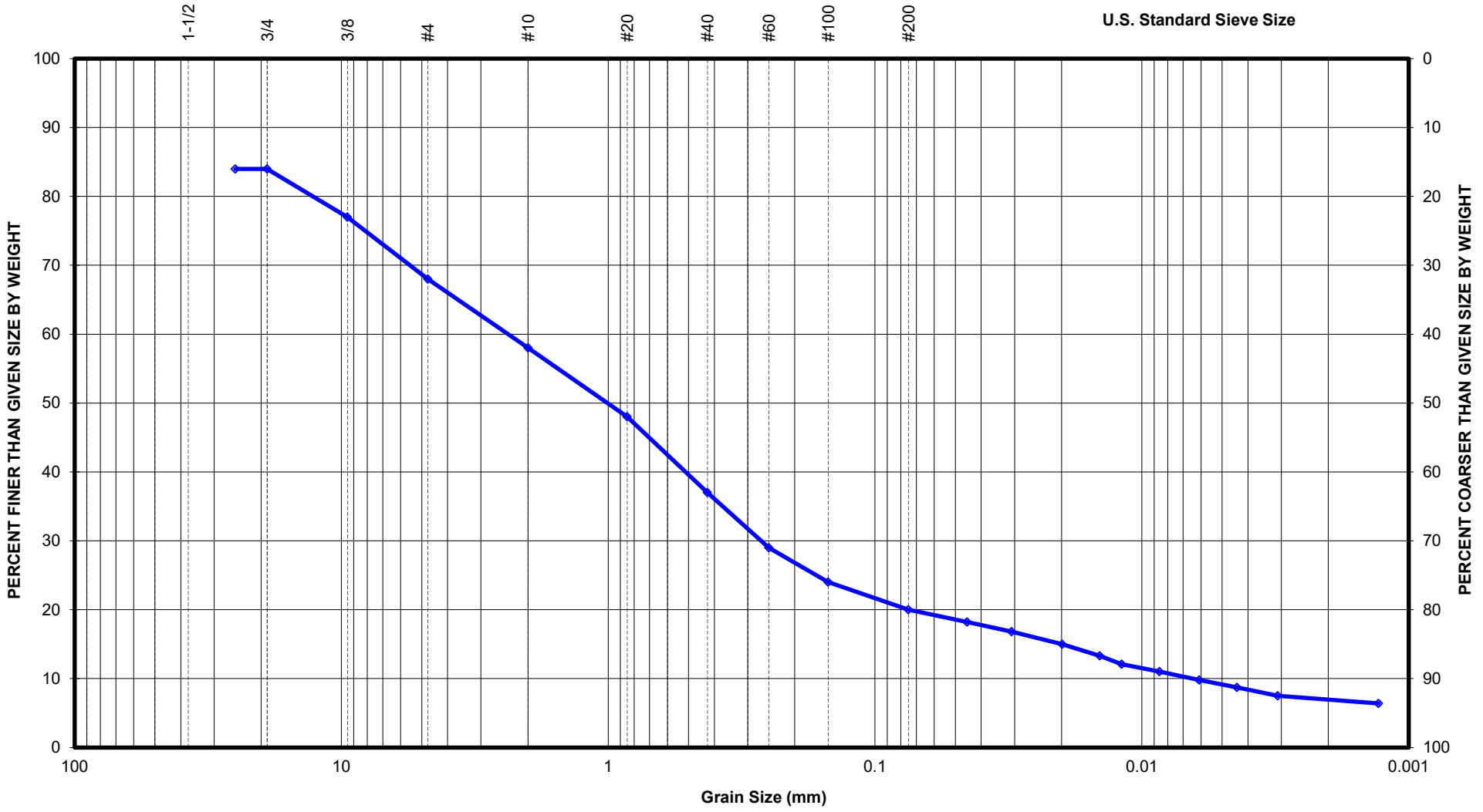
Project No. 62-210340 **Project Name** Barton Dam

Project Location Ann Arbor, MI **Source** In-Situ

Boring No. TB-2205 **Sample No.** LS-5 **Sample Depth** 12.5 **Sample Elev. (Tip)** 0

Sample Description Loose Brown GRAVELLY SAND with Trace of Clay and Silt

Sampled By G. Kachl **Date** 09/01/2022 **Tested By** E. Chapman **Date** 09/29/2022 **LWO No.** 22-0454-S14



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 10

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

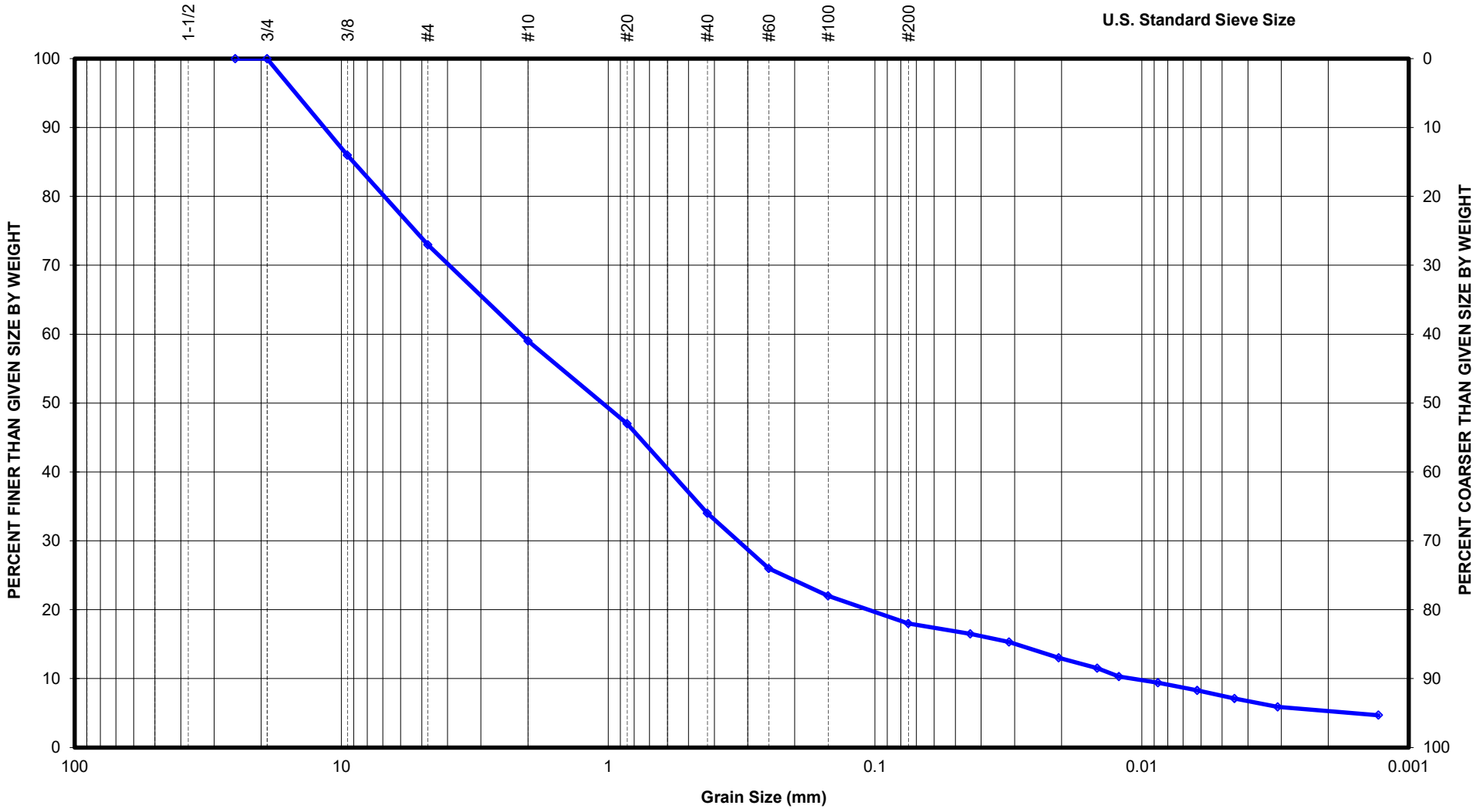
Project No. 62-210340 **Project Name** Barton Dam

Project Location Ann Arbor, MI **Source** In-Situ

Boring No. TB-2205 **Sample No.** LS-6 **Sample Depth** 15.0 **Sample Elev. (Tip)** 0

Sample Description Medium Compact Brown GRAVELLY SAND with Trace of Clay and Gravel

Sampled By G. Kachl **Date** 09/01/2022 **Tested By** E. Chapman **Date** 09/29/2022 **LWO No.** 22-0454-S15



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 11

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

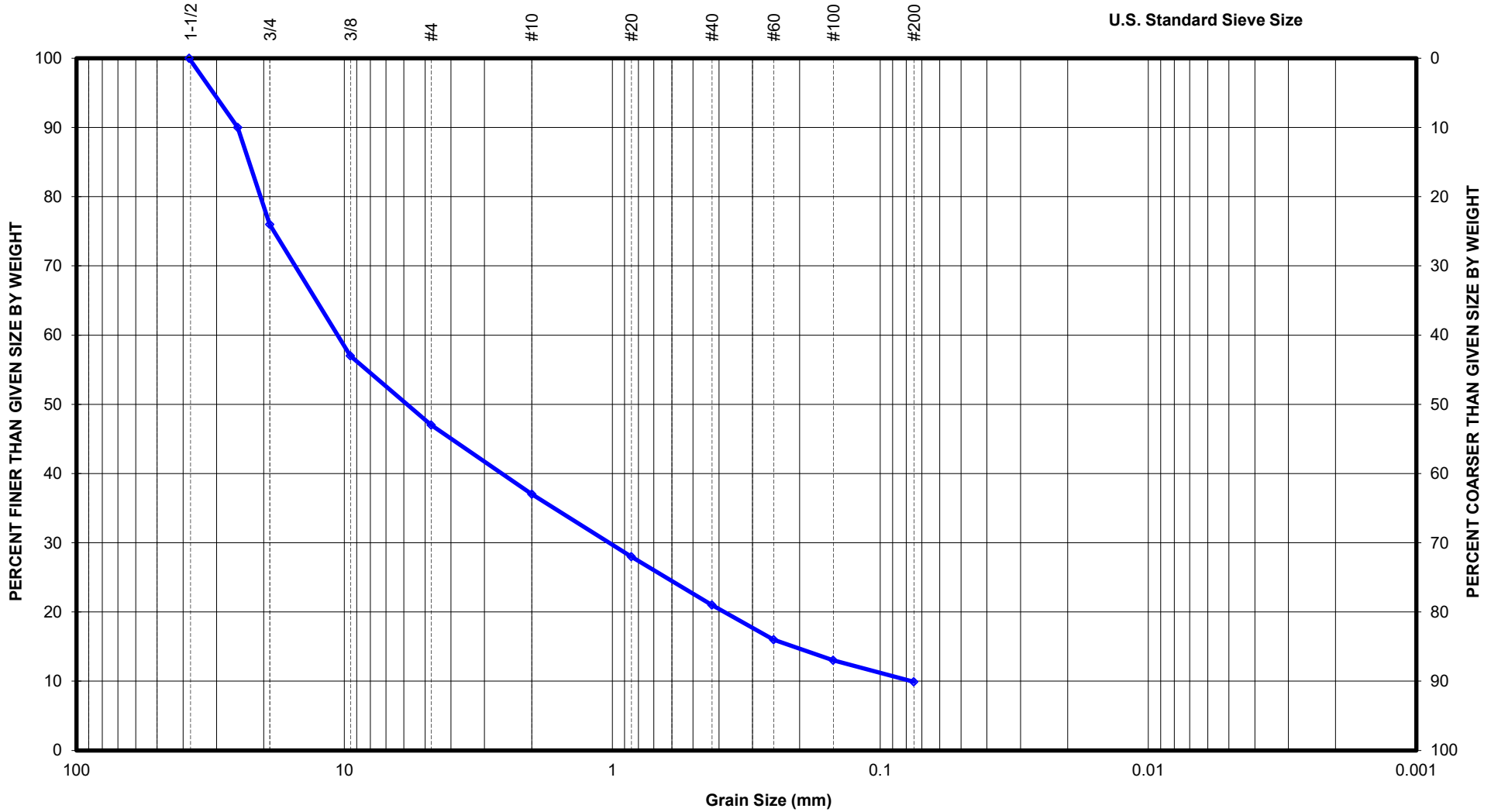
Project No. 62-210340 **Project Name** Barton Dam

Project Location Ann Arbor, MI **Source** In-Situ

Boring No. TB-2205 **Sample No.** LS-12 **Sample Depth** 30.0 **Sample Elev. (Tip)** 0

Sample Description Compact Gray SANDY GRAVEL with Trace of Clay and Silt

Sampled By G. Kachl **Date** 09/01/2022 **Tested By** S. Pierce **Date** 09/30/2022 **LWO No.** 22-0454-S17



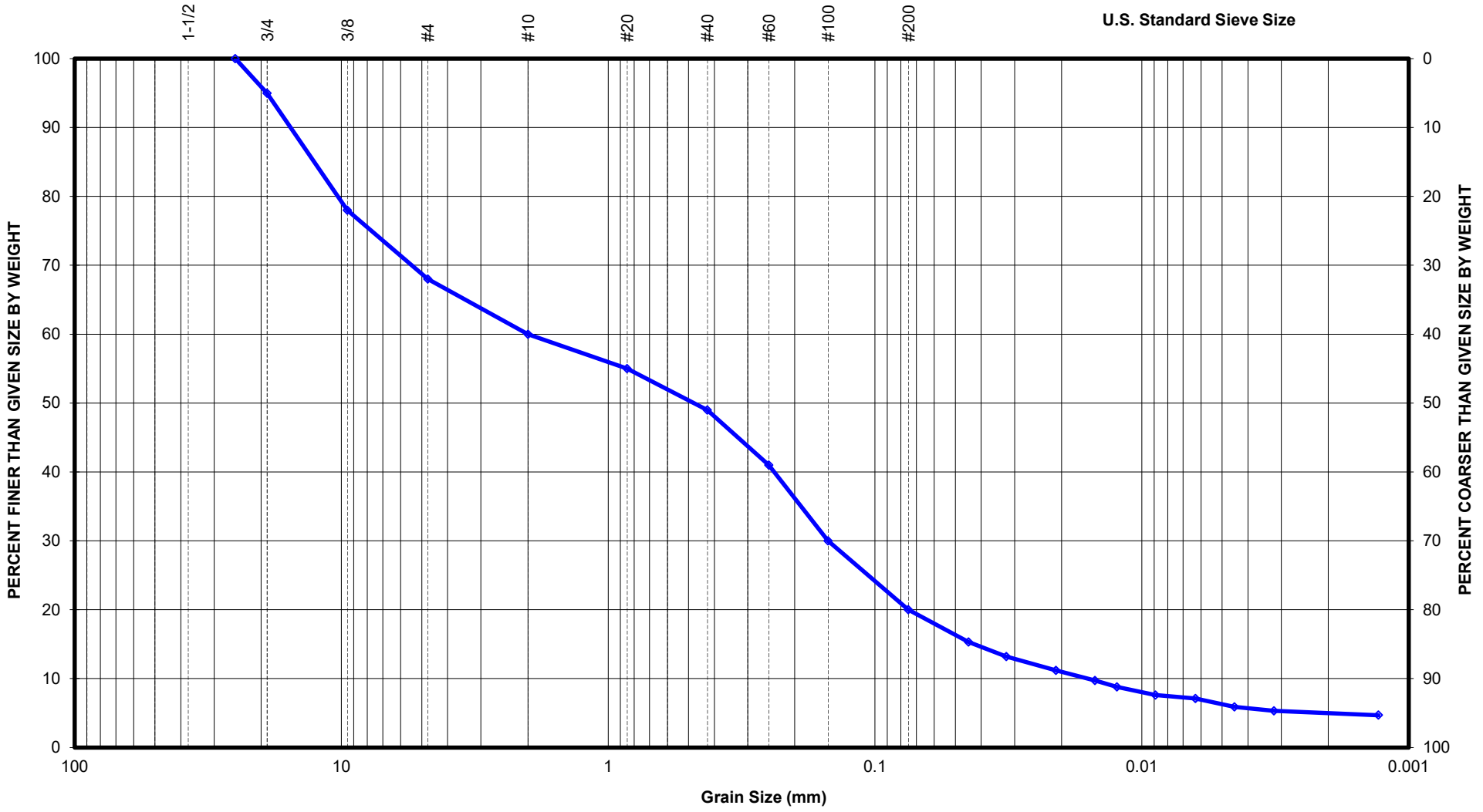
Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 12

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	62-210340	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	In-Situ
Boring No.	TB-2205	**Sample No.**	LS-15	**Sample Depth**	45.0	**Sample Elev. (Tip)**	0
Sample Description	Compact Gray GRAVELLY SAND with Trace of Clay and Silt						
Sampled By	G. Kachl	**Date**	09/01/2022	**Tested By**	E. Chapman	**Date**	09/29/2022

LWO No. 22-0454-S19



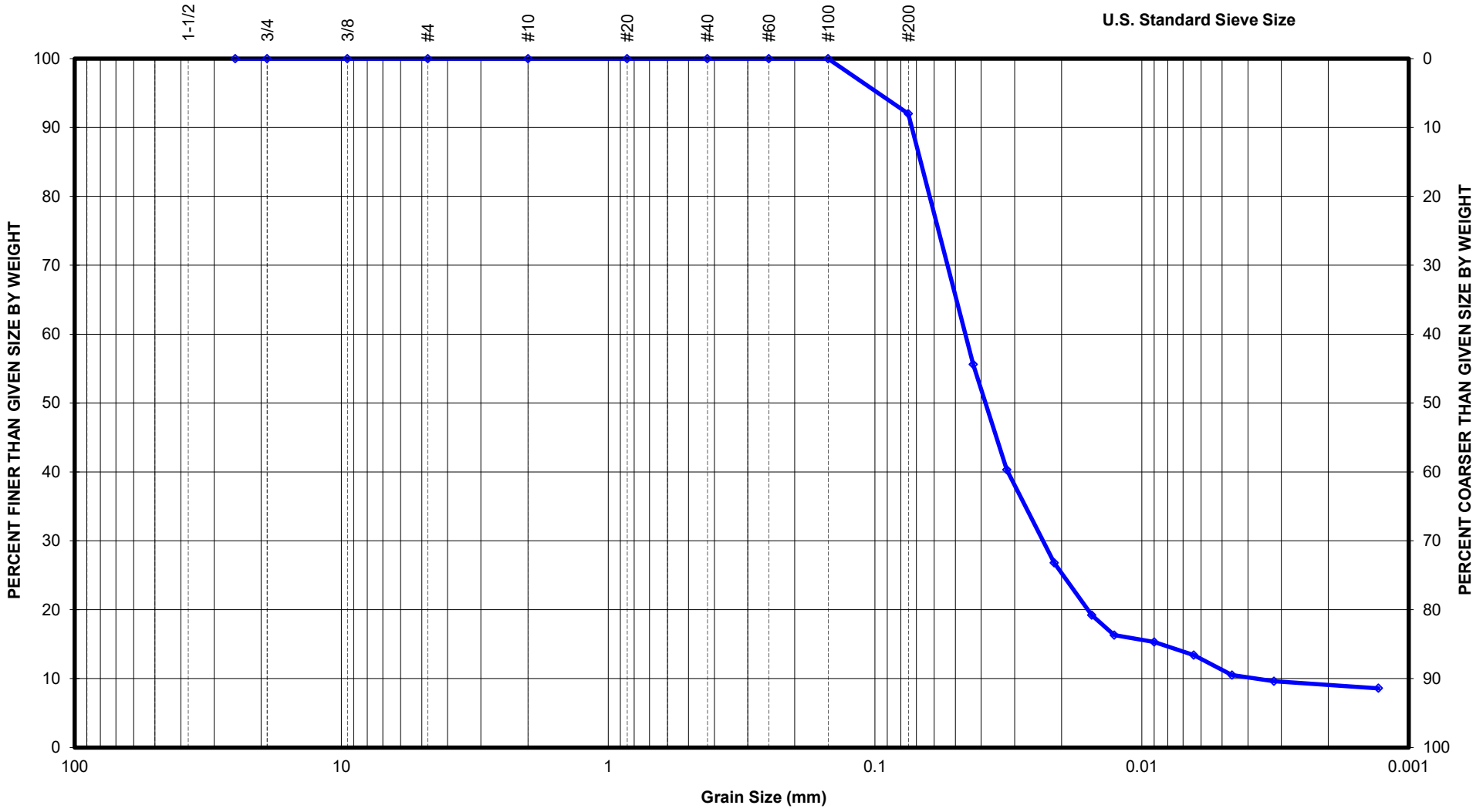
Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 13

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	62-210340	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	In-Situ
Boring No.	TB-2205	**Sample No.**	LS-23	**Sample Depth**	85.0	**Sample Elev. (Tip)**	0
Sample Description	Medium Compact Gray SILT with Trace of Fine Sand with Occasional Clay Pockets						
Sampled By	G. Kachl	**Date**	09/01/2022	**Tested By**	E. Chapman	**Date**	09/29/2022

LWO No. 22-0454-S22



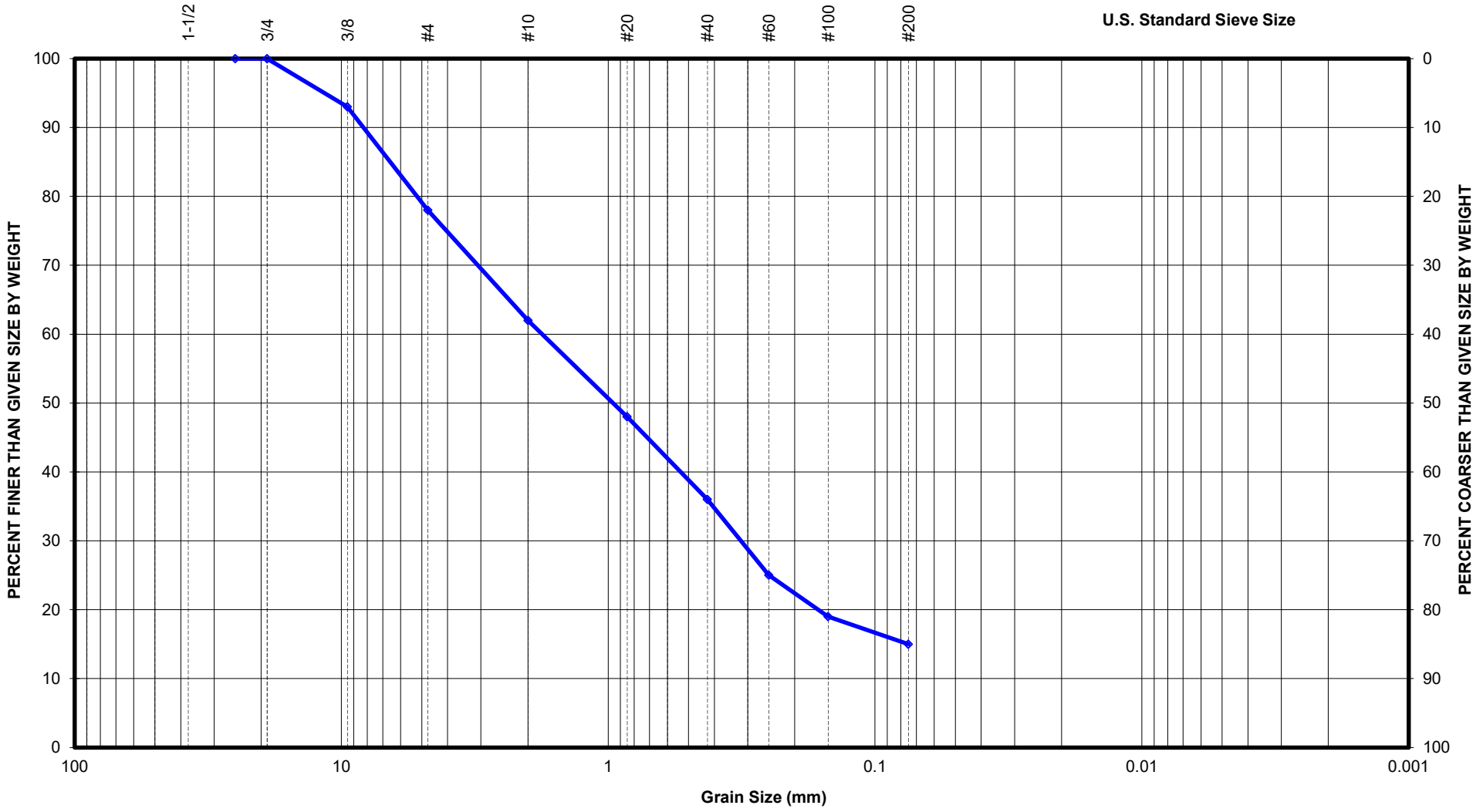
Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 14

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	62-210340	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	In-Situ
Boring No.	TB-2206	**Sample No.**	LS-7	**Sample Depth**	17.5	**Sample Elev. (Tip)**	0
Sample Description	FILL: Loose Gray GRAVELLY SAND with Trace of Clay and Silt						
Sampled By	G. Kachl	**Date**	08/31/2022	**Tested By**	S. Pierce	**Date**	09/30/2022

LWO No. 22-0454-S26



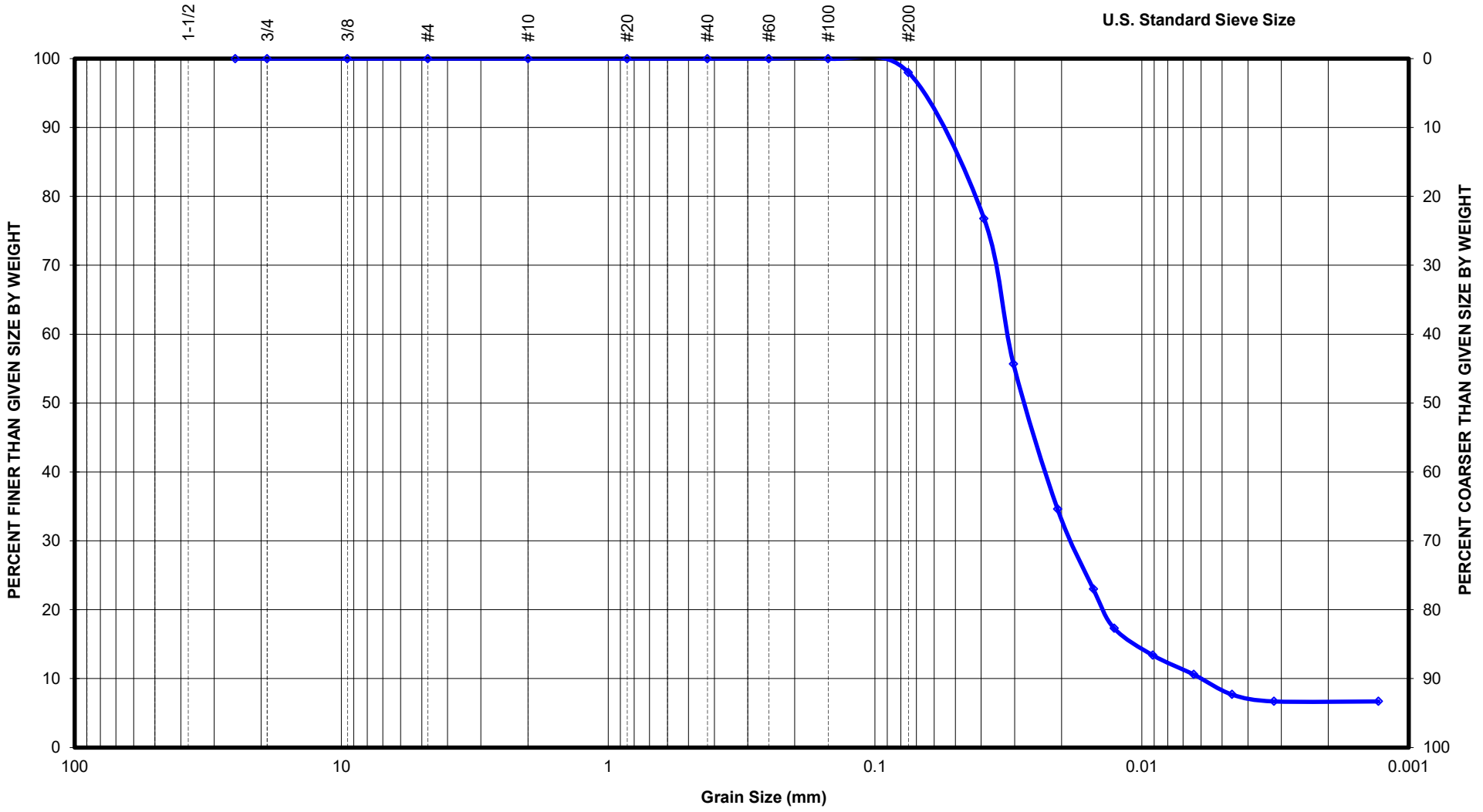
Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 15

NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	62-210340	**Project Name**	Barton Dam				
Project Location	Ann Arbor, MI					**Source**	In-Situ
Boring No.	TB-2206	**Sample No.**	LS-18	**Sample Depth**	60.0	**Sample Elev. (Tip)**	0
Sample Description	Very Compact Gray SILT with Trace of Sand with Frequent Layers of Hard Gray Silty Clay						
Sampled By	G. Kachl	**Date**	08/31/2022	**Tested By**	E. Chapman	**Date**	09/29/2022

LWO No. 22-0454-S31



Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 16

ATTACHMENT Q

Barton Dam Temporary Emergency Action Plan (TCEAP)

To Be Provided After FERC Approval

ATTACHMENT R

Railroad Permit

Engineering Practice No. EP3014 Is Included Below. Permit To Be Provided Upon Receipt From Amtrak

SCOPE AND NATURE

This practice provides procedures for Contractors to follow, when working on Amtrak Right-of-Way, adjacent to Amtrak tracks, to assure the protection of trains and maintenance of scheduled railroad operations.

SPECIAL REFERENCE

Note: This information was included under former Engineering Practice 1305.

Contractors shall comply with procedures detailed in the following specifications, when applicable:

Section	Title	Revision No.	Revision Date
01141A	Safety and Protection of Railroad Traffic and Property	4	10/01/12
01142A	Submission Documentation Required for Amtrak Review and Approval of Plans for Bridge Erection, Demolition and Other Crane/ Hoisting Operations over Railroad Right-of-Way	1	12/15/05
01520A	Requirements for Temporary Protection Shields for Demolition and Construction of Overhead Bridges and Other Structures	1	08/07/01
02261A	Requirements for Temporary Sheeting and Shoring to Support Amtrak Tracks	3	06/20/08

SPECIAL MATERIALS

Not Applicable

PROCEDURE

1. The Contractor shall conform to the applicable specifications.

2. Amtrak I&C shall assure that agencies and other third parties proposing construction on or adjacent to Amtrak Right-of-Way conform to Amtrak requirements detailed herein.

3. Amtrak Design and Construction shall review the Contractor’s proposed design and construction procedures for conformance with specifications, with sound engineering design practice and with the procedures detailed in the applicable Engineering Practice documents.

4. Amtrak Construction shall monitor the activities of the Contractor on-site to assure compliance/ adherence to approved procedures throughout the construction period.

REPORTING

As detailed in the specifications.

RESPONSIBILITY

Amtrak I&C Staff	Comply with Procedure
Director Project Initiation & Development	Assure Compliance
Amtrak Design Staff	Comply with Procedure
Director Structures Design	Assure Compliance
Amtrak Construction Staff	Comply with Procedure
Deputy Chief Engineer Construction	Assure compliance

SECTION 01141A – SAFETY AND PROTECTION OF RAILROAD TRAFFIC AND PROPERTY

PART 1 - GENERAL

1.1 SCOPE

A. This specification describes the safety procedures and protection provisions for Contractors and Permittees entering and working upon railroad property.

B. Use of this specification is as required by Amtrak, as described in Amtrak Engineering Practice EP3014.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

A. CHIEF ENGINEER: Amtrak Chief Engineer

B. RAILROAD: National Railroad Passenger Corporation (Amtrak), and/or the duly authorized representative

C. ENGINEERING PRACTICE: Amtrak Engineering Practices establish a system of uniform practices, notices and instructions for the Amtrak Engineering Department, providing current, permanent and temporary, departmental procedures and policies.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PRE-ENTRY MEETING

A. Before entry of Permittee and/or Contractors onto Railroad's property, a pre-entry meeting shall be held at which time Permittee and/or Contractors shall submit for written approval of the Chief Engineer, plans, computations and a detailed description of proposed methods for accomplishing the work, including methods for protecting Railroad's traffic. Any such written approval shall not relieve Permittee and/or Contractor of their complete responsibility for the adequacy and safety of their operations.

3.2 RULES, REGULATIONS AND REQUIREMENTS

A. Railroad traffic shall be maintained at all times with safety and continuity, and Permittee and/or Contractors shall conduct their operations in compliance with all rules, regulations, and requirements of Railroad (including these Specifications) with respect to any work performed on, over, under, within or adjacent to Railroad's property. Permittee and/or Contractors shall be responsible for acquainting themselves with such rules, regulations and requirements. Any violation of Railroads safety rules, regulations, or requirements shall be grounds for the immediate suspension of the Permittee and/or Contractor work, and the re-training of all personnel, at the Permittee's expense.

3.3 MAINTENANCE OF SAFE CONDITIONS

A. If tracks or other property of Railroad are endangered during the work, Permittee and/or Contractor shall immediately take such steps as may be directed by Railroad to restore safe conditions, and upon failure of Permittee and/or Contractor to immediately carry out such direction, Railroad may take whatever steps are reasonably necessary to restore safe conditions. All costs and expenses of restoring safe conditions, and of repairing any damage to Railroad's trains, tracks, right-of-way or other property caused by the operations of Permittee and/or Contractors, shall be paid by Permittee.

3.4 PROTECTION IN GENERAL

A. Permittee and/or Contractors shall consult with the Chief Engineer to determine the type and extent of protection required to insure safety and continuity of railroad traffic. Any Inspectors, Track Foremen, Track Watchmen, Flagman, Signalmen, Electric Traction Linemen, or other employees deemed necessary by Railroad, at its sole discretion, for protective services shall be obtained from Railroad by Permittee and/or Contractors. The cost of same shall be paid directly to Railroad by Permittee. The provision of such employees by Railroad, and any other precautionary measures taken by Railroad, shall not relieve Permittee and/or Contractors from their complete responsibility for the adequacy and safety of their operations.

3.5 PROTECTION FOR WORK NEAR ELECTRIFIED TRACK OR WIRE

A. Whenever work is performed in the vicinity of electrified tracks and/or high voltage wires, particular care must be exercised, and Railroad's requirements regarding clearance to be maintained between equipment and tracks and/or energized wires, and otherwise regarding work in the vicinity of electrified tracks, must be strictly observed. No employees or equipment will be permitted to work near overhead wires, except when protected by a Class A employee of Railroad. **Permittee and/or Contractors must supply an adequate length of grounding cable (4/0 copper with approved clamps) for each piece of equipment working near or adjacent to any overhead wire**.

3.6 FOULING OF TRACK OR WIRE

A. No work will be permitted within twenty-five (25) feet of the centerline of track or the energized wire or have potential of getting within twenty-five (25) feet of track wire without the

approval of the Chief Engineer's representative. Permittee and/or Contractors shall conduct their work so that no part of any equipment or material shall foul an active track or overhead wire without the written permission of the Chief Engineer's representative. When Permittee and/or Contractors desire to foul an active track, they must provide the Chief Engineer's representative with their site-specific work plan a minimum of twenty-one (21) working days in advance, so that, if approved, arrangements may be made for proper protection of Railroad. Any equipment shall be considered to be fouling a track or overhead wire when located (a) within fifteen (15) feet from the centerline of the track or within fifteen (15) feet from the wire, or (b) in such a position that failure of same, with or without a load, would bring it within fifteen (15) feet from the centerline of the track or within fifteen (15) feet from the wire and requires the presence of the proper Railroad protection personnel.

B. If acceptable to the Chief Engineer's representative, a safety barrier (approved temporary fence or barricade) may be installed at fifteen (15) feet from centerline of track or overhead wire to afford the Permittee and/or Contractor with a work area that is not considered fouling. Nevertheless, protection personnel may be required at the discretion of the Chief Engineer's representative.

3.7 TRACK OUTAGES

A. Permittee and/or Contractors shall verify the time and schedule of track outages from Railroad before scheduling any of their work on, over, under, within, or adjacent to Railroad's right-of-way. Railroad does not guarantee the availability of any track outage at any particular time. Permittee and/or Contractors shall schedule all work to be performed in such a manner as not to interfere with Railroad operations. Permittee and/or Contractors shall use all necessary care and precaution to avoid accidents, delay or interference with Railroad's trains or other property.

3.8 DEMOLITION

A. During any demolition, the Contractor must provide horizontal and vertical shields, designed by a Professional Engineer registered in the state in which the work takes place. These shields shall be designed in accordance with the Railroad's specifications and approved by the Railroad, so as to prevent any debris from falling onto the Railroad's right-of-way or other property. A grounded temporary vertical protective barrier must be provided if an existing vertical protective barrier is removed during demolition. In addition, if any openings are left in an existing bridge deck, a protective fence must be erected at both ends of the bridge to prohibit unauthorized persons from entering onto the bridge.

B. Ballasted track structure shall be kept free of all construction and demolition debris. Geo-textiles or canvas shall be placed over the track ties and ballast to keep the ballast clean.

3.9 EQUIPMENT CONDITION

A. All equipment to be used in the vicinity of operating tracks shall be in "certified" first-class condition so as to prevent failures that might cause delay to trains or damage to Railroad's property. No equipment shall be placed or put into operation near or adjacent to operating tracks without first obtaining permission from the Chief Engineer's representative. **Under no**

circumstances shall any equipment or materials be placed or stored within twenty-five (25) feet from the centerline of an outside track, except as approved by the Site Specific Safety Work Plan. To insure compliance with this requirement, Permittee and/or Contractors **must establish a twenty-five (25) foot foul line prior to the start of work** by either driving stakes, taping off or erecting a temporary fence, or providing an alternate method as approved by the Chief Engineer's representative. Permittee and/or Contractors will be issued warning stickers which must be placed in the operating cabs of all equipment as a constant reminder of the twenty-five (25) foot clearance envelope.

3.10 STORAGE OF MATERIALS AND EQUIPMENT

A. No material or equipment shall be stored on Railroad's property without first having obtained permission from the Chief Engineer. Any such storage will be on the condition that Railroad will not be liable for loss of or damage to such materials or equipment from any cause.

B. If permission is granted for the storage of compressed gas cylinders on Railroad property, they shall be stored a minimum of 25 feet from the nearest track in an approved lockable enclosure. The enclosure shall be locked when the Permittee and/or Contractor is not on the project site.

3.11 CONDITION OF RAILROAD'S PROPERTY

A. Permittee and/or Contractors shall keep Railroad's property clear of all refuse and debris from its operations. Upon completion of the work, Permittee and/or Contractors shall remove from Railroad's property all machinery, equipment, surplus materials, falsework, rubbish, temporary structures, and other property of the Permittee and/or Contractors and shall leave Railroad's property in a condition satisfactory to the Chief Engineer.

3.12 SAFETY TRAINING

A. All individuals, including representatives and employees of Permittee and/or Contractor, before entering onto Railroad's property and before coming within twenty-five (25) feet of the centerline of the track or energized wire must first attend Railroad's Contractor Orientation Computer Based Training Class. The Contractor Orientation Class will be provided electronically at **www.amtrakcontractor.com**. Upon successful completion of the course and test, the individual taking the course will receive a temporary certificate without a photo that is valid for three weeks. The individual must upload a photo of himself/herself that will be embedded in the permanent ID card. The photo ID will be mailed to the individual's home address and must be worn/displayed while on Railroad property. Training is valid for one calendar year. All costs of complying with Railroad's safety training shall be at the sole expense of Permittee and/or Contractor. The Permittee and/or Contractor shall appoint a qualified person as its Safety Representative. The Safety Representative shall continuously ensure that all individuals comply with Railroad's safety requirements. All safety training records must be maintained with the Permittee's and/or Contractor's site specific work plan.

3.13 NO CHARGES TO RAILROAD

A. It is expressly understood that neither these Specifications, nor any document to which they are attached, include any work for which Railroad is to be billed by Permittee and/or Contractors, unless Railroad gives a written request that such work be performed at Railroad's expense.

END OF SECTION 01141A

SECTION 01142A – SUBMISSION DOCUMENTATION REQUIRED FOR AMTRAK REVIEW AND APPROVAL OF PLANS FOR BRIDGE ERECTION, DEMOLITION AND OTHER CRANE/ HOISTING OPERATIONS OVER RAILROAD RIGHT-OF-WAY

PART 1 - GENERAL

1.1 SCOPE

A. Amtrak requires that a site-specific work plan for accomplishing hoisting operations be prepared for every applicable project, and for each type of lift on a project.
   1. The plan shall demonstrate adherence to Amtrak safety rules.
   2. The plan shall demonstrate constructibility.
   3. The plan shall minimize impact to rail operations.
   4. The approved plan will provide the basis for field inspection/ verification of the actual work.

B. Preparation, review and approval of the Crane/ Hoisting site-specific work plan does not relieve the Contractor from meeting other Amtrak requirements for adequate planning and documentation of proposed work procedures within the Right-of-Way of the railroad..

C. Current Amtrak safety rules shall be adhered to in every respect.

D. Use of this specification is as required by Amtrak, as described in Amtrak Engineering Practice EP3014.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

A. CHIEF ENGINEER: Amtrak Vice President, Chief Engineer

B. RAILROAD: National Railroad Passenger Corporation (Amtrak), and/or the duly authorized representative

C. ENGINEERING PRACTICE: Amtrak Engineering Practices establish a system of uniform practices, notices and instructions for the Amtrak Engineering Department, providing current, permanent and temporary, departmental procedures and policies.

1.4 SUBMISSION REQUIREMENTS

A. Unless otherwise directed in the Contract, the Contractor shall submit five sets of plans and calculations to the authorized representative of the Chief Engineer, Structures, whose name and address will be provided at the project pre-construction meeting.

B. Submitted calculations and plans shall be signed and sealed by a Professional Engineer, registered in the State in which the work will be performed.

C. The Contractor shall revise and resubmit plans and calculations as many times as necessary, until a complete and correct site-specific work plan for crane/ hoisting operations has been approved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 THE CONTRACTOR SHALL PROVIDE, AT A MINIMUM, THE FOLLOWING INFORMATION FOR REVIEW AND APPROVAL BY AMTRAK ENGINEERING STRUCTURES:

A. Plan view showing location(s) of cranes, operating radii, with delivery and/or disposal locations shown. Provide all necessary dimensions for locating the elements of the plan.

B. Plans and computations showing the weight of the pick.

C. Crane rating sheets, demonstrating that cranes are adequate for 150% of the calculated pick weight. That is, the cranes shall be capable of picking 150% of the load, while maintaining normal, recommended factors of safety. The adequacy of the crane for the proposed pick shall be determined by using the manufacturer's published crane rating chart and not the maximum crane capacity. Crane and boom nomenclature is to be indicated.

D. Calculations demonstrating that slings, shackles, lifting beams, etc. are adequate for 150% of the calculated pick weight.

E. Location plan showing obstructions, indicating that the proposed swing is possible. "Walking" of load using two cranes will not be permitted. Rather, multiple picks and repositioning of the crane may be permitted to get the load to the needed location for the final pick, if necessary.

F. Data sheet listing types and sizes of slings and other connecting equipment. Include copies of catalog cuts for specialized equipment. Detail attachment methods on the plans.

G. A complete procedure, indicating the order of lifts and any repositioning or re-hitching of the crane or cranes.

H. Temporary support of any components or intermediate stages, as may be required.

I. A time schedule of the various stages, as well as a schedule for the entire lifting process.

END OF SECTION 01142A

SECTION 01520A – REQUIREMENTS FOR TEMPORARY PROTECTION SHIELDS FOR DEMOLITION AND CONSTRUCTION OF OVERHEAD BRIDGES AND OTHER STRUCTURES

PART 1 - GENERAL

1.1 SCOPE

A. This engineering practice describes items to be included in the design and construction of temporary protection shields for construction overhead and near to Amtrak tracks.

B. Use of this specification is as required by Amtrak, as described in Amtrak Engineering Practice EP3014.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

A. CHIEF ENGINEER: Amtrak Vice President, Chief Engineer

B. RAILROAD: National Railroad Passenger Corporation (Amtrak), and/or the duly authorized representative

C. ENGINEERING PRACTICE: Amtrak Engineering Practices establish a system of uniform practices, notices and instructions for the Amtrak Engineering Department, providing current, permanent and temporary, departmental procedures and policies.

1.4 SUBMISSION REQUIREMENTS

A. Unless otherwise directed in the Contract, the Contractor shall submit five sets of plans and calculations to the authorized representative of the Chief Engineer, Structures, whose name and address will be provided at the project pre-construction meeting.

B. Submitted calculations and plans shall be signed and sealed by a Professional Engineer, registered in the State in which the work will be performed.

C. The Contractor shall revise and resubmit plans and calculations as many times as necessary, until a complete and correct site-specific work plan for crane/ hoisting operations has been approved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONTRACTORS WORKING ON OVERHEAD OR NEARBY DEMOLITION AND/OR CONSTRUCTION ADJACENT TO AMTRAK TRACKS, SHALL CONFORM TO THE FOLLOWING

DESIGN AND CONSTRUCTION REQUIREMENTS FOR TEMPORARY PROTECTION SHIELDING:

A. The Contractor shall maintain a specified level of protection to railroad facilities, during demolition and construction activities that occur overhead and nearby Amtrak tracks, as shown on the Contract Plans, as detailed in the Contract Specifications, and as described below.

B. Prior to the start of construction, the Contractor shall submit to Amtrak for review and approval, detailed, site specific plans for temporary protection shields. The plans will be reviewed as to the methods of erection, and as to whether or not the proposed installation will provide the required level of protection. No construction shall proceed until the Contractor has received written approval of the Contractor's complete, site specific plans, from Amtrak.

C. The Contractor shall design the protection shields to conform to all applicable and governing federal, state and local laws and regulations.

D. Drawings for the proposed temporary protection shields shall be signed and sealed by a Licensed Professional Engineer. Complete design calculations, clearly referenced to the drawings, and easy to review, shall be provided with submission of drawings.

E. Protection shields shall be designed for the following, minimum load and size criteria.
   1. The horizontal shield design liveload on horizontal surfaces shall be the greater of a minimum of 100 pounds per square foot (psf) [5000 Pascals] or the anticipated liveload to be produced by the Contractor's anticipated operations. When determining the appropriate design live load, the designer shall consider factors such as the physical capacity of proposed debris-catching platforms to retain materials, and the type of equipment the platforms might support. Positive means of demolition and construction controls shall be provided to assure that debris that may collect on the shield will not exceed the design live load. The horizontal protection shield, in plan view, shall cover no less than the area directly over the tracks plus ten feet minimum beyond the centerline of the outermost tracks.
   2. The vertical shield shall be designed to carry a minimum 30 psf [1500 Pascals] allowance for wind load. The vertical shield shall extend a minimum of 6'-6" [1950 millimeters] above the top of the adjacent surface, such as curb or sidewalk. Anti-climb wings shall be installed at each end, as necessary, to restrict access to the railroad property.

F. The vertical and horizontal clearance envelopes required for maintenance of railroad operations, shall be indicated on the site specific work plans. These clearances are subject to review and approval by Amtrak. If applicable, both temporary and permanent envelopes shall be indicated on the plans. The temporary protection shields shall be installed outside the limits of these minimum vertical and horizontal clearances shown on the site specific work plans.

G. In electrified territory, temporary protection shields shall be bonded and grounded.

H. Temporary protection shields shall be designed and constructed to prevent dust, debris, concrete, formwork, paint, tools, or anything else from falling onto the railroad property below.

I. The temporary protection shields shall be attached to the structure in accordance with site specific work plans submitted by the Contractor and approved by Amtrak. Drilling in structural members and welding will generally not be permitted in members that are scheduled to remain in place in the reconstructed structure. For existing members scheduled for demolition or for later reconstruction, any proposed attachment shall be designed with consideration of potential existing, deteriorated conditions.

J. The Contractor shall provide the Amtrak on-site representative, for review and approval prior to any construction activity in the effected area, a proposed construction schedule for the installation, maintenance and removal of the temporary protection shields.

K. The temporary protection shields shall be installed prior to the start of any other work over the railroad in the effected areas. No construction shall proceed until the Amtrak on-site representative reviews and approves the Contractor's installed protection. Before proceeding with the work, Amtrak must be satisfied, in its sole judgment, that sufficient protection has been provided to proceed with the work.

L. The Contractor shall install and remove temporary protection shields only when an Amtrak representative is on-site.

M. The Contractor shall not install or remove temporary protection shields during train operations.

N. Temporary protection shields shall remain in place for the duration of construction activities over and nearby the railroad in the effected areas. The Contractor may remove temporary construction only after approved by Amtrak on-site representatives.

O. Where site specific conditions impose insurmountable restrictions to the design of temporary construction conforming to the limitations listed above, the design of temporary construction shall be developed in close coordination with Amtrak design review personnel. The Chief Engineer, Structures shall provide final approval of temporary construction that does not conform to the above limitations.

END OF SECTION 01520A

SECTION 02261A – REQUIREMENTS FOR TEMPORARY SHEETING AND SHORING TO SUPPORT AMTRAK TRACKS

PART 1 - GENERAL

1.1 SCOPE

A. This engineering practice describes items to be included in the design and construction of temporary sheeting and shoring construction adjacent and proximate to Amtrak tracks.

B. Use of this specification is as required by Amtrak, as described in Amtrak Engineering Practice EP3014.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 DEFINITIONS

A. CHIEF ENGINEER: Amtrak Vice President, Chief Engineer

B. RAILROAD: National Railroad Passenger Corporation (Amtrak), and/or the duly authorized representative

C. ENGINEERING PRACTICE: Amtrak Engineering Practices establish a system of uniform practices, notices and instructions for the Amtrak Engineering Department, providing current, permanent and temporary, departmental procedures and policies.

1.4 SUBMISSION REQUIREMENTS

A. Unless otherwise directed in the Contract, the Contractor shall submit five sets of plans and calculations to the authorized representative of the Chief Engineer, Structures, whose name and address will be provided at the project pre-construction meeting.

B. Submitted calculations and plans shall be signed and sealed by a Professional Engineer, registered in the State in which the work will be performed.

C. The Contractor shall revise and resubmit plans and calculations as many times as necessary, until a complete and correct site-specific work plan for temporary sheeting and shoring has been approved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONTRACTORS INSTALLING TEMPORARY CONSTRUCTION SHEETING AND SHORING TO SUPPORT AMTRAK TRACKS SHALL CONFORM TO THE FOLLOWING:

A. Footings for all piers, columns, walls, or other facilities shall be located and designed so that any temporary sheeting and shoring for support of adjacent track or tracks during construction, will not be closer than toe of ballast slope. The dimension from gage of rail to toe of ballast, along tangent track, is 7'-5"; see dimensions on Track standard plans for curved track dimensions.

B. USE OF SHEETING: When support of track or tracks is necessary during construction of the above-mentioned facilities, interlocking steel sheeting, adequately braced and designed to carry Cooper E80 live-load plus 50 percent impact allowance is required. Soldier piles and lagging will be permitted for track support ONLY when required penetration of steel sheet piling cannot be obtained, due to site-specific conditions that make steel sheet piling placement impracticable, in the opinion of the authorized, Amtrak design review engineer.
   1. For usual soil conditions and limited excavations, sheeting is required when the near-track excavation extends beneath or nearer to the track than the Theoretical Railroad Embankment Line. The Theoretical Railroad Embankment Line is defined as a line that starts at grade, ten foot from the centerline of the outer track, and extends downward, away from the track, at a slope of 1-1/2 horizontal to one vertical.
   2. For special soil conditions, such as soft organic soils and rock conditions, and for unusual excavation conditions, temporary supports for excavations may be necessary even when the limits fall beyond the Theoretical Railroad Embankment Line, requiring site specific analysis by a professional, geotechnical engineer.
   3. See Sketch SK-1, "Normal Requirements for Sheet Piling Adjacent to Tracks".

C. Exploratory trenches, three feet deep and 15 inches wide in the form of an "H", with outside dimensions matching the proposed outside dimensions of sheeting, shall be hand dug, prior to placing and driving the sheeting, in any area where railroad or utility underground installations are known or suspected. These trenches are for exploratory purposes only, and shall be backfilled and immediately compacted, in layers. This work shall be performed only in the presence of a railroad inspector.

D. Absolute use of track is required while driving sheeting adjacent to running track. Track usage shall be prearranged per standard procedures, through the Amtrak project representative.

E. Cavities adjacent to sheet piling, created by pile driving, shall be filled with sand, and any disturbed ballast shall be restored and tamped immediately.

F. Sheet piling cutoffs
   1. During construction, sheeting shall be cut off at an elevation no higher than the top of tie.
   2. At the completion of construction activities involving the use of sheet piling, sheet piling may be pulled if there will be no adverse impact to the railroad track support bed, as determined by the Amtrak site engineer. This will generally be permitted when both of these conditions are met:
      a. the sheeting face is at least ten feet distant from the centerline of track, and
      b. the bottom of the excavation that the sheeting supported prior to backfilling, does not fall within an assumed influence zone under the tracks. The assumed influence

zone is defined as the area, as seen in cross-sectional view, falling beneath the Theoretical Underground Track Disturbance Line. This line is defined as a line that starts at the end and bottom of the ties, and extends from the track outward and downward at a one-to-one (45-degree) slope.

3. Sheet piling that is to be left in-place, shall be cut off below the ground line
   a. at least eighteen inches below final ground line at the sheeting, and
   b. no higher than 24 inches below the elevation of the bottom of the nearest ties
4. See Sketch SK-1, "Normal Requirements for Sheet Piling Adjacent to Tracks".

G. The excavation adjacent to the track shall be covered, ramped and protected by handrails, barricades and warning lights, as required by applicable safety regulations, and as directed by Amtrak.

H. Final backfilling of excavation shall conform to project specifications.

I. The Contractor shall provide Amtrak with a detailed schedule of proposed construction operations, detailing each step of the proposed temporary construction operations in proximity to Amtrak tracks, so that Amtrak may review and approve the proposed operations, and may properly inspect and monitor operations.

J. Drawings for the proposed temporary sheeting and shoring shall be signed and sealed by a Licensed Professional Engineer. Complete design calculations, clearly referenced to the drawings, and easy to review, shall be provided with submission of drawings.

K. Where site specific conditions impose insurmountable restrictions to the design of temporary construction conforming to the limitations listed above, the design of temporary construction shall be developed in close coordination with Amtrak design review personnel. The Chief Engineer, Structures shall provide final approval of temporary construction that does not conform to the above limitations.

1. When Amtrak grants approval for sheeting closer than standard minimum clearances, the Contractor shall develop a survey plan, if not already required by the project, for the adjacent tracks, to be conducted prior to, during, and after the temporary sheeting construction operations. If settlement is detected, construction operations shall be suspended until the track has been returned to its initial condition, and stabilized, as determined by the Amtrak project site representative.
2. The Contractor shall stockpile ten (10) tons of approved ballast at the project site, and maintain that amount in ready reserve, to allow for the possible need to restore track profile.

L. Particular care shall be taken in the planning, design and execution of temporary construction, as relates to railroad slope protection and drainage facilities. Erosion and sediment control best management practices shall be designed and employed, as approved by Amtrak. Any unintended disruption to railroad drainage facilities, caused by the temporary construction, shall be promptly remedied, as directed by the Engineer, solely at the Contractor's cost.

M. The following Information Sketch is attached:

1. Figure No. SK-1: Normal Requirements for Sheet Piling Adjacent to Track

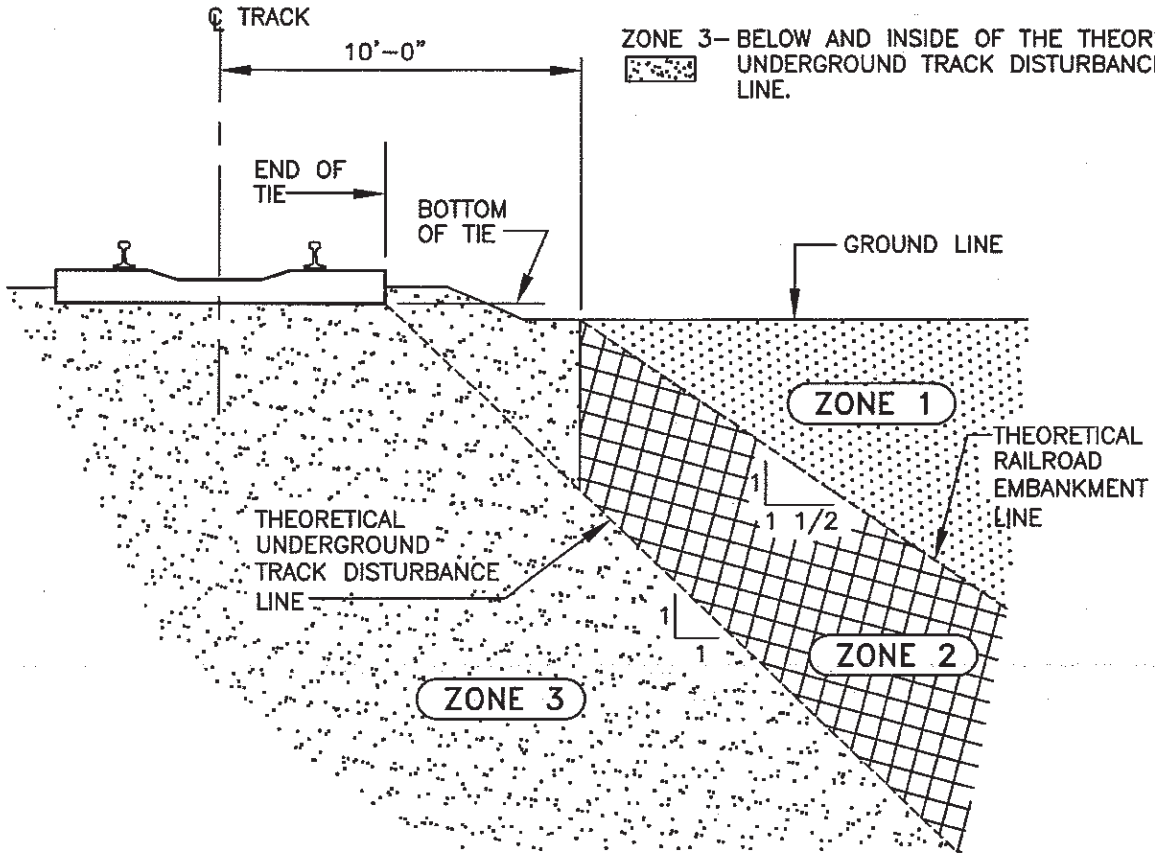
END OF SECTION 02261A

LEGEND

ZONE 1 – ABOVE AND OUTSIDE THE THEORETICAL RAILROAD EMBANKMENT LINE.

ZONE 2 – FARTHER THAN 10 FEET FROM THE CENTERLINE OF TRACK, BELOW THE THEORETICAL RAILROAD EMBANKMENT LINE AND ABOVE THE THEORETICAL UNDERGROUND TRACK DISTURBANCE LINE.

ZONE 3 – BELOW AND INSIDE OF THE THEORETICAL UNDERGROUND TRACK DISTURBANCE LINE.



NORMAL REQUIREMENTS FOR SHEET PILING ADJACENT TO TRACK

(1) EXCAVATIONS WITHIN ZONE 1 – ABOVE AND OUTSIDE OF THE THEORETICAL RAILROAD EMBANKMENT LINE – DO NOT NORMALLY REQUIRE SHEETING TO PROTECT RAILROAD ROAD BED. SHEETING MAY BE REQUIRED FOR OTHER REASONS.

(2) EXCAVATIONS WHOSE BOTTOMS EXTEND INTO ZONE 2 REQUIRE SHEETING, BUT THE SHEETING MAY NORMALLY BE PULLED AFTER THE EXCAVATION HAS BEEN BACKFILLED.

(3) EXCAVATIONS WHOSE BOTTOMS EXTEND INTO ZONE 3 WILL NORMALLY REQUIRE THE SHEETING TO BE LEFT IN PLACE AND CUT–OFF PER REQUIREMENTS.

Office of Chief Engineer
STRUCTURES
National Railroad Passenger Corporation
30th Street Station, Philadelphia, Pennsylvania 19104

SKETCH 1

SPEC. 02261A – REV. 1

Designed	Drawn	Date
CJR	JLM	8/06/01

File No:	
Design No:	3501
Sheet No.	1 of 1
Dwg. No.	SK–1

ATTACHMENT S

Joint Permit

To Be Provided Upon Receipt From EGLE / ACOE

ATTACHMENT T

Drilling Program Plan

To Be Provided Upon Approval By FERC

ATTACHMENT U

Piezometer Monitoring Data

BARTON DAM PIEZOMETRIC READINGS

								Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
Elevations of top of caps								**801.92**	**782.35**	**802.66**	**782.37**	
1/1/88								801.92	782.35	802.66	782.37	
2/1/88								801.92	782.35	802.66	782.37	
3/5/88	796							801.92	782.35	802.66	782.37	
4/5/88	735		18.75	1.17	23.75	5.25		783.17	781.18	778.91	777.12	
5/15/88	547							801.92	782.35	802.66	782.37	
6/14/88	516							801.92	782.35	802.66	782.37	
7/16/88	157		18.50	1.45	23.75	5.92		783.42	780.9	778.91	776.45	
8/19/88	197		20.20	1.46	23.94	6.04		781.72	780.89	778.72	776.33	
9/11/88	197		20.75	3.50	24.83	6.08		781.17	778.85	777.83	776.29	
10/10/88	273		20.42	3.17	24.75	7.42		781.5	779.18	777.91	774.95	
11/18/88	1066							801.92	782.35	802.66	782.37	
12/22/88	328							801.92	782.35	802.66	782.37	
1/1/89								801.92	782.35	802.66	782.37	
2/1/89								801.92	782.35	802.66	782.37	
3/5/89								801.92	782.35	802.66	782.37	
4/5/89								801.92	782.35	802.66	782.37	
5/4/89	378		19.75	1.50	24.12	6.25		782.17	780.85	778.54	776.12	
6/14/89								801.92	782.35	802.66	782.37	
7/7/89	610		23.92	6.34	19.75	23.00		778	776.01	782.91	759.37	
8/25/89	291		19.50	2.17	23.83	6.20		782.42	780.18	778.83	776.17	
9/15/89								801.92	782.35	802.66	782.37	
10/15/89								801.92	782.35	802.66	782.37	
11/29/89	578		19.53	1.42	24.20	6.37		782.39	780.93	778.46	776	
12/30/89								801.92	782.35	802.66	782.37	
1/15/90								801.92	782.35	802.66	782.37	
2/15/90								801.92	782.35	802.66	782.37	
3/15/90								801.92	782.35	802.66	782.37	
4/2/90	1027		19.50	2.45	24.00	6.08		782.42	779.9	778.66	776.29	
5/3/90	742		19.47	1.04	24.00	6.12		782.45	781.31	778.66	776.25	
6/1/90	314							801.92	782.35	802.66	782.37	
7/2/90	378		18.58	1.42	23.83	6.37		783.34	780.93	778.83	776	
8/1/90								801.92	782.35	802.66	782.37	
9/1/90								801.92	782.35	802.66	782.37	
10/1/90								801.92	782.35	802.66	782.37	
11/1/90								801.92	782.35	802.66	782.37	
12/4/90	858							801.92	782.35	802.66	782.37	
1/1/91								801.92	782.35	802.66	782.37	
2/1/91								801.92	782.35	802.66	782.37	
3/5/91	796							801.92	782.35	802.66	782.37	
4/5/91	735		18.75	1.17	23.75	5.25		783.17	781.18	778.91	777.12	
5/15/91	547							801.92	782.35	802.66	782.37	
6/14/91	516							801.92	782.35	802.66	782.37	
7/16/91	157		18.50	2.17	23.75	5.92		783.42	780.18	778.91	776.45	
8/12/91	328		20.20	2.00	24.78	5.87		781.72	780.35	777.88	776.5	

BARTON DAM PIEZOMETRIC READINGS

								Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
9/11/91	197		20.75	3.50	24.83	6.08		781.17	778.85	777.83	776.29	
10/10/91	273		20.42	3.17	24.75	7.42		781.5	779.18	777.91	774.95	
11/12/91	610		20.67	2.83	24.75	5.67		781.25	779.52	777.91	776.7	
12/13/91	550		20.17	2.42	24.75	5.58		781.75	779.93	777.91	776.79	
1/24/92	498		20.42	2.08	24.50	6.08		781.5	780.27	778.16	776.29	
2/27/92	723		20.17	2.00	24.75	5.83		781.75	780.35	777.91	776.54	
3/27/92	810		19.34	2.83	23.50	5.75		782.58	779.52	779.16	776.62	
4/29/92	1335		18.58	2.92	23.53	5.50		783.34	779.43	779.13	776.87	
5/26/92	457	796.89	19.50	3.67	23.67	5.92		782.42	778.68	778.99	776.45	
6/25/92	192	796.94	19.00	3.34	23.92	6.08		782.92	779.01	778.74	776.29	
7/31/92	508	796.96	19.25	3.58	23.34	5.67		782.67	778.77	779.32	776.7	
8/31/92	411	796.95	19.67	3.58	23.42	5.75		782.25	778.77	779.24	776.62	
9/30/92	406	796.93	19.75	3.58	23.58	5.92		782.17	778.77	779.08	776.45	
10/29/92	441	796.92	19.58	3.58	23.51	5.70		782.34	778.77	779.15	776.67	
11/30/92	937	797	18.73	2.40	23.83	5.83		783.19	779.95	778.83	776.54	
12/30/92	1018	797.06	18.50	2.25	23.67	6.00		783.42	780.1	778.99	776.37	
1/28/93	895	797.04	18.96	2.54	22.96	6.04		782.96	779.81	779.7	776.33	
2/26/93	426	796.9	18.25	2.79	22.96	6.08		783.67	779.56	779.7	776.29	
3/25/93	1345	797.05	18.80	2.29	23.17	6.25		783.12	780.06	779.49	776.12	
4/26/93	1120	797.04	18.34	2.50	23.62	5.83		783.58	779.85	779.04	776.54	
5/26/93	340	796.96	18.42	3.00	23.17	6.00		783.5	779.35	779.49	776.37	
6/29/93	801	797	18.67	3.08	22.92	6.08		783.25	779.27	779.74	776.29	
7/30/93	192	796.91	19.25	3.42	23.58	6.00		782.67	778.93	779.08	776.37	
8/30/93	253	796.94	18.42	3.50	22.67	5.83	775.36	783.5	778.85	779.99	776.54	
9/30/93		794.97	18.83	3.75	23.34	5.83	774.67	783.09	778.6	779.32	776.54	
10/29/93		794.96	18.67	3.67	22.83	5.83	774.66	783.25	778.68	779.83	776.54	
11/30/93	574	796.99	18.08	2.92	23.08	6.00	775.38	783.84	779.43	779.58	776.37	
12/30/93	273	796.9	19.67	3.17	22.50	6.00	775.29	782.25	779.18	780.16	776.37	
2/1/94	446	796.96	18.67	2.75	23.00	5.83	775.33	783.25	779.6	779.66	776.54	
2/28/94	607	797.04	19.25	2.67	23.00	5.75	775.36	782.67	779.68	779.66	776.62	
3/30/94	1060	797	21.20	2.10	24.20	6.20	775.35	780.72	780.25	778.46	776.17	
4/29/94	643	796.98	19.40	1.80	24.10	6.00	775.35	782.52	780.55	778.56	776.37	
5/31/94	222	797	20.10	2.70	24.10	6.30	775.35	781.82	779.65	778.56	776.07	
								801.92	782.35	802.66	782.37	
8/1/94	197	796.91	20.20	3.10	23.90	6.30	775.37	781.72	779.25	778.76	776.07	
8/31/94	330	796.98	20.20	3.20	23.50	6.30	775.39	781.72	779.15	779.16	776.07	
10/2	495	796.99	19.67	2.58	24.00	6.17	775.41	782.25	779.77	778.66	776.2	
11/1	314	796.9	18.60	2.40	23.90	6.20	775.35	783.32	779.95	778.76	776.17	
12/29/94	631	797	20.40	2.60	24.10	6.30	775.39	781.52	779.75	778.56	776.07	
1/31/95	676	796.99	19.90	2.30	23.00	6.30	775.37	782.02	780.05	779.66	776.07	
2/28/95	432	796.96	20.00	2.34	24.34	6.42	775.45	781.92	780.01	778.32	775.95	
3/31/95	682	797	20.08	2.25	24.25	6.42	775.4	781.84	780.1	778.41	775.95	
4/30/95	525	797	19.90	2.30	24.10	6.40	775.45	782.02	780.05	778.56	775.97	
5/31/95	386	796.94	20.00	2.50	24.10	6.40	775.39	781.92	779.85	778.56	775.97	
6/30/95	577	797	19.50	2.60	24.10	6.40	775.4	782.42	779.75	778.56	775.97	

BARTON DAM PIEZOMETRIC READINGS

							Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
7/28/95	427	797	19.60	2.40	23.70	6.30	775.42	782.32	779.95	778.96	776.07	
9/30/95	155	797.01	20.10	2.10	24.10	6.40		781.82	780.25	778.56	775.97	
10/31/95	335	797.01	19.80	2.60	24.20	6.30	775.38	782.12	779.75	778.46	776.07	
11\30\95	810	797.01	20.00	2.50	24.10	6.40		781.92	779.85	778.56	775.97	
12\30\95	305	797.03	20.30	2.60	24.00	6.40		781.62	779.75	778.66	775.97	
01\30\96	335	797.03	20.20	2.80	23.20	6.50		781.72	779.55	779.46	775.87	
02\29\96	840	797.03	19.90	2.20	23.40	6.30		782.02	780.15	779.26	776.07	
03\30\96	710	797	20.10	2.00	24.30	6.30		781.82	780.35	778.36	776.07	
04\30\96	900	797.01	18.30	1.80	24.10	6.20		783.62	780.55	778.56	776.17	
05\31\96	527	797.03	20.00	2.30	24.20	6.30		781.92	780.05	778.46	776.07	
								801.92	782.35	802.66	782.37	
7/31/96	285	797.03	20.00	2.70	24.10	6.30	775.4	781.92	779.65	778.56	776.07	
8/31/96	117	797.02	20.00	3.10	24.10	6.30	775.4	781.92	779.25	778.56	776.07	
9/30/96	217	796.97	19.80	2.80	24.00	6.30	775	782.12	779.55	778.66	776.07	
10/30/96		796.97	19.80	2.80	24.00	6.20	775	782.12	779.55	778.66	776.17	
11/30/96	552	797.01	19.90	2.50	24.20	6.20	772.91	782.02	779.85	778.46	776.17	
12/30/97		797.01	20.10	2.10	24.10	6.40	773.4	781.82	780.25	778.56	775.97	
1/31/97		795.07	20.00	2.70	24.50	6.40	774	781.92	779.65	778.16	775.97	
2/28/97		796	20.00	2.50	24.10	6.40	775	781.92	779.85	778.56	775.97	
3/31/97			19.90	1.80	24.30	6.30	773	782.02	780.55	778.36	776.07	
9/30/97	428	797.05	19.90	2.80	24.10	6.30		782.02	779.55	778.56	776.07	
10/31/97	410	796.94	19.80	2.65	24.15	6.25		782.12	779.7	778.51	776.12	
11/30/97	447	796.94	20.00	2.60	24.30	6.15		781.92	779.75	778.36	776.22	
12/30/97	515	796.93	19.80	2.40	24.20	6.30		782.12	779.95	778.46	776.07	
1/29/98	568	797.02	19.80	2.10	24.20	6.35		782.12	780.25	778.46	776.02	
2/27/98	1298	797.02	19.60	1.80	24.10	6.10		782.32	780.55	778.56	776.27	
3/31/98	1223	797.01	19.60	1.80	24.10	6.10		782.32	780.55	778.56	776.27	
4/30/98	958	797.01	19.70	2.15	24.10	6.15		782.22	780.2	778.56	776.22	
5/31/98	238	796.99	19.80	2.70	24.10	6.30		782.12	779.65	778.56	776.07	
6/30/98	263	797	19.85	2.90	24.00	6.30	771.23	782.07	779.45	778.66	776.07	
								801.92	782.35	802.66	782.37	
8/28/98	157	797.02	20.00	2.90	24.00	6.30		781.92	779.45	778.66	776.07	
9/30/98	120	797.02	20.00	3.00	23.90	5.95	773.3	781.92	779.35	778.76	776.42	
10/31/98	187	796.99	20.10	2.95	24.15	6.10	773.31	781.82	779.4	778.51	776.27	
11/30/98	243	797.06	20.20	3.00	24.20	6.10	773.25	781.72	779.35	778.46	776.27	
12/31/98	202	796.94	20.10	2.90	24.10	6.10	773.3	781.82	779.45	778.56	776.27	
2/10/99	700	797.02	18.65	2.10	24.10	6.10	773.62	783.27	780.25	778.56	776.27	
3/1/99	437	796.94	20.10	1.90	24.20	6.10	773.4	781.82	780.45	778.46	776.27	
5/14/99	284	796.99	20.20	2.40	24.10	6.20	773.55	781.72	779.95	778.56	776.17	
6/1/99	314	797	20.10	2.50	24.00	6.10	773.72	781.82	779.85	778.66	776.27	
6/30/99	330	796.99	20.00	2.60	23.90	6.10	773.65	781.92	779.75	778.76	776.27	
8/2/99	142	796.99	20.20	3.00	24.00	6.10	773.61	781.72	779.35	778.66	776.27	
8/27/99	195	797.06	20.10	2.80	23.90	5.90	773.87	781.82	779.55	778.76	776.47	
11/3/99	140	797	20.10	3.10	24.00	6.00	773.72	781.82	779.25	778.66	776.37	
11/30/99	217	796.95	20.30	3.10	24.20	6.20	773.63	781.62	779.25	778.46	776.17	

BARTON DAM PIEZOMETRIC READINGS

							Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
12/29/99	289	796.98	20.00	2.90	24.20	6.10	773.78	781.92	779.45	778.46	776.27	
2/1/00	284	796.98	20.10	2.90	24.20	6.10	773.78	781.82	779.45	778.46	776.27	
3/6/00	375	796.97	20.10	2.50	24.20	6.00	773.77	781.82	779.85	778.46	776.37	
3/31/00	160	797.01	20.10	2.45	24.10	6.00	773.72	781.82	779.9	778.56	776.37	
4/28/00	523	797.04	19.90	2.30	24.00	5.95	773.89	782.02	780.05	778.66	776.42	
5/30/00	623	797.04	20.00	2.40	23.40	6.00	773.97	781.92	779.95	779.26	776.37	
7/31/00	590	797.05	20.00	2.50	23.90	6.00	773.94	781.92	779.85	778.76	776.37	
9/9/00	222	797	20.10	2.80	23.90	6.00	773.65	781.82	779.55	778.76	776.37	
10/6/00	548	797.08	20.00	2.15	23.90	5.90	773.92	781.92	780.2	778.76	776.47	
10/31/00	375	796.96	20.00	2.55	23.90	6.00	773.77	781.92	779.8	778.76	776.37	
11/30/00	381	796.93	20.10	2.55	24.15	6.00	773.77	781.82	779.8	778.51	776.37	
1/4/01	432	796.98	19.95	2.50	24.25	6.10	773.79	781.97	779.85	778.41	776.27	
2/1/01	498	796.97	19.95	2.20	24.20	6.00	773.8	781.97	780.15	778.46	776.37	
3/1/01	1388	797.11	19.70	1.80	23.50	5.85	774.81	782.22	780.55	779.16	776.52	
5/9/01	365	797.01	20.00	2.45	24.00	6.00	773.78	781.92	779.9	778.66	776.37	
7/26/01	100	797.04	20.20	3.00	24.00	6.00	773.67	781.72	779.35	778.66	776.37	
9/8/01	100	797.04	20.15	3.30	23.90	5.95	773.65	781.77	779.05	778.76	776.42	
10/3/01	237	796.91	20.04	3.00	23.77	5.79	773.66	781.88	779.35	778.89	776.58	
Elevations of top of caps								**803.72**	**782.35**	**804.45**	**782.37**	Upper Left and Upper Right raised by 21.5"
11/2/01	812	797.09	21.80	2.20	25.20	5.95	774.08	781.92	780.15	779.25	776.42	
1/25/02	625	797.08	21.70	1.80	25.30	5.90	773.9	782.02	780.55	779.15	776.47	
5/1/02	477	796.82	21.80	2.30	25.10	5.90	773.65	781.92	780.05	779.35	776.47	
7/5/02	117	797.05	22.10	3.20	25.20	5.95	773.69	781.62	779.15	779.25	776.42	
8/14/02	100	797.11	22.00	3.30	25.70	6.00	773.69	781.72	779.05	778.75	776.37	
9/13/02	100	797.13	22.00	3.30	25.70	6.00	773.68	781.72	779.05	778.75	776.37	
10/3/02	117	796.94	22.10	3.30	2.80	6.00	773.68	781.62	779.05	801.65	776.37	
11/1/02	220	796.88	22.10	3.00	25.90	6.00	773.65	781.62	779.35	778.55	776.37	
1/9/03	273	796.9	21.90	2.80	26.00	6.10	773.67	781.82	779.55	778.45	776.27	
3/25/03	628	797.09	21.85	2.08	25.93	5.95	773.79	781.87	780.27	778.52	776.42	
4/4/03	314	797.07	21.80	2.30	25.80	5.90	773.58	781.92	780.05	778.65	776.47	
5/1/03	314	797.02	21.81	2.45	25.60	5.85	773.56	781.91	779.9	778.85	776.52	
4/2/04	445	797.05	21.60	2.05	25.65	5.90	774.95	782.12	780.3	778.8	776.47	
4/30/04	180	797.07	21.90	2.50	25.70	5.90	772.68	781.82	779.85	778.75	776.47	
5/24/04	1770	797.1	21.60	1.50	25.40	5.60	775.69	782.12	780.85	779.05	776.77	
6/1/04	1300	797.09	21.60	1.90	25.48	5.70	774.41	782.12	780.45	778.97	776.67	
7/2/04	1145	796.98	21.75	2.50	25.50	5.75	774.44	781.97	779.85	778.95	776.62	
7/29/04	437	796.93	22.10	2.70	25.70	6.00	773.67	781.62	779.65	778.75	776.37	
8/24/04	238	797.01	22.20	3.10	25.80	6.10	773.5	781.52	779.25	778.65	776.27	
9/17/04	190	797.1	22.05	3.30	25.56	5.86	774	781.67	779.05	778.89	776.51	
11/5/04	425	797	22.00	2.25	26.00	6.08	773.64	781.72	780.1	778.45	776.29	
12/10/04	815	797.06	21.80	2.45	25.90	6.00	773.96	781.92	779.9	778.55	776.37	
1/5/05	985	797	21.90	2.15	26.10	6.00	774.22	781.82	780.2	778.35	776.37	
3/8/05	1155	797.05	21.80	1.75	25.35	6.00	774.28	781.92	780.6	779.1	776.37	
4/11/05	695	797.04	21.89	2.25	25.90	5.86	774.2	781.83	780.1	778.55	776.51	
5/6/05	440	797.04	22.03	2.60	25.90	6.00	775.89	781.69	779.75	778.55	776.37	

BARTON DAM PIEZOMETRIC READINGS

							Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
6/6/05	240	797.05	21.90	2.90	25.70	6.00	776.08	781.82	779.45	778.75	776.37	
7/6/05	275	797.09	22.08	2.98	25.55	5.71	776.88	781.64	779.37	778.9	776.66	
8/8/05	170	797.1	22.08	3.17	25.34	5.75	773.15	781.64	779.18	779.11	776.62	
9/7/05	250	797.09	22.12	3.42	25.34	5.67	773.14	781.6	778.93	779.11	776.7	
10/6/2005	250	797.08	22.08	3.25	25.42	5.67	773.23	781.64	779.1	779.03	776.7	
11/7/2005	425	797.06	22.34	2.95	25.42	5.75	773.31	781.38	779.4	779.03	776.62	
12/5/2005	400	797.02	22.17	2.00	25.34	5.97	773.36	781.55	780.35	779.11	776.4	
1/6/2006	675	797.03	21.95	2.15	26.65	5.95	773.55	781.77	780.2	777.8	776.42	
2/8/2006	335	797.03	21.50	1.67	24.50	6.75	773.73	782.22	780.68	**779.95**	775.62	
3/9/2006	508	797.05	21.55	1.70	26.00	5.75	773.41	782.17	780.65	778.45	776.62	
4/7/2006	973	797.08	21.75	1.70	25.80	5.85	773.76	781.97	780.65	778.65	776.52	
5/5/2006	437	796.94	22.00	2.00	26.05	5.90	773.34	781.72	780.35	778.4	776.47	
5/16/2006	495	797.04	21.76	1.33	25.90	5.63	774.59	781.96	**781.02**	778.55	776.74	rain
6/6/2006	467	796.99	21.75	2.25	25.75	5.80	773.32	781.97	780.1	778.7	776.57	
7/6/2006	299	796.99	22.30	2.83	26.00	5.95	773.16	781.42	779.52	778.45	776.42	
8/3/2006	151	797.05	22.20	2.90	25.85	5.60	773.28	781.52	779.45	778.6	776.77	
9/28/2006		797.05	22.30	3.27	25.70	5.75	773.31	781.42	779.08	778.75	776.62	
10/9/2006	299	797	21.95	2.95	25.70	5.80	773.32	781.77	779.4	778.75	776.57	
11/6/2006	477	797.05	21.75	2.42	25.58	5.67	773.47	781.97	779.93	778.87	776.7	
12/5/2006	1388	797.05	21.60	1.68	24.58	5.58	774.2	782.12	780.67	**779.87**	776.79	
1/4/2007	953	797.05	21.67	1.75	25.67	5.67	773.8	782.05	780.6	778.78	776.7	
2/5/2007	386	796.93	22.17	2.34	24.68	5.90	773.51	781.55	780.01	**779.77**	776.47	
3/6/2007	523	797.03	22.50	2.40	25.30	5.90	773.67	781.22	779.95	779.15	776.47	
4/6/2007	508	796.96	21.75	2.20	25.42	5.40	773.43	781.97	780.15	779.03	776.97	
5/4/2007	878	797.05	22.02	2.28	25.80	5.70	773.71	781.7	780.07	778.65	776.67	
5/22/2007	314	796.84	22.10	3.10	25.80	5.80	773.29	781.62	779.25	778.65	776.57	
6/15/2007		796.85	22.00	3.30	25.50	5.80	775.96	781.72	779.05	778.95	776.57	
7/11/2007	151	796.9	22.26	3.84	25.72	5.83	776.41	781.46	778.51	778.73	776.54	
8/7/2007	116	797.08	23.40	3.55	25.30	5.65	775.5	780.32	778.8	779.15	776.72	
9/4/2007	304	797.08	22.20	3.25	25.50	5.60	775.44	781.52	779.1	778.95	776.77	
10/5/2007	233	796.87	22.30	3.50	25.55	5.80	776.06	781.42	778.85	778.9	776.57	
10/31/2007	228	796.91	22.05	3.19	25.50	5.58	776.09	781.67	779.16	778.95	776.79	
12/4/2007	488	797.02	21.95	2.30	25.70	6.70	776.78	781.77	780.05	778.75	775.67	
2/4/2008		797.05	21.95	2.10	24.40	5.85	774.04	781.77	780.25	**780.05**	776.52	
3/4/2008	1223	797.05	21.90	1.55	24.80	5.65	775.01	781.82	780.8	**779.65**	776.72	
3/27/2008	700	797.08	21.80	2.20	25.60	5.40	775.92	781.92	780.15	778.85	776.97	
5/5/2008	360	796.82	22.00	2.40	25.40	5.48	773.44	781.72	779.95	779.05	776.89	
6/4/2008	355	796.94	22.00	2.90	25.00	5.40	773.25	781.72	779.45	779.45	776.97	
7/7/2008	508	796.91	22.05	3.04	25.30	5.77	774.45	781.67	779.31	779.15	776.6	
8/5/2008	192	796.93	22.30	3.95	25.25	8.85	773.18	781.42	778.4	779.2	773.52	
9/2/2008	113	796.88	22.45	4.30	25.45	5.80	773.17	781.27	778.05	779	776.57	
10/6/2008	355	796.88	22.35	3.42	25.50	5.85	773.9	781.37	778.93	778.95	776.52	
11/4/2008	314	796.99	22.25	3.25	25.30	5.80	773.46	781.47	779.1	779.15	776.57	
12/3/2008	493	796.88	22.10	2.55	25.40	5.85	773.54	781.62	779.8	779.05	776.52	
1/5/2009	1368	797.08	21.85	2.10	25.90	5.40	775.78	781.87	780.25	778.55	776.97	

BARTON DAM PIEZOMETRIC READINGS

							Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
2/4/2009	375	796.86	22.15	2.25	25.30	5.90		781.57	780.1	779.15	776.47	
3/5/2009	915	797.05	21.65	1.85	25.05	5.80	775.62	782.07	780.5	779.4	776.57	
4/7/2009	958	797.04	22.05	1.96	25.62	5.77	775.55	781.67	780.39	778.83	776.6	
5/8/2009	1350	797.03	21.90	1.90	25.10	5.40	773.67	781.82	780.45	779.35	776.97	
6/4/2009	576	797.09	22.15	2.46	25.15	5.38	773.64	781.57	779.89	779.3	776.99	
7/7/2009	457	796.94	21.95	2.55	25.30	5.80	773.45	781.77	779.8	779.15	776.57	
8/4/2009	212	796.97	22.15	3.10	25.47	5.85	773.38	781.57	779.25	778.98	776.52	
9/2/2009	330	796.95	22.20	3.15	25.32	5.70	773.35	781.52	779.2	779.13	776.67	
10/5/2009	294	796.98	22.30	3.15	25.40	5.70	773.34	781.42	779.2	779.05	776.67	
11/4/2009	457	796.97	22.22	2.69	25.54	5.68	773.41	781.5	779.66	778.91	776.69	
12/4/2009	472	796.98	22.20	2.50	25.80	5.70	773.37	781.52	779.85	778.65	776.67	
1/4/2010	457	796.83	22.05	2.30	25.50	5.80	773.3	781.67	780.05	778.95	776.57	
1/27/2010	452	797	22.27	2.15	25.78	5.76	773.37	781.45	780.2	778.67	776.61	
3/5/2010	426	796.96	22.04	2.07	25.59	5.73	773.35	781.68	780.28	778.86	776.64	
4/6/2010	457	796.9	21.99	2.39	25.52	5.75	773.4	781.73	779.96	778.93	776.62	
5/4/2010	765	797	21.85	2.15	25.20	5.65	773.6	781.87	780.2	779.25	776.72	
6/4/2010	678	797.02	21.90	2.45	25.20	5.70	773.61	781.82	779.9	779.25	776.67	
7/6/2010	324	796.89	22.18	2.82	25.39	5.79	773.35	781.54	779.53	779.06	776.58	
8/10/2010	380	797.02	21.75	2.58	25.13	5.50	773.35	781.97	779.77	779.325	776.87	
9/4/2010	177	797.01	22.10	3.00	25.30	5.70	773.34	781.62	779.35	779.15	776.67	
10/4/2010	182	797.01	22.40	3.30	25.40	5.60	773.31	781.32	779.05	779.05	776.77	
11/4/2010	225	797.05	22.25	3.15	25.50	5.65	773.3	781.47	779.2	778.95	776.72	
12/1/2010	675	797.01	22.11	2.48	25.57	5.67	773.45	781.61	779.87	778.88	776.7	
1/3/2011	279	796.98	22.10	2.40	25.60	5.70	773.35	781.62	779.95	778.85	776.67	
2/3/2011	263	796.99	22.45	2.90	25.50	5.80	773.35	781.27	779.45	778.95	776.57	
3/4/2011	523	797.01	21.95	2.00	24.85	7.00	773.51	781.77	780.35	**779.6**	775.37	*Rainfall was 0.08 "
4/4/2011	658	797.03	21.75	2.06	25.28	7.56	773.69	781.97	780.29	779.17	774.81	
4/29/2011	2377	797	21.15	1.23	24.80	5.22	775.38	782.57	**781.12**	**779.65**	777.15	*Rainfall between 4/27/11 to 4/29/11 was 1.91"
5/4/2011	1653	797	21.97	1.69	25.16	5.54	774.74	781.75	780.66	779.29	776.83	
5/26/2011	2510	797	21.70	1.25	24.80	5.20	775.54	782.02	**781.1**	**779.65**	777.17	*Rainfall between 5/25/11 to 5/26/11 was 3.14"
5/27/2011	3006	796.99	21.65	1.20	24.55	5.05	775.9	782.07	**781.15**	**779.9**	777.32	*Additional rainfall for 5/27/11 was 0.03"
5/31/2011	2677	797	21.56	1.44	24.58	5.17	775.45	782.16	780.9125	**779.87**	777.203	*Additional rainfall between 5/28/11 to 5/31/11 was 0.46"
6/3/2011	1387	796.99	21.90	1.90	25.00	5.45	774.52	781.82	780.45	779.45	776.92	
7/5/2011	350	796.96	22.29	2.99	25.25	5.80	773.31	781.43	779.36	779.2	776.57	Hydro on 304 cfs
8/4/2011	793	797	22.20	2.75	25.30	5.70	773.66	781.52	779.6	779.15	776.67	Hydro flow = 508 cfs, gate flowing = 285 cfs
9/6/2011	375	797	22.35	2.89	25.45	5.73	773.32	781.37	779.46	779	776.64	
10/4/2011	483	797.04	22.15	2.65	25.43	5.59	773.43	781.57	779.7	779.02	776.78	
11/4/2011	447	797.04	22.30	2.60	25.40	5.65	773.48	781.42	779.75	779.05	776.72	
12/5/2011	1628	797.03	21.85	1.75	25.30	5.50	774.63	781.87	780.6	779.15	776.87	
1/3/2012	988	797.04	22.15	2.30	25.65	6.50	773.87	781.57	780.05	778.8	775.87	
2/6/2012	992	797.03	22.01	2.16	25.64	5.75	773.76	781.71	780.19	778.81	776.62	
3/1/2012	1428	797.04	21.90	1.98	25.69	5.68	773.97	781.82	780.37	778.76	776.69	
4/4/2012	686	797.03	22.15	2.20	25.65	5.75	773.54	781.57	780.15	778.8	776.62	
5/3/2012	522	797.01	22.03	2.42	25.61	5.73	773.44	781.69	779.93	778.84	776.64	
6/5/2012	176	797	22.40	3.00	25.90	5.95	773.25	781.32	779.35	778.55	776.42	

BARTON DAM PIEZOMETRIC READINGS

							Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
7/31/2012	Yes - 0	796.98	22.70	4.62	25.81	5.66	773.06	781.02	777.73	778.64	776.71	
8/30/2012	128	797	22.80	4.35	26.00	5.80	773.01	780.92	778	778.45	776.57	Flow Stream was clear
9/27/2012	98	796.98	22.78	3.92	25.90	5.69	773.06	780.94	778.43	778.55	776.68	Flow Stream was clear
10/9/2012	107.5	796.97	22.75	4.95	26.00	5.75	773.22	780.97	777.4	778.45	776.62	Flow Stream was clear
11/5/2012	215.3	796.95	22.75	3.50	26.10	5.80	773.21	780.97	778.85	778.35	776.57	Flow Stream was clear
12/6/2012	228.5	796.99	22.75	3.60	26.10	5.90	773.22	780.97	778.75	778.35	776.47	Flow Stream was clear
1/4/2013	301	796.98	22.50	3.50	25.80	6.40	773.31	781.22	778.85	778.65	775.97	Flow Stream was clear
2/4/2013	925.3	796.98	22.35	3.40	26.15	5.90	773.62	781.37	778.95	778.3	776.47	Flow Stream was clear
3/4/2013	669.4	796.98	22.52	2.50	26.15	5.84	773.42	781.2	779.85	778.3	776.53	Flow Stream was clear
4/4/2013	435	796.98	22.65	2.75	26.15	5.85	773.36	781.07	779.6	778.3	776.52	Flow Stream was clear
5/8/2013	852	797.08	22.30	2.40	25.70	5.90	773.55	781.42	779.95	778.75	776.47	Flow Stream was clear. Cleaned debris out of runoff pond.
6/5/2013	373	797.05	22.60	3.58	25.92	5.95	773.34	781.12	778.77	778.53	776.42	Flow Stream was clear.
7/8/2013	531	797.11	22.38	3.28	25.38	5.89	773.47	781.34	779.07	779.07	776.48	Flow Stream was clear.
8/7/2013	291	796.96	22.50	3.82	25.69	5.75	773.35	781.22	778.53	778.76	776.62	Flow Stream was standing clear.
9/5/2013	195	797	22.75	4.05	25.85	5.80	773.29	780.97	778.3	778.6	776.57	Flow Stream was clear.
10/9/2013	281	796.95	22.70	3.70	25.90	5.60	773.43	781.02	778.65	778.55	776.77	Flow Stream was clear. Camera did not work - manhole clear. Took
11/7/2013	485	797	22.48	3.20	25.80	5.61	773.55	781.24	779.15	778.65	776.76	Flow Stream was clear.
12/5/2013	332	796.92	22.50	3.20	25.70	5.70	773.4	781.22	779.15	778.75	776.67	Flow Stream was clear. Pipe slight trickle clear - little rusty mirk in bottom
2/4/2014	211	797	23.64	2.86	25.70	5.85	773.39	780.08	779.49	778.75	776.52	Flow Stream was clear.
3/7/2014	437	796.93	23.65	3.85	24.40	5.85	773.44	780.07	778.5	780.05	776.52	Flow Stream was clear.
4/10/2014	1404	797.04	22.35	1.90	25.94	5.70	774.17	781.37	780.45	778.51	776.67	Flow Stream was clear with very little flow.
5/8/2014	814	797.04	22.40	2.10	25.75	5.70	773.57	781.32	780.25	778.7	776.67	Flow Stream was cloudy.
6/5/2014	628	797.03	22.48	2.65	25.60	5.60	773.56	781.24	779.7	778.85	776.77	Flow Stream was clear.
7/10/2014	542	797.03	22.60	3.36	25.64	5.65	773.35	781.12	778.99	778.81	776.72	Flow Stream was cloudy.
8/8/2014	266	797.04	22.50	4.10	25.50	5.70	773.31	781.22	778.25	778.95	776.67	Flow Stream was clear.
9/8/2014	340	797.05	22.50	4.10	25.70	5.80	773.3	781.22	778.25	778.75	776.57	Flow Stream was clear.
10/6/2014	311	797	22.55	3.70	25.70	5.67	773.51	781.17	778.65	778.75	776.7	Flow Stream was clear.
11/7/2014	361	797	22.55	2.30	25.90	5.75	773.4	781.17	780.05	778.55	776.62	Flow Stream was clear.
12/5/2014	531	796.93	22.65	3.00	25.95	5.80	773.4	781.07	779.35	778.5	776.57	Flow Stream was clear.
1/12/2015	435	796.92	23.50	2.70	25.70	5.80	773.48	780.22	779.65	778.75	776.57	Flow Stream was clear.
2/4/2015	311	796.97	22.61	2.87	24.38	6.79	773.52	781.11	779.48	780.07	775.58	Flow Stream was clear.
3/12/2015	522	796.94	22.50	2.20	25.30	5.60	773.4	781.22	780.15	779.15	776.77	Flow Stream was clear.
4/7/2015	512	797	22.55	2.40	26.05	5.72	773.36	781.17	779.95	778.4	776.65	Flow Stream was clear.
5/1/2015	332	797.04	22.55	2.46	25.88	5.76	773.35	781.17	779.89	778.57	776.61	Flow Stream was clear.
6/1/2015	1567	797.04	22.35	1.73	25.75	5.50	774.29	781.37	780.62	778.7	776.87	Rain fall 3.23 inches from 05/30/15-05/31/15. Flow Stream was clear.
7/8/2015	608	797.05	22.40	2.91	25.74	5.78	773.47	781.32	779.44	778.71	776.59	Flow Stream was clear.
8/6/2015	261	796.98	22.58	3.50	26.00	5.81	773.34	781.14	778.85	778.45	776.56	Flow Stream was clear.
9/4/2015	340	796.97	22.55	3.70	25.80	5.70	773.39	781.17	778.65	778.65	776.67	Flow Stream was clear with slight trickle.
10/9/2015	250	796.91	22.60	3.90	25.90	5.70	773.32	781.12	778.45	778.55	776.67	Flow Stream was clear.
11/4/2015	380	796.95	22.70	3.30	25.90	5.56	773.4	781.02	779.05	778.55	776.81	Flow Stream was clear but minimul flow.
12/7/2015	435	796.94	22.43	3.10	25.91	5.80	773.43	781.29	779.25	778.54	776.57	Flow Stream was clear.
1/7/2016	451	796.92	22.37	2.68	25.75	5.78	773.42	781.35	779.67	778.7	776.59	Flow Stream was clear.
2/4/2016	421	796.95	22.48	2.45	25.81	5.74	773.46	781.24	779.9	778.64	776.63	Flow Stream was clear.
3/9/2016	1024	797.04	22.48	2.00	25.90	5.60	773.76	781.24	780.35	778.55	776.77	Flow Stream was clear.
4/8/2016	964	797.03	22.20	2.08	25.50	5.71	773.69	781.52	780.27	778.95	776.66	Flow Stream was rusty.

BARTON DAM PIEZOMETRIC READINGS

							Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
5/6/2016	603	797.03	22.45	2.48	25.70	6.75	773.39	781.27	779.875	778.75	775.62	Flow Stream was clear.
6/6/2016	344	796.99	22.33	2.90	25.68	5.75	773.23	781.39	779.45	778.77	776.62	Flow Stream was clear.
7/8/2016	166	797	22.54	3.65	25.76	5.65	773.24	781.18	778.7	778.69	776.72	Flow Stream was clear.
8/5/2016	148	796.99	22.50	4.20	25.70	5.60	773.16	781.22	778.15	778.75	776.77	Flow Stream was clear.
9/6/2016	154	797.1	22.52	3.90	25.28	5.75	773.29	781.2	778.45	779.17	776.62	Flow Stream was clear.
10/6/2016	522	797.06	22.40	3.30	25.60	5.60	773.34	781.32	779.05	778.85	776.77	Flow Stream was clear.
11/4/2016	435	797.01	22.48	2.60	25.92	5.65	773.31	781.24	779.75	778.53	776.72	Flow Stream was clear.
12/9/2016	542	796.99	22.40	2.71	25.76	5.65	773	781.32	779.64	778.69	776.72	Flow Stream was clear.
1/6/2017	657	797.03	22.33	2.30	25.77	5.70	773.34	781.39	780.05	778.68	776.67	Flow Stream was clear.
2/10/2017	1149	797.03	22.30	2.00	25.52	5.60	773.84	781.42	780.35	778.93	776.77	Flow Stream was clear.
3/7/2017	1069	797.01	22.00	2.05	25.40	5.70	773.81	781.72	780.3	779.05	776.67	Rusty, calm, no flow.
4/7/2017	2182	797.05	22.10	1.43	25.42	5.18	775.31	781.62	780.92	779.03	777.19	Discovered 3"-4" hole next to upstream airshaft. DW/Aaron Buza
4/28/2017	1342	796.84			25.55	5.65	773.96			778.90	776.72	After DCP tests performed
5/4/2017	1204	797.05	22.30	2.40	25.60	5.65	773.93	781.42	779.95	778.85	776.72	
6/6/2017	550	796.94	22.30	3.03	25.64	5.72	773.93	781.42	779.32	778.81	776.65	Clear
6/8/2017	367				25.70	5.80	773.93			778.75	776.57	Weekly Reading
6/23/2017	191				25.75	5.78	773.93			778.7	776.59	Weekly Reading
7/10/2017	413	797	22.40	3.40	25.70	5.70	773.21	781.32	778.95	778.75	776.67	Flow clear and slow.
7/24/2017	256				25.65	5.75				778.8	776.62	Weekly Reading
7/31/2017	200				25.90	5.80				778.55	776.57	Weekly Reading
8/3/2017	146				25.90	5.80				778.55	776.57	Weekly Reading
8/7/2017	146	797	22.90	4.14	25.70	5.76	773.2	780.82	778.21	778.75	776.61	Clear water
8/7/2017	146				25.70	5.76				778.75	776.61	Weekly Reading
8/14/2017	146				25.71	5.79	773.21			778.74	776.58	Weekly Reading
8/17/2017	208				25.72	5.80				778.73	776.57	Weekly Reading
8/21/2017	145				27.54	5.76				776.91	776.61	Weekly Reading
8/24/2017	145				25.74	5.79				778.71	776.58	Weekly Reading
8/31/2017	163				25.90	5.70				778.55	776.67	Weekly Reading
9/8/2017	132	797.03	22.50	3.40	25.75	5.70	773.21	781.22	778.95	778.7	776.67	Monthly.
9/14/2017	132				25.75	5.75				778.7	776.62	Weekly Reading
9/21/2017	132				25.70	5.70				778.75	776.67	Weekly Reading
10/9/2017	145	797.03	22.54	3.38	25.75	5.58	773.21	781.18	778.975	778.7	776.79	Monthly
10/23/2017	491											Weekly Reading
12/8/2017	449	796.99	22.30	2.60	25.70	5.70	773.33	781.42	779.75	778.75	776.67	Monthly
1/18/2018	684	797.05	22.20	2.17	27.75	5.40	773.45	781.52	780.18	776.7	776.97	Monthly
2/8/2018	401	797	22.30	2.40	25.70	5.80	773.29	781.42	779.95	778.75	776.57	Monthly
2/21/2018	2367	797.12	21.90	1.00	25.70	5.10	775.19	781.82	781.35	778.75	777.27	Checked due to high flow
3/5/2018	1899	797.02	22.09	1.46	25.45	5.43	774.63	781.63	780.89	779	776.94	Monthly
4/5/2018	1049	797	22.41	1.95	25.70	5.75	773.67	781.31	780.4	778.75	776.62	Monthly - Cement around manhole is degrading
5/10/2018	1212	796.94	22.20	2.15	25.70	5.70	773.96	781.52	780.2	778.75	776.67	Slight flow - cloudy 66 degrees. Monthly
6/5/2018	774	797.15	22.32	2.73	25.60	5.76	773.51	781.4	779.62	778.85	776.61	Monthly
7/16/2018	184	797.01	22.60	3.70	25.70	5.70		781.12	778.65	778.75	776.67	Monthly - wet, muddy, cleared
8/14/2018	208	797	22.70	3.85	25.80	5.80	773.24	781.02	778.5	778.65	776.57	Monthly - Clear
10/5/2018		797.09	22.61	3.24	25.75	5.65	773.26	781.11	779.11	778.7	776.72	Dam only - Hydro is down. Clear water slight dripping out of pipe.
10/26/2018	367	797.05	22.50	3.17	26.10	5.63	773.28	781.22	779.18	778.35	776.745	Monthly.

BARTON DAM PIEZOMETRIC READINGS

							Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
11/8/2018	634	797.04	22.44	2.56	25.73	5.63		781.28	779.79	778.72	776.74	Very slow flow through manhole (trickle) *People working on building
11/18/2018	546	797.06	22.34	2.69	25.78	5.76	773.37	781.38	779.66	778.67	776.61	Flow stream was clear.
12/17/2018	504	797.05	22.34	2.62	25.75	5.75	773.36	781.38	779.73	778.7	776.62	Monthly
12/27/2018	583	797.05	22.42	2.55	25.87	5.78	773.4	781.3	779.8	778.58	776.59	Flow stream was clear.
1/18/2019	563	797.06	22.39	2.65	25.09	5.82		781.33	779.7	779.36	776.55	Monthly - water but no flow.
2/4/2019	913	797.06	22.30	2.13	25.08	5.79	773.41	781.42	780.22	779.37	776.58	Monthly - clear/flowing
2/28/2019	692	797.03	22.30	2.41	24.87	5.79	773.42	781.42	779.94	779.58	776.58	Weekly Reading
3/11/2019	769	797.03	22.40	2.20	25.00	5.80		781.32	780.15	779.45	776.57	Weekly Reading
3/19/2019	1263	797.02	22.32	2.21	25.32	5.69	773.94	781.4	780.14	779.13	776.68	Weekly Reading
4/11/2019	774	796.95	22.40	2.40	25.80	5.80		781.32	779.95	778.65	776.57	Monthly
4/18/2019	769	796.96	22.45	2.60	25.90	5.74	773.47	781.27	779.75	778.55	776.63	Weekly Reading
5/6/2019	1442	796.96	22.46	2.10	25.59	5.57	774	781.26	780.25	778.86	776.8	Monthly
5/17/2019	993	797	22.53	2.58	25.75	5.73	773.67	781.19	779.77	778.7	776.64	Monthly
6/6/2019	1112	796.92	22.62	2.86	25.79	5.67	773.78	781.1	779.49	778.66	776.7	Monthly - #3 is <0.70' so it doesn't read on our tape.
7/12/2019	410	796.92	22.80	3.50	26.10	5.85	773.34	780.92	778.85	778.35	776.52	Monthly - Clear
8/8/2019	234	796.95	22.70	3.60	25.80	5.80	773.16	781.02	778.75	778.65	776.57	Monthly
9/5/2019	340	797.06	22.67	3.75	25.87	5.75		781.05	778.6	778.58	776.62	Monthly
10/4/2019	732	797.03	22.47	2.57	25.80	5.54	773.29	781.25	779.78	778.65	776.83	Monthly - Hydro Down.
10/10/2019	634	797.01	22.52	3.14	25.76	5.62	773.29	781.20	779.21	778.69	776.75	Monthly
12/12/2019	707	796.98	22.55	2.73	25.77	5.72	773.63	781.17	779.62	778.68	776.65	Monthly
1/7/2020	1022	797.05	22.36	2.47	25.71	5.69	773.33	781.36	779.88	778.74	776.68	Monthly
1/23/2020	1498	797.03	22.36	2.25	24.72	5.57	774.22	781.36	780.10	779.73	776.80	Weekly Reading
1/30/2020	1453	797.00	22.20	2.00	25.50	5.60	774.23	781.52	780.35	778.95	776.77	Weekly Reading
2/6/2020	1358	797.02	22.19	2.35	25.46	5.70	774.08	781.53	780.00	778.99	776.67	Monthly
2/13/2020	1067	797.00	22.37	2.53	25.53	5.74	773.62	781.35	779.82	778.92	776.63	Weekly Reading
2/27/2020	831	797.02	22.45	2.75	25.74	5.75	773.62	781.27	779.60	778.71	776.62	Weekly Reading
3/19/2020	937	797.00	22.45	2.66	25.80	5.75	773.62	781.27	779.69	778.65	776.62	Monthly
3/26/2020	761	797.00	22.35	2.53	25.69	5.73	773.62	781.37	779.82	778.76	776.64	Weekly Reading
4/6/2020	1373	797.00	22.32	2.19	25.45	5.65	774.02	781.40	780.16	779.00	776.72	Monthly
4/16/2020	945	797.00	22.44	2.41	25.61	5.73	773.64	781.28	779.94	778.84	776.64	Weekly Reading
4/23/2020	817	797.00	22.41	2.56	25.65	5.76	773.56	781.31	779.79	778.80	776.61	Weekly Reading
4/30/2020	658	797.00	22.38	2.65	25.65	5.77	773.45	781.34	779.70	778.80	776.60	Weekly Reading
5/13/2020	599.6	797.02	22.61	2.81	25.81	5.76	773.42	781.11	779.54	778.64	776.61	Weekly Reading
5/19/2020	2670	797.42	22.29	1.47	25.68	5.10	775.98	781.43	780.88	778.77	777.27	Weekly Reading - Lots of rain in the day(s) prior.
5/20/2020	2670	797.12	22.24	1.52	25.26	4.99	775.53	781.48	780.83	779.19	777.38	Daily Reading - Lots of rain in the day(s) prior. There is flow in manhole.
5/21/2020	2562	797.04	22.16	1.69	25.18	5.15	775.23	781.56	780.66	779.27	777.22	Daily Reading - Lots of rain in the day(s) prior. Less flow in manhole than
5/26/2020	1725	797.00	22.25	2.26	25.34	5.54	774.39	781.47	780.09	779.11	776.83	Weekly Reading
6/1/2020	897	797.00	22.45	2.75	25.55	5.72	773.59	781.27	779.60	778.90	776.65	Weekly Reading - Flow in Manhole - Very short trickle.
6/8/2020	558	797.00	22.53	3.03	25.63	5.79	773.37	781.19	779.32	778.82	776.58	Weekly Reading - Flow in Manhole - Trickle - clear
6/15/2020	456	796.96	22.65	3.33	25.69	5.77	773.30	781.07	779.02	778.76	776.60	Weekly Reading - No flow in manhole flow.
6/22/2020	324	796.96	22.60	3.48	25.67	5.84	773.23	781.12	778.87	778.78	776.53	Weekly Reading - Manhole has a dibble.
6/29/2020	936	796.97	22.54	2.95	25.70	5.71	773.58	781.18	779.40	778.75	776.66	Weekly Reading - Manhole has a dibble.
7/6/2020	274	797.00	22.59	3.58	25.66	5.82	773.19	781.13	778.77	778.79	776.55	Monthly Reading - Manhole has a dibble.
7/13/2020	449	797.01	22.52	3.35	25.63	5.75	773.37	781.20	779.00	778.82	776.62	Weekly Reading - Manhole has a dibble.
7/20/2020	543	797.00	22.49	3.25	25.59	5.69	773.37	781.23	779.10	778.86	776.68	Weekly Reading - Manhole has a dibble.

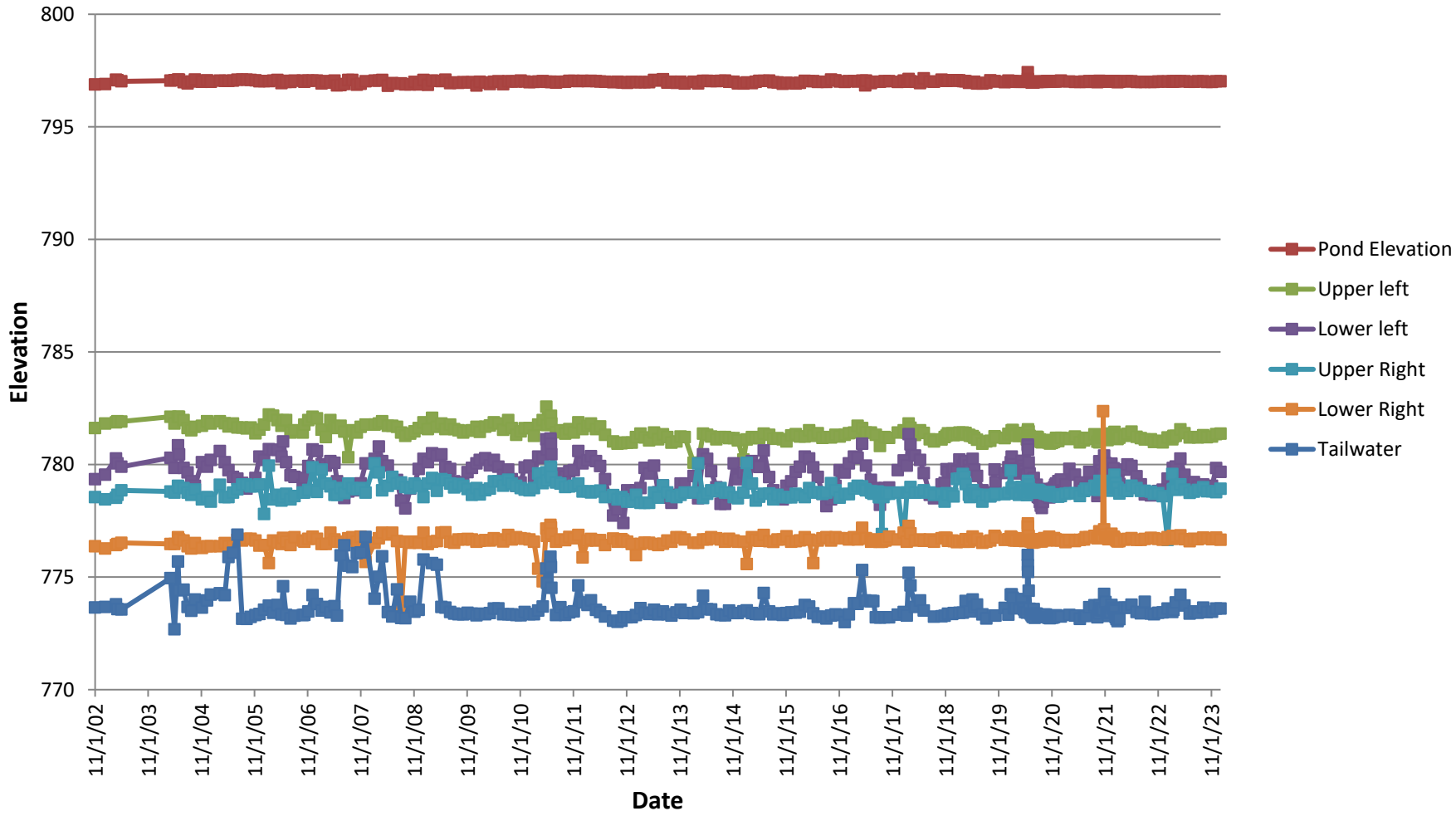
BARTON DAM PIEZOMETRIC READINGS

							Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
7/27/2020	345	796.99	22.51	3.79	25.58	5.78	773.30	781.21	778.56	778.87	776.59	Weekly Reading - Manhole has a dibble.
8/3/2020	345	797.00	22.67	3.82	25.61	5.73	773.29	781.05	778.53	778.84	776.64	Monthly Reading - Manhole has a dibble.
8/10/2020	285	797.00	22.61	4.02	25.64	5.77	773.24	781.11	778.33	778.81	776.60	Weekly Reading - Manhole has a dibble.
8/17/2020	384	797.00	22.72	4.18	25.67	5.78	773.28	781.00	778.17	778.78	776.59	Weekly Reading - Manhole has a dibble.
8/24/2020	230	797.00	22.74	4.28	25.70	5.79	773.26	780.98	778.07	778.75	776.58	Weekly Reading - Manhole has a dibble. Hydro is off.
8/31/2020	439	797.00	22.72	4.01	25.69	5.72	773.28	781.00	778.34	778.76	776.65	Weekly Reading - Manhole has a dibble. Hydro is off.
9/9/2020	453	797.00	22.68	3.62	25.73	5.64	773.33	781.04	778.73	778.72	776.73	Monthly Reading - Manhole has a dibble.
9/14/2020	488	797.00	22.63	3.44	25.72	5.72	773.33	781.09	778.91	778.73	776.65	Weekly Reading - Manhole has a dibble.
9/21/2020	358	797.00	22.71	3.63	25.75	5.74	773.33	781.01	778.72	778.70	776.63	Weekly Reading - Manhole has a dibble.
9/28/2020	285	797.03	22.66	3.73	25.69	5.73	773.22	781.06	778.62	778.76	776.64	Weekly Reading - Manhole has a dibble.
10/5/2020	303	797.02	22.74	3.73	25.78	5.72	773.20	780.98	778.62	778.67	776.65	Monthly Reading - Manhole has a trickle.
10/13/2020	339	797.02	22.73	3.81	25.68	5.58	773.18	780.99	778.54	778.77	776.79	Weekly Reading - Manhole has a trickle.
10/19/2020	316	797.02	22.79	3.80	25.82	5.72	773.17	780.93	778.55	778.63	776.65	Weekly Reading - Manhole has a trickle.
10/26/2020	610	797.02	22.71	3.50	25.81	5.67	773.26	781.01	778.85	778.64	776.70	Weekly Reading - Manhole has a trickle.
11/2/2020	350	797.03	22.76	3.44	25.82	5.71	773.20	780.96	778.91	778.63	776.66	Monthly Reading - Manhole has a trickle.
11/9/2020	388	797.02	22.71	3.45	25.83	5.72	773.20	781.01	778.90	778.62	776.65	Weekly Reading - Manhole has a trickle.
11/16/2020	428	797.02	22.72	3.36	25.78	5.64	773.22	781.00	778.99	778.67	776.73	Weekly Reading - Manhole has a trickle.
11/23/2020	450	797.02	22.68	3.25	25.86	5.71	773.26	781.04	779.10	778.59	776.66	Weekly Reading - Manhole has a trickle.
11/30/2020	645	797.02	22.54	3.19	25.81	5.70	773.30	781.18	779.16	778.64	776.67	Weekly Reading - Manhole has a trickle. Mark removed 4 sticks from
12/7/2020	576	797.02	22.61	3.32	25.81	5.75	773.26	781.11	779.03	778.64	776.62	Monthly Reading - Manhole has a trickle per Mark MacArthur.
12/15/2020	644	797.02	22.68	3.09	25.88	5.72	773.27	781.04	779.26	778.57	776.65	Weekly Reading - Manhole has a trickle.
1/1/2021	484	797.05	22.54	3.02	25.85	5.74	773.25	781.18	779.33	778.60	776.63	Monthly
2/2/2021			22.55	3.24	25.75	5.82		781.17	779.11	778.70	776.55	Monthly
3/1/2021	694	797.01	22.59	2.54	25.73	5.72	773.32	781.13	779.81	778.72	776.65	Monthly
4/8/2021	475	796.99	22.48	2.80	25.73	5.77	773.29	781.24	779.55	778.72	776.60	Monthly
5/12/2021	302	796.99	22.74	3.15	25.85	5.72	773.14	780.98	779.20	778.60	776.65	Monthly - Derek R.
6/10/2021	245	797.01	22.65	3.42	25.63	5.70	773.28	781.07	778.93	778.82	776.67	Monthly - Derek R.
6/21/2021	308	796.99	22.54	3.34	25.53	5.60	773.27	781.18	779.01	778.92	776.77	Completed by Derek R. due to heavy rain
7/16/2021	1045	797.03	22.58	2.68	25.57	5.60	773.66	781.14	779.67	778.88	776.77	Completed by Mark M. cleaned toe drain pond outlet
8/20/2021	885	797.02	22.38	3.17	25.40	5.54	773.75	781.34	779.18	779.05	776.83	Completed by David K.
9/9/2021	193	796.98	22.71	3.75	25.53	5.65	773.21	781.01	778.60	778.92	776.72	Completed by Mark M.
9/22/2021	410	797.01	22.74	3.60	25.58	5.56	773.39	780.98	778.75	778.87	776.81	Completed by Mark M.
9/23/2021	946	797.04	22.40	2.22	25.44	5.35	773.64	781.32	780.13	779.01	777.02	Completed by Mark M.
9/24/2021	1035	797.02	22.42	2.21	25.18	5.34	773.75	781.30	780.14	779.27	777.03	Completed by Mark M.
10/4/2021	745	797.02	22.44	2.90	25.33	5.48	773.53	781.28	779.45	779.12	776.89	Completed by Mark M.
10/6/2021	855	797.02	22.54	2.60	25.42	5.44	773.62	781.18	779.75	779.03	776.93	Completed by Mark M.
10/15/2021	832	797.03	22.49	2.82	25.51	5.57	773.55	781.23	779.53	778.94	776.80	Completed by Mark M.
10/19/2021	869	797.02	22.50	2.80	25.49		773.54	781.22	779.55	778.96	782.37	Completed by Neil W.
10/26/2021	1615	797.03	22.41	1.95	25.43	5.25	774.25	781.31	780.40	779.02	777.12	Completed by Neil W.
11/4/2021	1295	797.02	22.39	2.29	25.23	5.48	773.89	781.33	780.06	779.22	776.89	Completed by Mark M.
11/11/2021	727	797.03	22.43	2.68	25.39	5.60	773.43	781.29	779.67	779.06	776.77	Completed by Neil W.
11/19/2021	692	797.02	22.64	2.93	25.60	5.65	773.41	781.08	779.42	778.85	776.72	Completed by Neil W.
11/23/2021	610	797.03	22.55	2.96	25.60	5.69	773.27	781.17	779.39	778.85	776.68	Completed by Neil W.
12/1/2021	772	797.03	22.50	2.75	25.61	5.62	773.41	781.22	779.60	778.84	776.75	Completed by Neil W.
12/8/2021	857	797.03	22.41	2.59	25.47	5.59	773.45	781.31	779.76	778.98	776.78	Completed by Neil W.

BARTON DAM PIEZOMETRIC READINGS

							Action Level	783	781	779.5	777.5	
Date	**Flow (cfs)**	**Pond Elev**	**Upper Left (ft)**	**Lower Left (ft)**	**Upper Right**	**Lower Right**	**Tailwater Elev**	**Upper Left Elev**	**Lower Left Elev**	**Upper Right Elev**	**Lower Right Elev**	**Notes**
12/15/2021	1167	797.02	22.35	2.31	25.18	5.45	773.76	781.37	780.04	779.27	776.92	Completed by Neil W.
12/22/2021	1025	797.03	22.35	2.63	25.31	5.60	773.64	781.37	779.72	779.14	776.77	Completed by Ryan Eisley
12/30/2021	1053	797.02	22.43	2.52	25.38	5.58	773.60	781.29	779.83	779.07	776.79	Completed by Neil W.
1/5/2022	974	797.01	22.27	2.76	24.91	5.63	773.51	781.45	779.59	779.54	776.74	Completed by Ryan Eisley
1/12/2022	631	797.02	22.40	2.92	25.28	5.70	773.22	781.32	779.43	779.17	776.67	Completed by Ryan Eisley
1/19/2022	521	797.00	22.45	3.07	25.46	5.75	773.13	781.27	779.28	778.99	776.62	Completed by Ryan Eisley
1/26/2022	324	796.98	22.59	3.21	25.49	5.79	773.04	781.13	779.14	778.96	776.58	Completed by Mark M.
2/8/2022	395	797.00	22.53	3.21	25.74	5.78	773.13	781.19	779.14	778.71	776.59	Completed by Mark M.
3/14/2022	1087	797.02	22.45	2.58	25.58	5.71	773.65	781.27	779.77	778.87	776.66	Completed by Mark M.
4/4/2022	1086	797.02	22.36	2.35	25.63	5.68	773.63	781.36	780.00	778.82	776.69	Completed by Mark M.
5/2/2022	1193	797.02	22.26	2.41	25.39	5.64	773.77	781.46	779.94	779.06	776.73	Completed by Mark M.
6/6/2022	501	796.99	22.49	2.87	25.50	5.72	773.45	781.23	779.48	778.95	776.65	Completed by Mark M.
7/5/2022	208	796.99	22.55	3.23	25.62	5.72	773.39	781.17	779.12	778.83	776.65	Completed by Mark M.
8/1/2022	175	796.99	22.61	3.68	25.62	5.68	773.90	781.11	778.67	778.83	776.69	Completed by Mark M.
9/12/2022	211	796.99	22.60	3.72	25.66	5.63	773.38	781.12	778.63	778.79	776.74	Completed by Mark M.
10/3/2022	211	796.99	22.72	3.63	25.76	5.65	773.35	781.00	778.72	778.69	776.72	Completed by Mark M.
11/1/2022	305	797.01	22.67	3.53	25.73	5.68	773.41	781.05	778.82	778.72	776.69	Completed by Mark M.
12/2/2022	339	797.01	22.74	3.47	25.86	5.71	773.43	780.98	778.88	778.59	776.66	Completed by Mark M.
1/5/2023	640	797.01	22.52	2.98	27.80	5.60	773.60	781.20	779.37	776.65	776.77	Completed by Mark M.
2/6/2023	367	797.01	22.60	3.33	24.87	5.68	773.45	781.12	779.02	779.58	776.69	Completed by Mark M.
2/10/2023	661	797.01	22.50	2.51	25.57	5.54	773.58	781.22	779.84	778.88	776.83	Completed by Mark M.
2/14/2023	570	797.01	22.45	2.91	25.54	5.65	773.54	781.27	779.44	778.91	776.72	Completed by Mark M.
3/2/2023	1095	797.02	22.45	2.44	25.57	5.57	773.87	781.27	779.91	778.88	776.80	Completed by Mark M.
4/3/2023	1329	797.02	22.16	2.09	25.33	5.52	774.21	781.56	780.26	779.12	776.85	Completed by Mark M.
5/1/2023	809	797.02	22.33	2.81	25.57	5.69	773.74	781.39	779.54	778.88	776.68	Completed by Mark M.
6/6/2023	193	797.00	22.52	3.39	25.71	5.78	773.38	781.20	778.96	778.74	776.59	Completed by Mark M.
7/5/2023	369	797.00	22.50	3.13	25.66	5.67	773.47	781.22	779.22	778.79	776.70	Completed by Mark M.
8/1/2023	273	797.02	22.52	3.33	25.58	5.69	773.41	781.20	779.02	778.87	776.68	Completed by Mark M.
9/7/2023	585	797.02	22.42	3.24	25.46	5.62	773.64	781.30	779.11	778.99	776.75	Completed by Mark M.
10/2/2023	318	796.99	22.51	3.45	25.64	5.65	773.44	781.21	778.90	778.81	776.72	Completed by Mark M.
11/6/2023	315	796.99	22.48	3.30	25.64	5.69	773.46	781.24	779.05	778.81	776.68	Completed by Mark M.
12/4/2023	682	797.02	22.37	2.51	25.68	5.62	773.60	781.35	779.84	778.77	776.75	Completed by Mark M.
1/3/2024	693	797.02	22.35	2.68	25.53	5.71	773.60	781.37	779.67	778.92	776.66	Completed by Mark M.

Barton Piezometer Readings



Barton Dam Piezometers No. 1 - No. 6 Water Elevations							Notes
Month	No. 1	No. 2	*No. 3	No.4	**No. 5	No. 6	
12/1/2014	789.50	788.69	788.31	785.21	784.94	787.34	
1/1/2015	789.49	788.70	789.63	785.19	784.66	788.94	
2/1/2015	789.53	788.68	789.63	785.17	784.65	789.44	
3/1/2015	789.52	788.55	789.63	784.86		789.42	
4/1/2015	789.54	788.69	787.92	785.08	784.25	788.80	
5/1/2015	789.69	788.81	788.48	785.01	784.42	788.75	
6/1/2015	789.86	788.95	788.65	785.59	784.41	788.83	
7/1/2015	789.87	788.97	788.68	785.74	784.37	788.82	
8/1/2015	789.95	789.05	788.76	785.78	784.37	788.75	
9/1/2015	789.84	788.95	788.23	785.88	784.37		
10/1/2015	790.04	789.05	786.71	785.88	784.67		
11/1/2015	789.94	789.05	786.83	785.88	784.67		
12/1/2015	789.85	788.90	788.70	785.78	784.61	788.91	
1/1/2016	789.74	788.83	786.65	785.68	784.72	788.82	
2/1/2016	789.84	788.95	788.68	785.65	784.74	788.91	
3/1/2016	789.94	789.05	788.71	785.68	784.45	788.90	
4/1/2016	789.89	788.87	788.76	785.73	784.65	788.97	
5/1/2016	789.96	789.20	788.96	785.55	784.62	789.03	
6/1/2016	789.99	789.09	788.82	785.71	784.67	789.01	
7/1/2016	790.00	789.19	788.44	785.76	784.75	789.12	
8/1/2016	790.13	789.15	788.93	785.08	784.77	788.75	
9/1/2016	790.04	789.07	788.32	785.26	784.62	788.17	
10/1/2016	790.14	789.25	788.96	785.58	784.77	788.45	
11/1/2016	790.09	789.13	788.93	785.71	784.72	789.07	
12/1/2016	790.04	789.07	788.88	785.55	784.74	789.08	
1/17/2017	789.92	788.98	788.80	785.53	784.67	788.95	
2/17/2017	789.91	788.98	788.77	785.53	784.64	789.00	
3/17/2017	789.99	789.05	788.83	785.53	784.69	789.08	
4/17/2017	789.96	789.10	788.82	786.15	784.65	788.98	
5/17/2017	790.24	789.10	788.93	785.18	784.77	789.15	
6/17/2017	792.02	789.05	788.91	784.73	784.63	788.93	
7/17/2017	790.14	789.15	788.93	785.28	784.87	789.25	
8/17/2017	790.11	789.06	788.95	784.94	784.67	788.97	
9/17/2017	790.14	789.15	788.93	785.43	784.72	789.00	
10/9/2017	790.29	789.20	789.05	785.38	784.79	789.07	
10/17/2017	790.29	789.20	788.93	785.38	784.79	789.07	
11/16/2017	789.89	789.05	788.73	785.73	784.64	788.83	
11/19/2017	789.96	789.15	788.78	786.05	784.66	788.88	
12/8/2017	789.94	789.15	788.73	785.38	784.67	788.35	
1/18/2018	789.84	788.97	788.73	785.28	784.62	788.03	
2/18/2018	790.04	788.95	788.73	785.08	784.67	788.45	
3/18/2018	789.92	789.00	788.75	785.58	784.68	788.90	
4/5/2018	789.91	789.00	788.74	784.98	784.70	789.00	
4/18/2018	789.91	789.00	788.74	784.98	784.70	789.00	
5/18/2018	789.94	789.00	788.83	785.08	784.67	789.05	
6/18/2018	790.04	789.08	788.89	784.19	784.71	788.33	
7/18/2018	790.24	789.25	788.93	784.78	784.87	789.15	
8/18/2018	790.19	789.20	788.93	785.13	784.84	788.70	
8/28/2018	790.04	789.03	788.73	785.09	784.77	788.55	
10/5/2018	790.15	789.15	788.91	785.27	784.82	789.03	
10/26/2018	790.14	789.05	788.88	785.28	784.77	789.00	
11/5/2018	790.15	789.14	788.93	785.62	783.83	789.00	
11/8/2018	790.04	789.06	788.81	785.62	784.78	788.89	
11/18/2018	790.12	789.14	788.95	785.40	785.15	789.14	
12/3/2018	790.04	789.05	788.83	785.48	785.07	789.15	
12/17/2018	790.10	789.10	788.93	785.40	785.12	789.02	
12/27/2018	790.10	789.10	788.95	785.40	785.14	789.11	
1/3/2019	790.04	789.05	788.93	785.53	785.17	789.05	
1/15/2019	790.05	789.09	788.94	785.27	785.14	789.07	
1/18/2019	790.05	789.09	788.95	785.19	785.15	789.06	
2/4/2019	790.10	789.10	788.86	785.44	785.17	789.04	
2/28/2019	790.04	789.08	788.93	785.44	785.16	789.19	
3/7/2019	790.04	789.05	788.88	785.13		789.20	
3/19/2019	790.07	789.12	788.95	785.46	785.17	788.96	
3/28/2019	790.08	789.11	788.96	785.30	785.18	789.15	
4/11/2019	790.14	789.25	788.93	785.48	785.27	789.25	
4/18/2019	790.11	789.12	789.03	785.45	785.22	789.15	
5/3/2019	790.14	789.15	788.93	785.98	785.22	789.15	
5/17/2019	790.17	789.15	788.98	785.47	785.24	788.87	
5/30/2019	790.19	789.15	789.03	785.53	785.27	789.05	
6/6/2019	790.21	789.21	789.11	785.57	785.31	789.01	
6/6/2019	790.29	789.29	788.93	786.10	785.39	789.08	
6/6/2019	790.34	789.35	789.23	785.98	785.37	789.35	
7/12/2019	790.24	789.20	788.93	785.08	785.37	788.95	
7/18/2019	790.25	789.26	789.15	785.28	785.49	788.94	

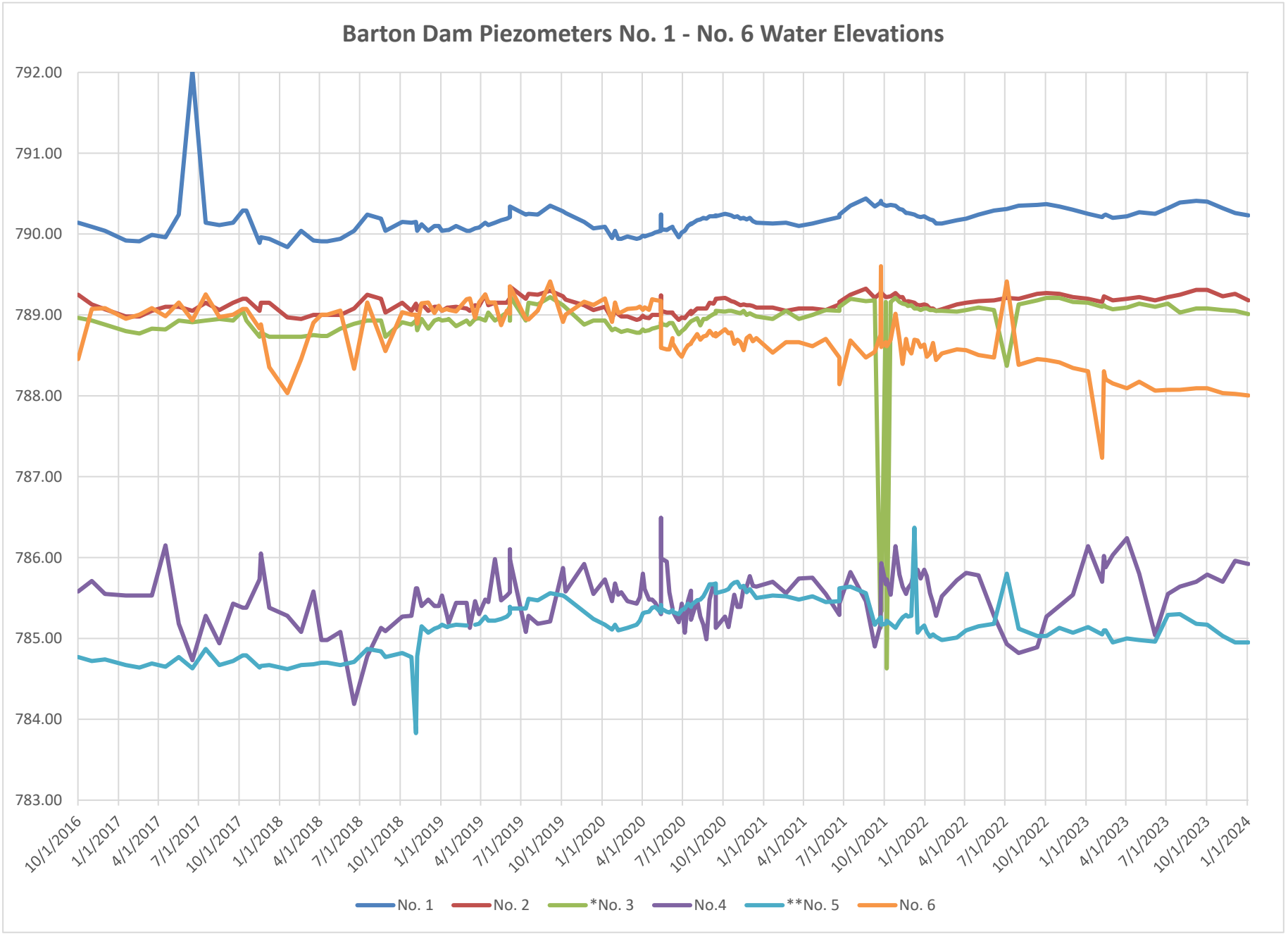
Barton Dam Piezometers No. 1 - No. 6 Water Elevations							Notes
Month	No. 1	No. 2	*No. 3	No.4	**No. 5	No. 6	
8/8/2019	790.24	789.25	789.13	785.18	785.47	789.05	
9/5/2019	790.35	789.30	789.22	785.21	785.56	789.41	
10/4/2019	790.28	789.23	789.12	785.87	785.53	788.91	
10/10/2019	790.26	789.19	789.09	785.58	785.51	789.00	
11/21/2019	790.15	789.12	788.88	785.92	785.33	789.16	
12/12/2019	790.07	789.06	788.93	785.55	785.24	789.12	
1/7/2020	790.09	789.10	788.93	785.73	785.17	789.20	
1/23/2020	789.95	788.95	788.81	785.46	785.11	788.91	
1/30/2020	790.04	789.05	788.83	785.68	785.17	789.15	
2/6/2020	789.94	789.01	788.81	785.54	785.10	789.02	
2/13/2020	789.94	788.98	788.79	785.57	785.11	789.03	
2/27/2020	789.97	788.98	788.81	785.46	785.13	789.07	
3/19/2020	789.94	788.94	788.78	785.43	785.17	789.08	
3/26/2020	789.95	788.95	788.78	785.51	785.22	789.10	
4/2/2020	789.98	788.99	788.82	785.80	785.31	789.06	
4/6/2020	789.97	788.97	788.80	785.61	785.32	789.09	
4/16/2020	789.99	788.96	788.81	785.48	785.33	789.06	
4/23/2020	790.00	789.00	788.83	785.48	785.38	789.19	*Mark measured #6 2x. Higher them it has been
4/30/2020	790.02	789.00	788.84	785.44	785.39	789.18	
5/13/2020	790.04	789.00	788.86	785.30	785.32	789.17	
5/13/2020	790.24	789.24	788.91	786.49	785.41	789.12	
5/13/2020	790.09	789.09	788.91	786.18	785.35	789.09	
5/13/2020	790.06	789.05	788.89	785.99	785.37	788.59	#6 is out of normal - usually 1.45-1.56
5/26/2020	790.05	789.03	788.87	785.95	785.33	788.57	
6/1/2020	790.07	789.03	788.90	785.57	785.32	788.57	
6/8/2020	790.09	789.03	788.90	785.37	785.35	788.71	
6/8/2020	790.08	789.02	788.90	785.34	785.33	788.65	
6/22/2020	789.96	788.94	788.76	785.20	785.30	788.52	
6/29/2020	790.02	788.97	788.80	785.43	785.35	788.48	
7/6/2020	790.04	788.96	788.83	785.07	785.37	788.56	
7/13/2020	790.10	789.01	788.88	785.46	785.43	788.62	
7/20/2020	790.13	789.05	788.92	785.59	785.39	788.64	
7/20/2020	790.12	789.01	788.92	785.23	785.41	788.65	
8/3/2020	790.17	789.08	788.96	785.47	785.47	788.76	
8/10/2020	790.18	789.08	788.87	785.27	785.48	788.69	
8/17/2020	790.20	789.08	788.95	785.17	785.52	788.73	
8/24/2020	790.19	789.08	788.95	784.99	785.59	788.74	
8/31/2020	790.22	789.15	788.98	785.48	785.67	788.80	
9/9/2020	790.22	789.14	789.01	785.67	785.67	788.74	Monthly
9/14/2020	790.23	789.19	789.02	785.55	785.68	788.76	
9/14/2020	790.23	789.19	789.03	785.34	785.58	788.77	
9/14/2020	790.22	789.20	789.05	785.13	785.56	788.73	
10/5/2020	790.25	789.21	789.04	785.27	785.59	788.82	Monthly
10/13/2020	790.24	789.19	789.05	785.14	785.61	788.77	
10/19/2020	790.23	789.17	789.05	785.33	785.66	788.78	
10/26/2020	790.21	789.16	789.04	785.54	785.69	788.64	
11/2/2020	790.22	789.14	789.03	785.39	785.70	788.69	Monthly
11/9/2020	790.19	789.12	789.02	785.39	785.63	788.66	
11/16/2020	790.20	789.13	789.05	785.63	785.65	788.56	
11/23/2020	790.18	789.12	789.00	785.64	785.57	788.71	
11/30/2020	790.20	789.12	789.02	785.77	785.61	788.74	
12/7/2020	790.16	789.11	789.00	785.65	785.56	788.67	Monthly
12/15/2020	790.14	789.09	788.98	785.64	785.50	788.71	
1/21/2021	790.13	789.09	788.95	785.70	785.53	788.53	Monthly
2/20/2021	790.14	789.05	789.05	785.56	785.52	788.66	Monthly
3/21/2021	790.10	789.08	788.95	785.74	785.48	788.66	Monthly
4/21/2021	790.13	789.08	789.00	785.75	785.52	788.61	Monthly
5/21/2021	790.17	789.06	789.06	785.55	785.45	788.70	Monthly - Derek R.
6/21/2021	790.21	789.13	789.05	785.29	785.46	788.47	Monthly - Derek R. Completed on June 10th
6/21/2021	790.24	789.16	789.10	785.43	785.62	788.14	Completed on June 21st: by Derek due to heavy rain
7/16/2021	790.35	789.25	789.20	785.82	785.64	788.68	Completed on July 16st: by Mark M. cleaned toe drain pond outlet
8/20/2021	790.44	789.33	789.17	785.46	785.56	788.47	Completed on August 20: by David K.
9/9/2021	790.34	789.21	789.18	784.90	785.17	788.54	Completed by Mark M.
9/22/2021	790.39	789.27	785.13	785.17	785.26	788.75	Completed by Mark M.
9/23/2021	790.41	789.30	785.53	785.83	785.26	789.60	Completed by Mark M.
9/24/2021	790.38	789.27	785.33	785.93	785.17	788.60	Completed by Mark M.
10/4/2021	790.35	789.22	789.16	785.67	785.18	788.66	Completed by Mark M.
10/6/2021	790.35	789.22	784.63	785.73	785.22	788.61	Completed by Mark M.
10/15/2021	790.36	789.23	789.16	785.54	785.18	788.69	Completed by Neil W.

Barton Dam Piezometers No. 1 - No. 6 Water Elevations							Notes
Month	No. 1	No. 2	*No. 3	No.4	**No. 5	No. 6	
10/26/2021	790.35	789.27	789.21	786.14	785.13	789.01	Completed by Neil W.
11/4/2021	790.31	789.22	789.16	785.79	785.21	788.70	Completed by Mark M.
11/11/2021	790.30	789.22	789.14	785.64	785.26	788.39	Completed by Neil W.
11/19/2021	790.26	789.14	789.13	785.55	785.29	788.70	Completed by Neil W.
11/23/2021	790.26	789.17	789.11	785.62	785.27	788.59	Completed by Neil W.
12/1/2021	790.25	789.16	789.12	785.68	785.28	788.52	Completed by Neil W.
12/8/2021	790.24	789.15	789.08	785.85	786.37	788.69	Completed by Neil W.
12/15/2021	790.22	789.12	789.08	785.85	785.07	788.68	Completed by Neil W.
12/22/2021	790.21	789.12	789.06	785.74	785.12	788.60	Completed by Ryan Eisley
12/30/2021	790.22	789.13	789.08	785.85	785.16	788.63	Completed by Neil W.
1/5/2022	790.20	789.12	789.08	785.77	785.08	788.48	Completed by Ryan Eisley
1/12/2022	790.18	789.08	789.06	785.56	785.02	788.52	Completed by Ryan Eisley
1/19/2022	790.17	789.08	789.06	785.44	785.05	788.65	Completed by Ryan Eisley
1/26/2022	790.13	789.05	789.05	785.28	785.02	788.44	Completed by Mark M.
2/8/2022	790.13	789.07	789.05	785.52	784.98	788.52	Completed by Mark M.
3/14/2022	790.17	789.13	789.04	785.72	785.01	788.57	Completed by Mark M.
4/4/2022	790.19	789.15	789.06	785.81	785.10	788.56	Completed by Mark M.
5/2/2022	790.24	789.17	789.09	785.78	785.15	788.50	Completed by Mark M.
6/6/2022	790.29	789.18	789.06	785.28	785.18	788.47	Completed by Mark M.
7/5/2022	790.31	789.21	788.37	784.93	785.80	789.41	Completed by Mark M.
8/1/2022	790.35	789.20	789.13	784.82	785.12	788.38	Completed by Mark M.
9/12/2022	790.36	789.26	789.18	784.89	785.03	788.45	Completed by Mark M.
10/3/2022	790.37	789.27	789.21	785.27	785.03	788.44	Completed by Mark M.
11/1/2022	790.34	789.26	789.21	785.40	785.13	788.41	Completed by Mark M.
12/2/2022	790.30	789.22	789.16	785.54	785.07	788.34	Completed by Mark M.
1/5/2023	790.25	789.20	789.15	786.14	785.14	788.30	Completed by Mark M.
2/6/2023	790.21	789.16	789.10	785.70	785.05	787.23	Completed by Mark M.
2/10/2023	790.23	789.23	789.12	786.02	785.10	788.30	Completed by Mark M.
2/14/2023	790.24	789.22	789.10	785.88	785.10	788.20	Completed by Mark M.
3/2/2023	790.20	789.18	789.07	786.03	784.95	788.15	Completed by Mark M.
4/3/2023	790.22	789.20	789.09	786.24	785.00	788.09	Completed by Mark M.
5/1/2023	790.27	789.22	789.14	785.80	784.98	788.17	Completed by Mark M.
6/6/2023	790.25	789.18	789.10	785.04	784.96	788.06	Completed by Mark M.
7/5/2023	790.32	789.22	789.14	785.55	785.29	788.07	Completed by Mark M.
8/1/2023	790.39	789.25	789.03	785.64	785.30	788.07	Completed by Mark M.
9/7/2023	790.41	789.31	789.08	785.70	785.18	788.09	Completed by Mark M.
10/2/2023	790.40	789.31	789.08	785.79	785.17	788.09	Completed by Mark M.
11/6/2023	790.32	789.23	789.06	785.70	785.03	788.03	Completed by Mark M.
12/4/2023	790.26	789.26	789.05	785.96	784.95	788.02	Completed by Mark M.
1/3/2024	790.23	789.18	789.01	785.92	784.95	788.00	Completed by Mark M.

Piezometer Elevations (ft)	
1	795.04
2	794.95
3	789.63
4	789.88
5	786.37
6	789.57

Rev_1	Rev_2
791.57	790.65

This value represents the top of the piezometer being 11" lower than first thought


Barton Dam Piezometers No. 1 - No. 6 Water Elevations
792.00
791.00
790.00
789.00
788.00
787.00
786.00
785.00
784.00
783.00
10/1/2016
1/1/2017
4/1/2017
7/1/2017
10/1/2017
1/1/2018
4/1/2018
7/1/2018
10/1/2018
1/1/2019
4/1/2019
7/1/2019
10/1/2019
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4/1/2021
7/1/2021
10/1/2021
1/1/2022
4/1/2022
7/1/2022
10/1/2022
1/1/2023
4/1/2023
7/1/2023
10/1/2023
1/1/2024
No. 1
No. 2
*No. 3
No.4
**No. 5
No. 6

Barton Dam (P-3142)
Ann Arbor, Michigan

Vibrating Wire Piezometer Static Head Elevations									
Date	Static Head Elevation (NAVD88) (feet)								
	PZ-7 (PB-1)	PZ-8 (PB-2)	PZ-9 (PB-3)	PZ-10 (PB-4)	PZ-11 (PB-5)	PZ-12 (PB-7)	PZ-13 (PB-8)	PZ-14 (PB-9)	PZ-15 (PB-10)
14/Nov/2017	779.5	788.4	786.6	787.7	787.0	789.8	788.5	780.5	780.7
20/Nov/2017	779.0	788.0	786.1	787.2	786.6	789.4	788.2	780.1	780.3
21/Nov/2017	778.7	787.8	785.9	787.0	786.4	789.2	788.2	779.9	780.1
22/Nov/2017	779.2	788.4	786.5	787.6	787.0	789.7	788.6	780.5	780.6
24/Nov/2017	778.6	787.8	785.9	787.0	786.5	789.2	788.3	779.9	780.1
26/Nov/2017	778.8	788.1	786.2	787.4	786.8	789.4	788.6	780.3	780.4
29/Nov/2017	779.1	788.4	786.5	787.6	786.9	789.7	788.8	780.5	780.6
07/Dec/2017	779.1	788.0	786.2	787.2	786.7	789.4	788.6	780.2	780.3
08/Jan/2018	779.1	787.9	786.0	787.1	786.6	789.2	789.0	780.0	780.1
02/Feb/2018	779.6	788.5	786.6	787.6	787.1	789.7	789.1	780.6	780.7
23/Feb/2018	780.1	788.4	786.3	787.3	786.9	789.5	789.7	780.3	780.5
02/Mar/2018	780.2	788.6	786.5	787.5	787.1	789.7	789.3	780.5	780.7
06/Apr/2018	779.2	787.9	785.9	786.9	786.6	789.1	788.8	779.9	780.1
04/May/2018	779.4	787.9	785.9	787.0	786.6	789.1	789.2	780.0	780.1
15/May/2018	780.1	788.4	786.2	787.3	786.8	789.4	789.6	780.5	780.5
01/Jun/2018	779.1	787.9	786.0	787.1	786.7	789.3	789.3	780.1	780.1
06/Jul/2018	779.3	788.4	786.7	787.8	787.4	789.9	789.5	780.7	780.7
03/Aug/2018	778.9	788.2	786.5	787.6	787.2	789.7	789.1	780.4	780.5
28/Aug/2018	778.8	788.0	786.1	787.2	786.8	789.5	789.0	780.4	780.4
07/Sep/2018	779.1	788.3	786.4	787.5	787.1	789.8	789.2	780.7	780.7
19/Sep/2018	778.8	788.0	786.1	787.3	786.9	789.5	789.0	780.4	780.5
05/Oct/2018	779.1	788.4	786.4	787.6	787.2	789.8	789.1	780.6	780.6
02/Nov/2018	779.0	788.1	786.0	787.2	786.9	789.3	788.1	780.3	780.3
07/Dec/2018	779.6	788.7	786.6	787.8	787.5	789.9	788.8	780.7	780.8
04/Jan/2019	779.2	788.2	786.1	787.3	787.1	789.2	788.4	780.1	780.2
11/Sep/2019	779.1	788.5	786.7	788.0	787.8	789.9	789.3	780.6	780.7
19/May/2021	779.5	788.4	786.9	788.3	787.9	790.0	788.9	780.8	780.9
09/Sep/2021	779.1	788.3	786.8	788.3	788.0	790.1	789.3	780.7	780.8
24/Sep/2021	779.4	788.4	786.7	788.2	787.8	790.0	789.1	780.7	780.8
06/Oct/2021	779.6	788.7	787.1	788.6	788.2	790.4	789.5	781.0	781.1
15/Oct/2021	779.2	788.3	786.6	788.1	787.8	789.9	789.1	780.5	780.6
04/Nov/2021	779.8	788.8	787.1	788.6	788.2	790.3	790.4	780.9	781.1
01/Dec/2021	779.4	788.4	786.7	788.2	787.9	790.0	789.6	780.6	780.7
05/Jan/2022	779.0	787.8	786.1	787.6	787.3	789.4	789.8	780.0	780.1
08/Feb/2022	779.5	788.3	786.7	788.2	787.9	789.9	789.7	780.5	780.7
14/Mar/2022	779.9	788.5	786.8	788.3	788.0	790.1	789.7	780.7	780.8
04/Apr/2022	779.7	788.3	786.6	788.1	787.8	789.9	790.3	780.5	780.6
02/May/2022	779.8	788.4	786.6	788.2	787.8	790.0	790.6	780.5	780.6
06/Jun/2022	779.2	788.1	786.5	788.0	787.7	789.9	789.9	780.4	780.5
05/Jul/2022	779.0	788.1	786.6	788.1	787.7	790.0	789.8	780.5	780.6
01/Aug/2022	778.9	788.0	786.6	788.2	787.8	790.0	789.6	780.5	780.6
12/Sep/2022	778.9	788.1	786.6	788.1	787.6	790.0	789.3	780.6	780.7
03/Oct/2022	779.5	788.7	787.2	788.8	788.3	790.7	789.1	781.2	781.3
04/Oct/2022	779.4	788.6	787.0	788.6	788.1	790.5	789.0	781.0	781.2
11/Oct/2022	779.3	788.5	787.0	788.6	788.1	790.4	788.9	781.0	781.1
24/Oct/2022	777.7	788.5	786.9	788.5	788.0	790.3	788.7	780.8	780.9
01/Nov/2022	777.5	788.5	786.8	788.4	787.9	790.3	788.6	780.8	780.9
14/Nov/2022	777.8	788.8	787.2	788.7	788.3	790.6	788.9	781.1	781.2
16/Nov/2022	778.7	788.4	786.8	782.9	787.9	790.2	788.5	780.7	780.8
02/Dec/2022	779.1	788.6	786.8	788.4	787.9	790.2	788.5	780.8	780.9
05/Jan/2023	779.4	788.4	786.5	788.1	787.6	790.0	788.3	780.5	780.6
06/Feb/2023	779.9	788.8	787.0	788.6	788.1	790.4	788.7	780.9	781.0
10/Feb/2023	779.9	788.7	786.8	788.5	788.0	790.3	788.6	780.8	780.9
14/Feb/2023	779.6	788.5	786.6	788.2	787.8	790.1	788.5	780.6	780.7
02/Mar/2023	779.7	788.4	786.5	788.1	787.7	790.0	788.6	780.5	780.6
03/Apr/2023	779.9	788.4	786.5	788.1	787.7	790.0	790.2	780.5	780.6
01/May/2023	776.8	787.7	785.9	787.5	787.1	789.4	789.3	779.9	779.9
06/Jun/2023	779.3	788.2	786.6	788.2	787.8	790.2	789.6	780.6	780.7
05/Jul/2023	779.5	788.4	786.8	788.4	787.9	790.4	789.5	780.8	780.8
06/Jul/2023	N/A	N/A	N/A	N/A	N/A	790.2	789.4	N/A	N/A
01/Aug/2023	779.6	788.6	787.1	788.7	788.2	790.7	789.7	781.0	781.1
02/Aug/2023	779.5	788.6	787.0	788.6	788.1	790.6	789.6	780.9	781.0
07/Aug/2023	779.1	788.1	786.5	788.2	787.7	790.2	789.3	780.5	780.6
07/Sep/2023	779.2	788.3	786.6	788.3	787.7	790.2	789.3	780.5	780.7
02/Oct/2023	777.6	788.8	787.2	788.8	788.3	790.8	789.7	781.1	781.2
04/Oct/2023	777.4	788.6	786.9	788.6	788.0	790.6	789.5	780.9	781.0
16/Oct/2023	779.0	788.4	786.7	788.4	787.9	790.4	789.3	780.8	780.9
18/Oct/2023	778.0	788.5	786.8	788.5	788.0	790.5	789.4	769.6	781.0
20/Oct/2023	777.0	788.0	786.3	787.9	787.4	789.9	788.9	780.3	780.6
06/Nov/2023	777.3	788.4	786.6	788.3	787.7	790.3	789.3	780.7	780.8
07/Nov/2023	777.3	788.4	786.7	788.3	787.8	790.3	789.2	780.7	780.8
13/Nov/2023	778.2	788.7	787.0	788.6	788.1	790.6	789.0	781.1	781.1
20/Nov/2023	777.7	788.8	787.1	788.7	788.2	790.7	789.1	781.1	781.2
27/Nov/2023	777.3	788.3	786.6	788.3	787.7	790.2	788.7	780.6	780.7
04/Dec/2023	777.8	788.4	786.6	788.3	787.7	790.2	788.6	780.7	780.7
03/Jan/2024	778.5	788.5	786.7	788.4	787.9	790.4	789.0	780.8	780.8

Note — The piezometers have dual identification as follows: the first identifier is the piezometer number continuing from the numbering of standpipe piezometers installed by CTI Consultants in 2015; the second identifier (in parentheses) is the number of the test boring by NTH Consultants in which the vibrating wire piezometer was installed in 2017.

PIEZOMETER THRESHOLD VALUES

ref. Section 4.1 of the April 2020 DSSMP for threshold values.

Piezometer	7	8	9	10	11	12	13	14	15
Threshold	N/A	N/A	787.1	788.6	788.5	790.3	790.5	781.1	781.2

Threshold alert appears in table above:

Barton Dam (P-3142)
Ann Arbor, Michigan

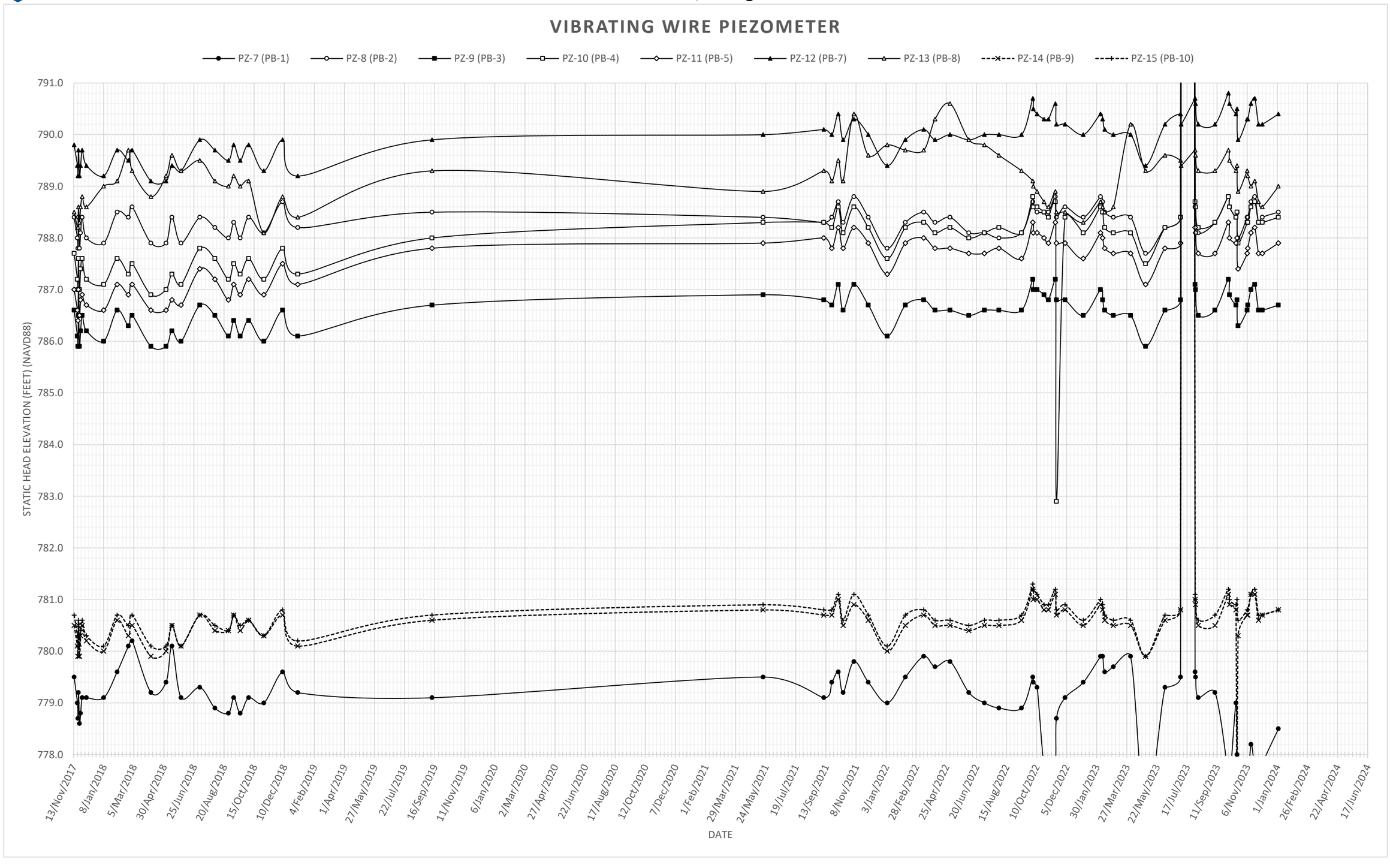


Figure No. __

ATTACHMENT V

Memorandum on High Flow Mitigation at Toe Drain 23

Memorandum

Memo Type: Project Team Memorandum

To: Glen Wiczorek, P.E. (City of Ann Arbor)

From: Peter A. Margules, P.E. and Keith M. Swaffar, P.E. (NTH)

cc: Paul Malocha, P.E. (Stantec), Steve McManus, P.E., and Erik Ventura, P.E.

Proj. No.: NTH Project No. 61-160089-01

Date: July 7, 2021

Re: Memorandum on High Flow Mitigation at Toe Drain 23
Barton Dam (FERC ID 3142)
Ann Arbor, Michigan

The City of Ann Arbor (the City) has retained NTH Consultants, Ltd. (NTH) to review the conditions and performance of Toe Drain 23 (TD-23) at Barton Dam and provide recommendations to restrict fines migration from TD-23. TD-23 is located along the right embankment (looking downstream) of Barton Dam (see Figure No. 1 in Attachment 1), which is owned by the City of Ann Arbor and under the regulatory authority of the Federal Energy Regulatory Commission (FERC).

NTH has reviewed historical data, analyzed samples of fines collected from TD-23 by the City, performed a field exploration at TD-23, and installed and monitored vibrating wire piezometers (VWPs) at the general location of TD-23. This memorandum summarizes the historical conditions observed at TD-23, the activities performed by NTH, NTH's conclusions and recommendations for rehabilitation at TD-23. This memorandum has been developed in conjunction with the Barton Dam Seepage and Stability Analysis Report (NTH, 2021). Some of the findings presented in the Seepage and Stability Analysis Report are summarized herein for reference but, in general, that information is not repeated in its entirety. Refer to the Seepage and Stability Analysis Report, dated March 2, 2021, for additional details regarding these items.

BACKGROUND

TD-23 is one of 75 toe drains along the right embankment of the Barton Dam. The toe drains are 4-inch-diameter vitrified clay pipe (VCP), spaced at intervals of approximately 15 feet (center-to-center). The toe drains extend from near the centerline of the embankment crest to the toe of the embankment (see Figure No. 2 in Attachment 1). The ends of the toe drains have been retrofitted with polyvinyl chloride (PVC) wyes/tees. Some, or all, of the downstream ends of the toe drains have been partially replaced or modified with PVC pipes.

Historically, seepage flowing from TD-23 has consistently had a higher flow rate than other toe drains within the embankment. Previously, the City of Ann Arbor installed a silt sock at TD-23, which captured soil particles within the TD-23 discharge. Subsequently, the silt sock was removed, and an internal screen was installed within TD-23 to prevent migration of fines from the dam core. However, due to the material fineness, the screen blinded (clogged) quickly, resulting in seepage daylighting at the face of the embankment. The internal screen was subsequently removed and seepage from the embankment face ceased.

NTH made an initial inspection of TD-23 in March of 2016 and observed that the flow from TD-23 was significantly greater than that from other toe drains but was noticeably less than the total flow within the receiving toe ditch. During subsequent visits, NTH also noted that, while flow from other toe drains has occasionally increased, the flow from TD-23 consistently remains higher than that of other toe drains.

Samples of particles collected by the City of Ann Arbor from the silt sock were analyzed by NTH and found to be primarily comprised of fine sand. Detailed discussion of the particle analysis is presented in the "Assessments" section of this memorandum.

ASSESSMENTS

To evaluate TD-23 and develop recommendations for rehabilitation, NTH has assessed the current conditions at TD-23. The assessments included analysis of particles collected by the City of Ann Arbor from TD-23, field explorations at TD-23, and installation and monitoring of VWPs. Each of these assessments are discussed in the following subsections.

SOIL SAMPLE FROM TD-23 SILT SOCK

Particles transported by the TD-23 effluent were captured in a silt sock and collected by the City of Ann Arbor on a monthly basis. A sample of this material was analyzed for grain size distribution and organic content. Based on laboratory testing, the material can be described as silty sand with trace clay and organic material using the Unified Soil Classification System. Figure No. 3 in Attachment 1 presents the grain size distribution of the sample analyzed by NTH. Note that there is a tendency for particle size segregation within soil transported in this manner. The presence of this soil in the TD-23 discharge is indicative of internal erosion of the embankment soils in the vicinity and/or upstream of TD-23.

FIELD EXPLORATION

NTH performed a field exploration in the vicinity of TD-23 to characterize the embankment and foundation soils. The exploration included the drilling of two test borings (PB-9 and PB-10) and the installation of two piezometers, as well as the performance of geophysical multi-channel analysis of surface waves (MASW) testing of the area. The test borings were performed in addition to contemporaneous explorations in the vicinity of TD-39, which are described in the Seepage and Stability Analysis Report.

Piezometer installation borings PB-9 and PB-10 are located just west and east of TD-23, respectively. These borings are positioned on the intermediate, less-steeply inclined portion of the downstream embankment face. In both borings, topsoil was encountered to a depth of approximately 6 inches. Underlying the topsoil, a layer of loose to medium compact sand fill was encountered to a depth of roughly 2½ feet in PB-9 and about 5 feet in PB-10. This material is underlain by medium sandy clay fill that extends to depths of 6 feet and 8 feet, respectively. These fill materials constitute the dam embankment material.

Underlying the embankment fill materials, native granular foundation soils consisting of loose to medium compact gravelly sand were encountered to depths of approximately 8½ feet in PB-9 and 13 feet in PB-10. In PB-9, this material is, in turn, underlain by a compact sand layer that extends to a depth of about 11 feet. The native granular soils are underlain by a very stiff to hard silty clay layer to the explored depth of approximately 15 feet in each of these borings.

In addition to the test borings and piezometer installations, NTH performed two geophysical MASW surveys in the vicinity of TD-23: one along the embankment crest and one along the intermediate, less-steeply inclined portion of the downstream embankment face. The surveys were oriented generally parallel to the embankment and were performed to aid in interpretation of piezometer boring soil stratification and to identify areas of anomalous soil shear wave velocities. Anomalous shear wave velocities may be indicative of voids or loose soils within the embankment associated with soil migration. Based on NTH's evaluation of the MASW data, voids or subsurface anomalies were not observed in the MASW data collected in the vicinity of TD-23.

Additional information regarding the field exploration at TD-23, including boring logs and MASW results, is presented in the Seepage and Stability Analysis Report.

VIBRATING WIRE PIEZOMETERS

Two VWPs, designated as PZ-14 and PZ-15, were installed in borings PB-9 and PB-10, respectively. Piezometric data from these VWPs was collected monthly from November 2017 through January 2019. An additional measurement was made on September 11, 2019. The piezometric head elevations at VWP-14 and VWP-15 varied from 779.9 feet to 780.8 feet, as presented in Figure Nos. 39 and 40 of the Seepage and Stability Analysis Report. In general, these piezometric head elevations are lower than those measured at the embankment face and crest in the vicinity of TD-39, which ranged from approximately 786.5 to 790.0 feet. These lower piezometric head measurements in the vicinity of TD-23 are consistent with expected conditions, due to the much higher flow rate from the toe drain.

CONCLUSIONS AND RECOMMENDED ACTIONS

To rehabilitate TD-23 and mitigate future internal erosion of the embankment, NTH recommends the following actions:

1. Chemical grouting of the TD-23 joints and cracks (if present);
2. Pneumatic placement of pea gravel within TD-23; and
3. Low-pressure injection grouting of the embankment adjacent to TD-23.

FERC recommendations and requirements, including those in the *Guidelines for Drilling in and near Embankment Dams and Their Foundations*, should be followed at all times during the work.

CHEMICAL GROUTING OF TD-23

Prior to chemical grout placement, TD-22, -23, and -24 should be prepared as shown in Figure No. 4 in Attachment 1 and inspected with a closed-circuit television (CCTV) camera to establish pre-construction conditions. The CCTV should also be used to identify potential areas of concern, such as cracks in the pipe or points of concentrated inflow, within the toe drains. The chemical grout should be an acrylamide grout and it should be installed through an inflatable grout packer with integral scrapers, centered on pipe joints and cracks (if present). A CCTV camera should be used during chemical grouting to ensure the packer is correctly positioned at the joints/cracks. CCTV inspections of the adjacent toe drains should be performed periodically during chemical grouting to monitor for potential grout migration. If grout is noted to be entering the adjacent toe drains, the affected drains should be cleaned by scraping internally, and the grout curing period should be accelerated to reduce grout migration and intrusion. After chemical grouting is complete and the grout has cured, CCTV inspections of TD-22, -23, and -24 should be completed to document the conditions and to identify any visible changes to the pipe and/or flow behavior. If any plugging of the pipes is noted, the affected pipes should be jetted at this time to remove the plugging material.

Additional recommendations regarding chemical grout materials, equipment, and procedures are presented in Attachment 2.

PNEUMATIC PLACEMENT OF PEA GRAVEL

After chemical grout placement and curing is complete, the location of TD-23 should be established using an appropriate utility location technology (e.g., tracer wire and line locator or sonde and receiver equipment). Once the toe drain is located and the position marked on the face of the embankment, TD-23 should be filled with pea gravel (rounded natural aggregate with at least 90 percent passing the $^{3}/_{8}$-inch sieve and no particles retained on the ½-inch sieve, such as MDOT 34R open-graded aggregate). The pea gravel should be pneumatically placed using an injection hose to within 12 inches of the upstream end of the pipe. As the pea gravel is placed, the injection hose should be withdrawn, and the quantity of placed material recorded and evaluated to verify that adequate pea gravel is placed for each lineal foot of the toe drain.

Additional recommendations regarding pneumatic placement of the pea gravel are presented in Attachment 2.

LOW-PRESSURE INJECTION GROUTING OF THE EMBANKMENT

After TD-23 is filled with pea gravel, low-pressure injection grouting should be performed to fill voids that may be present within the embankment adjacent to TD-23. Cementitious grout should be injected into the embankment through eight primary grout holes and six secondary grout holes (as shown on Figure No. 5 in Attachment 1) proximate to the locations where relatively high chemical grout takes were noted. Tertiary grout holes may be necessary if excessive grout take is observed at the primary and secondary grout holes.

Cementitious grout should be injected into the embankment through double-packer, manchette tube systems (Strata-Tech, Inc., or similar). The manchette tube systems should be 2 inches in diameter and should be installed into a 6-inch-diameter borehole, backfilled with MDOT 2NS fine aggregate (as shown in Figure No. 6 in Attachment 1). The bottom of the manchette tube system should be located 4 feet lower than the springline of TD-23.

Cementitious grout should be injected into the primary grout holes sequentially, beginning with P1 and ending with P8. Primary grout holes should be located to provide the best coverage of the TD-23 joints/cracks that exhibited high grout take during the chemical grouting process. After all primary grout holes have been grouted, cementitious grout should be injected into the secondary grout holes. This should also be done sequentially, from S1 through S6.

Cementitious grout should be injected into each hole in a bottom-to-top manner. A double-packer system should be used to isolate each set of ports, as recommended by the manufacturer. Grout pressure should not exceed 1 pound per square inch (psi) per foot of depth below the ground surface at the injection elevation and no more than 15 cubic feet of grout should be injected into any set (isolated row) of grout ports. An engineer should be present for all grouting activities to review grouting pressures and quantities and to determine the necessity of tertiary grout holes.

The cementitious grout should be a cement-bentonite mixture without fluidizers, accelerators, or admixtures (unless otherwise approved), such as that summarized in the following table:

Table 1 – Example Cement-Bentonite Grout Mixture

Component	Ratio	Weight (lbs)
Cement	1	94
Water	1.09	102.83
Bentonite	3.00 %	2.820
Welan Gum	0.10 %	0.094
Rheobuild 1000	1.59 %	1.50

Additional recommendations regarding cementitious grout materials, equipment, procedures, and testing are presented in Attachment 2.

POST-CONSTRUCTION MONITORING

After completion of the work, CCTV inspections of TD-22, -23, and -24 should be performed to verify that no grout intrusion has occurred. Additionally, visual inspections of the ground surface and discharge from the nearby toe drains along with monitoring of PZ-14 and PZ-15 should be performed to assess the effectiveness of the work and to promptly identify any conditions of concern that may arise. Conditions of concern include:

- Significantly increased flow rate from TD-22, -23, or -24. A moderate increase to the flow rate from TD-22 and TD-24, and a commensurate decrease to the TD-23 flow rate, is expected.
- Complete cessation of flow from TD-23.
- Increased quantity of soil in the TD-23 discharge.
- Excessive discoloration of the TD-23 discharge indicative of grout.
- Seepage appearing at the face of the embankment.
- Sloughing of the surficial soils at the embankment face.
- Piezometric head elevations at PZ-14 or PZ-15 greater than 788 feet. The piezometric head elevations at these VWPs is expected to increase as a result of the work. However, it should not be much greater than that measured at the VWPs near TD-39.

The presence of any conditions of concern should be evaluated by a licensed professional engineer to assess the potential impacts and actions to be taken, if any.

NTH recommends the following schedule for visual inspections and VWP monitoring during and after the work:

- Daily during the work,
- Daily for 2 weeks following the work,
- Twice weekly for weeks 3 through 6 after the work, and
- Weekly thereafter until 4 months after the work.

Once this schedule for visual inspections and VWP monitoring has been completed, monitoring should return to the monthly schedule presented in the Seepage and Stability Analysis Report. This is also based on NTH's understanding that Barton Pond will be maintained at the same elevation throughout the year and no appreciable variation in water surface elevation, including winter drawdown, will occur.

CONCLUSION

Construction Cost Estimate and Urgency

Due to the presence of soil particles in the TD-23 effluent and the associated potential for internal erosion of the embankment, NTH recommends that rehabilitation of TD-23 be completed in the next three years. Moreover, earlier implementation of the mitigation measures described in this memorandum may mean that mitigation need not be performed over an area as extensive as later implementation may require. NTH estimates that this work will cost approximately $150,000 to complete, at present. This is a conceptual cost estimate intended to assist the City of Ann Arbor to budget the work. It is not a detailed engineer's estimate of potential construction costs.

NTH is pleased to have the opportunity to assist the City of Ann Arbor with this project. Please contact Peter Margules (pmargules@nthconsultants.com; (248) 662-2714) or Keith Swaffar (kswaffar@nthconsultants.com; (313) 237-3939) with any questions or concerns related to the information contained herein.

ATTACHMENTS

Attachment 1 – Figures

Figure No. 1 – Toe Drain 23 Location Plan

Figure No. 2 – Original Design Cross Section at Typical Toe Drain

Figure No. 3 – Grain Size Distribution Curve for TD-23 Silt Sock Sample

Figure No. 4 – Detail for Modification of Downstream end of Toe Drain

Figure No. 5 – Grout Hole Location Detail

Figure No. 6 – Grout Hole Detail

Attachment 2 - Procedures and Recommendations for Grouting and Placement of Pea Gravel at TD-23

ATTACHMENT I

Figures

BARTON POND

REVERSE FILTER AREA

PARKING AREA

TOE DRAIN OUTLET (TYPICAL)

TOE DRAIN 23 (TD-23)

RIPRAP ON UPSTREAM FACE

AREA NOT MAPPED
RAILROAD ACCESS DENIED

PZ-1 PZ-2 PZ-3 PZ-4 PZ-5 PZ-7 PZ-8 PZ-9 PZ-10 PZ-11 PZ-12 PZ-13 PZ-14 PZ-15
PB-1 PB-2 PB-3 PB-4 PB-5 PB-6 (ABANDONED) PB-7 PB-8 PB-9 PB-10

NEW GRAVEL

BARTON POND

CONC BENCH

RIP RAP

STEPS

WOOD BENCH

GRILL
PICNIC TABLE

WOODED PICNIC TABLE

POND

SPILLWAY

GRATE DROP INLET

30 COTTONWOOD

12 OAK

14 MAPLE

LEGEND

- PIEZOMETER INSTALLED BY CTI DURING DECEMBER 2014
- VIBRATING WIRE PIEZOMETER DRILLED BY STEARNS DRILLING UNDER THE OBSERVATION OF NTH CONSULTANTS, LTD. OCTOBER 23, 2017 THROUGH NOVEMBER 3, 2017
- 35 → TOE DRAIN NUMBER. ARROW POINTS TO OUTLET.

PROJECT NORTH

GRAPHIC SCALE
50 0 50
1" = 50'

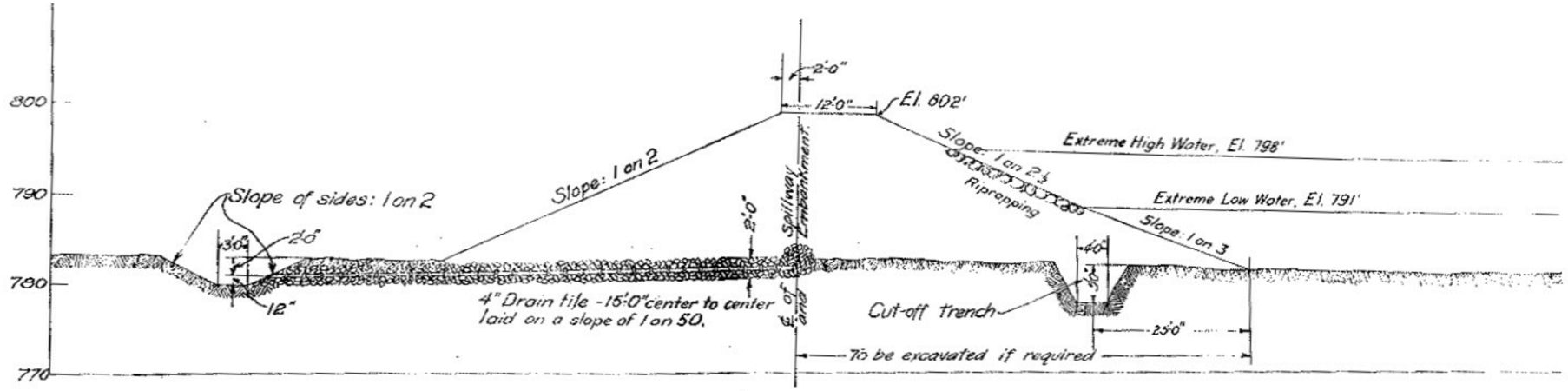
NTH Consultants, Ltd.
Infrastructure Engineering and Environmental Services

NTH PROJECT No:	61-160089-01
DESIGNED BY:	SAM
DRAWN BY:	DET
CHECKED BY:	PAM
CAD FILE NAME:	D16008925
INCEP DATE:	25 JAN 2018
DRAWING SCALE:	1" = 50'
PLOT DATE:	01 Jul 2021

TOE DRAIN 23 LOCATION PLAN

BARTON DAM
ANN ARBOR, MICHIGAN

FIGURE No.
1



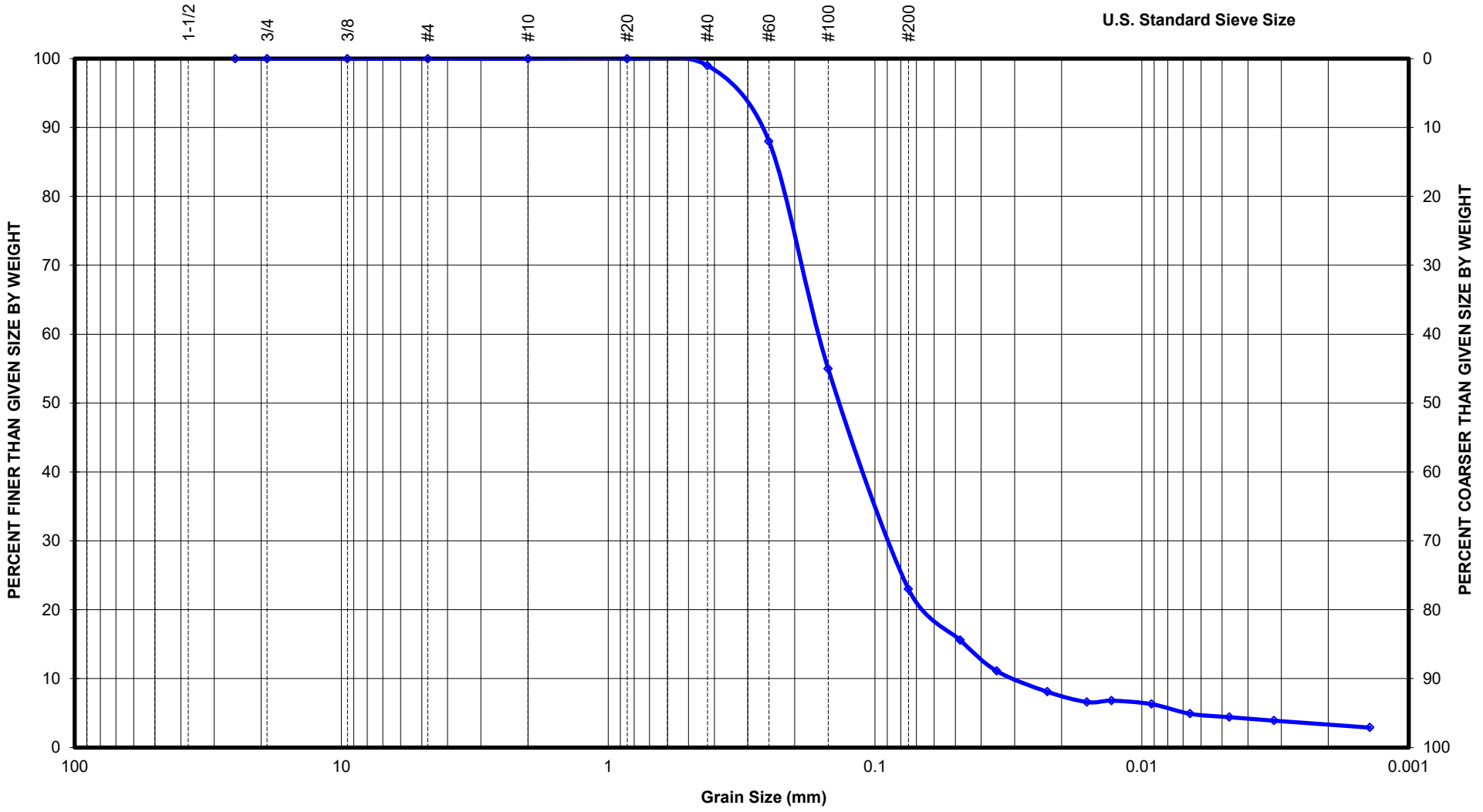
REFERENCE

BARTON DAM DESIGN DRAWINGS
PROVIDED TO NTH BY CITY OF ANN ARBOR.

NTH PROJECT No.:	DESIGNED BY:	CHECKED BY:	DRAWING SCALE:	NTH Consultants, Ltd. Infrastructure Engineering and Environmental Services	BARTON DAM ANN ARBOR, MICHIGAN	ORIGINAL DESIGN CROSS SECTION AT TYPICAL TOE DRAIN	FIGURE No.
61-160089-01	SAM	PAM	NONE				2
CAD FILE NAME:	DRAWN BY:	INCEP DATE:	PLOT DATE:				
D16008926	DET	01 JUN 2021	01 Jul 2021				

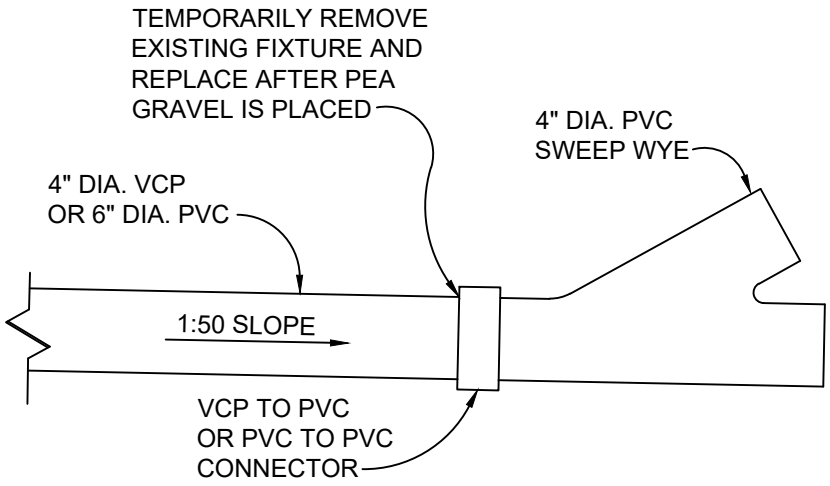
NTH Consultants, Ltd.
GRAIN SIZE DISTRIBUTION CURVE

Project No.	61-160089	**Project Name**	Barton Dam Piezometer Installation and Slope Stability Evaluation				
Project Location	Ann Arbor, Michigan					**Source**	
Boring No.	N/A	**Sample No.**	TD23-BS-1	**Sample Depth**	N/A	**Sample Elev. (Tip)**	N/A
Sample Description	Sample from silt sock at TD-23						
Sampled By	City of Ann Arbor	**Date**		**Tested By**	ZP	**Date**	05/10/2017	**LWO No.**	001270

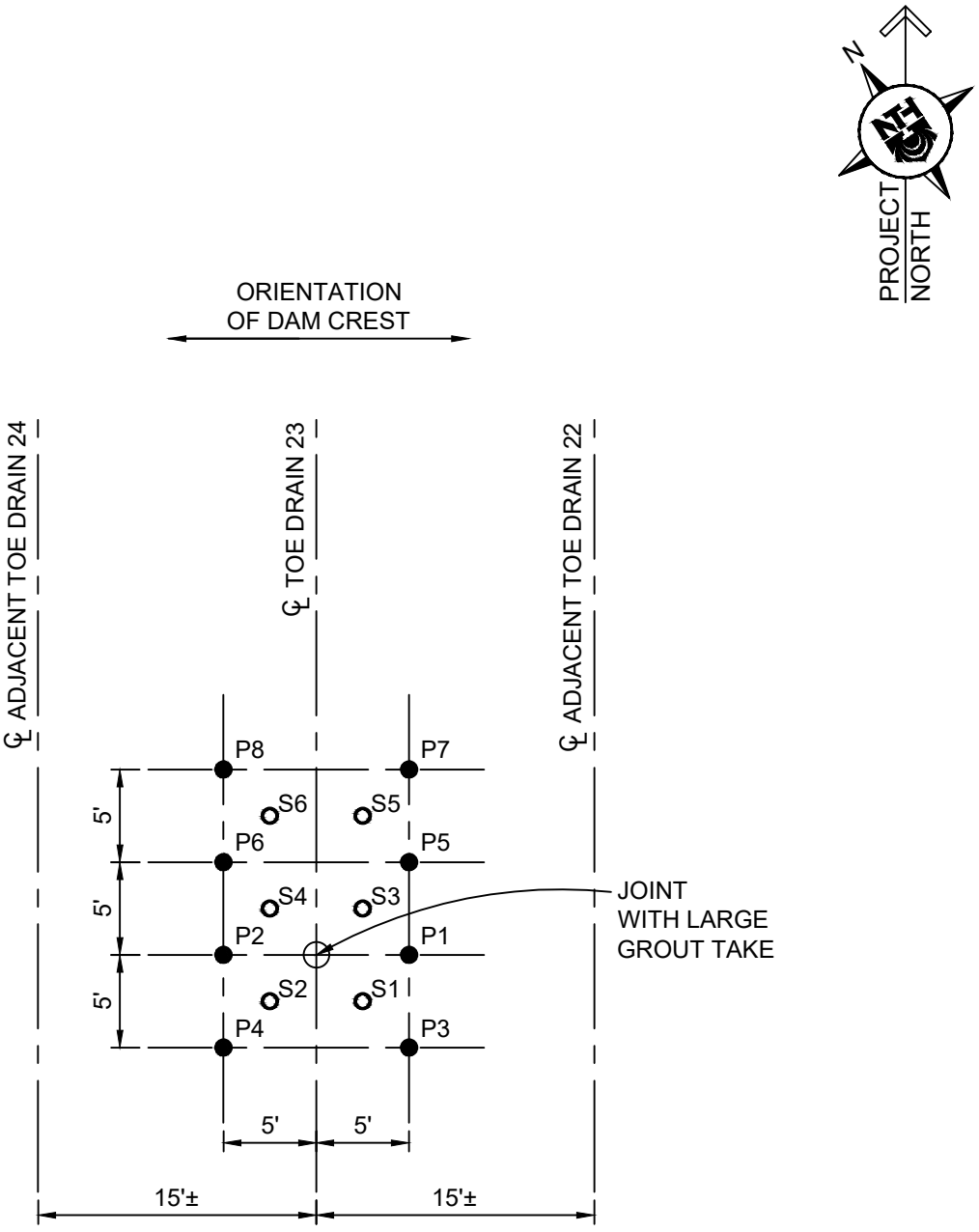


Gravel		Sand			Fines		
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	Colloid

FIGURE NO. 3



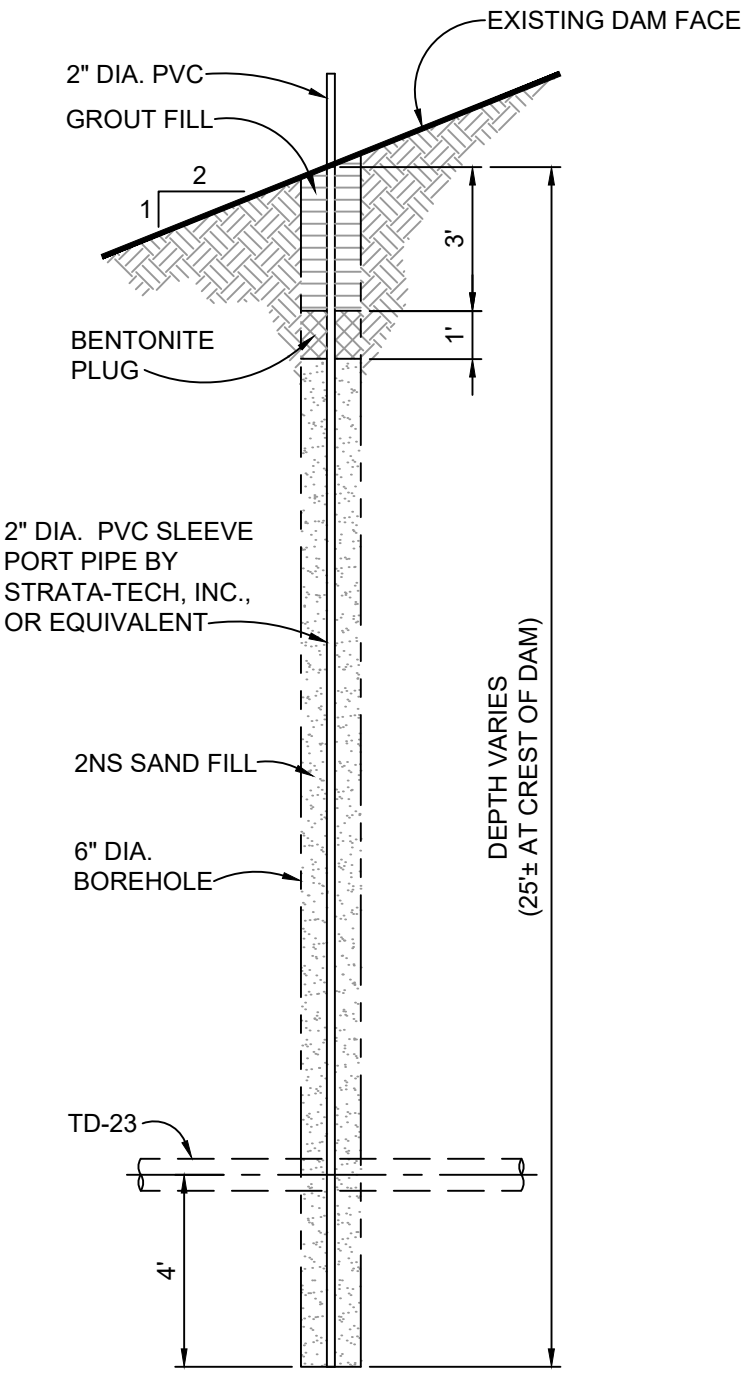
NTH PROJECT No.: 61-160089-01	CAD FILE NAME: D16008927	**NTH Consultants, Ltd.** Infrastructure Engineering and Environmental Services	DETAIL FOR MODIFICATION OF DOWNSTREAM END OF TOE DRAIN	FIGURE No. **4**
DESIGNED BY: SAM	PLOT DATE: 7-Jul-21			
DRAWN BY: DET	DRAWING SCALE: NONE		BARTON DAM ANN ARBOR, MICHIGAN	
CHECKED BY: PAM	INCEP DATE: 14 MAY 2021			



LEGEND

- P# — PRIMARY GROUT HOLE
- S# — SECONDARY GROUT HOLE

NTH PROJECT No.: 61-160089-01	CAD FILE NAME: D16008927	**NTH Consultants, Ltd.** Infrastructure Engineering and Environmental Services	GROUT HOLE LOCATION DETAIL	FIGURE No. **5**
DESIGNED BY: SAM	PLOT DATE: 7-Jul-21		BARTON DAM ANN ARBOR, MICHIGAN	
DRAWN BY: DET	DRAWING SCALE: 1" = 10'			
CHECKED BY: PAM	INCEP DATE: 14 MAY 2021			



NTH PROJECT No.:	CAD FILE NAME:			
61-160089-01	D16008927	**NTH Consultants, Ltd.** Infrastructure Engineering and Environmental Services	GROUT HOLE DETAIL	FIGURE No. **6**
DESIGNED BY: SAM	PLOT DATE: 7-Jul-21			
DRAWN BY: DET	DRAWING SCALE: NONE		BARTON DAM ANN ARBOR, MICHIGAN	
CHECKED BY: PAM	INCEP DATE: 14 MAY 2021			

ATTACHMENT II

Procedures & Recommendations

PROCEDURES AND RECOMMENDATIONS FOR GROUTING AND PLACEMENT OF PEA GRAVEL AT TD-23

I. CHEMICAL GROUTING

It is the intent of this procedure to install chemical (acrylamide) grout through the pipe joints and cracks (if present) in TD-23. The chemical grout should be installed via an inflatable grout packer with integral scrapers centered on the pipe joints.

A. Procedure

1. Prepare TD-22, -23, and -24 as shown on Figure No. 2 in Attachment 1.
2. Perform CCTV inspection of TD-22, -23, and -24 to establish pre-construction conditions.
3. Install the chemical grout through the pipe joints and cracks (if present) using an inflatable grout packer with integral scrapers (by ChemGrout or an equivalent manufacturer).
4. Install the chemical grout beginning at the upstream end of the pipe and advancing in a downstream direction.
5. Position the grout packer with a CCTV camera, located downstream of the grout packer.
6. Perform periodic CCTV inspections of TD-22 and TD-24 during chemical grout installation. If grout is entering adjacent toe drain(s), remove the jelled grout and accelerate the set time of the grout to mitigate and avoid grout intrusions into TD-22 and TD-24.
7. The maximum grout holding pressure should not exceed 1 psi per foot depth below the downstream face of the embankment at the point of placement.
8. The maximum volume of grout injected per joint or crack should not exceed 60 gallons (8 cubic feet) without approval of the Engineer.
9. For joints at which the maximum grout volume is reached, attempt to re-inject chemical grout again after 4 hours.
10. Document total grout take per joint/crack. Based on grout takes, the Engineer will identify locations for cementitious grouting.
11. All chemical grouting should be performed in the presence of the Engineer.
12. Perform a post-grouting inspection of TD-22, -23, and -24 to document conditions of pipe interiors.
13. Using appropriate utility locating equipment, locate and mark the locations of TD-22, -23, and -24 on the downstream face of the embankment. Appropriate equipment may include, but is not limited to, tracer wire and line locator or sonde and receiver.
    a. If locating the toe drains at the upstream end is problematic, due to field conditions, a multi-frequency sonde (such as those used for horizontal directional drilling) may be appropriate.

B. Qualifications

1. Contractor placing chemical grout should have at least 5 years' experience using acrylamide grout in small-diameter pipe joints.

C. Material Specifications

1. The chemical grout should be an acrylamide AV-100 grout, catalyst, accelerator, and tracer dye as manufactured by Avanti International (or equivalent).
2. Materials should be handled, mixed, and injected in accordance with the manufacturer's recommendations and requirements.

D. Contractor Submittals

1. Details of the Contractor's chemical grouting experience for review and approval by the Engineer.
2. Documentation that the personnel handling the chemical grout have completed the manufacturer-required training. Contractor to provide training for inspection staff monitoring the grout injection.
3. Details of the grouting equipment to be used for review and approval by the Engineer.
4. A grouting plan for review and approval of the Engineer.
5. Proposed cure time for the chemical grout for review and approval of the Engineer. This may be adjusted in the field, with the approval of the Engineer, based on observation of chemical grouting operations.

II. PEA GRAVEL PLACEMENT WITHIN TD-23

It is the intent of this procedure to fill TD-23 with pneumatically placed pea gravel.

A. Procedure

1. Stage pea gravel and equipment to avoid delays or interruptions to the pea gravel placement operation.
2. Verify that the locations of TD-22, -23, and -24 have been clearly marked on the downstream face of the embankment prior to pea gravel placement.
3. Insert placement pipe or hose into the toe drain to within 12 inches of the upstream end of the pipe. The placement pipe or hose should be sized to fit within the toe drain and avoid development of blockages during pea gravel placement.
4. Place the pea gravel using pneumatic methods and gradually withdraw pipe or hose as aggregate is placed.
5. Place 0.03 cubic feet of pea gravel per lineal foot of toe drain until the toe drain is filled in its entirety.
6. Determine invert elevation of TD-22, -23, and -24, then replace the existing end fixtures to the toe drain outlets (per Figure No. 2 in Attachment 1).

B. Qualifications

1. Contractor should have experience performing similar pneumatic placement of aggregate.

C. Material Specifications

1. Pea gravel should be rounded, natural aggregate meeting the gradation criteria of MDOT 34R open-graded aggregate.

D. Contractor Submittals

1. Details of Contractor's pea stone placement experience for review and approval by the Engineer.
2. Detailed procedure for pea stone placement, pressure, and equipment for review and approval by the Engineer.
3. Results of grain size analysis of the pea gravel to be used, demonstrating it meets the specified gradation criteria for review and approval by the Engineer.
4. At the Engineer's request, submit for testing a sample of the pea gravel to be used.
5. Surveyed invert elevations for the outlets of TD-22, -23, and -24 subsequent to replacement of the end fixtures to these toe drains.

III. CEMENTITIOUS GROUTING

It is the intent of this procedure to fill voids adjacent to TD-23 with cementitious grout.

A. Procedure

1. Layout primary and secondary grout hole locations centered on joints with high chemical grout take (see Figure No. 3 in Attachment 1).
2. Locate joints by field measurement from outlet of TD-23.
3. Estimate invert elevation of TD-23 adjacent to each grout hole, based on surveyed invert elevation at toe drain outlet and distance from outlet to grout hole. Add 0.1 feet per 5 feet from outlet to surveyed outlet elevation. Engineer and Contractor to compute required depth of grout hole and approximate ground surface elevation at grout hole location.
4. Install primary and secondary grout holes per Figure No. 4 in Attachment 1.
5. Cementitious grout should be injected into each hole should in a bottom-to-top manner. Individual sets of grout ports should be isolated with a double packer system.
6. Once a set of ports is grouted, remove the packer assembly and flush the grout pipe to remove any grout that has accumulated in the grout pipe.
7. Reinstall the grout pipe and packers on the next set of grout ports and inject cementitious grout.
8. Repeat until specified height is reached.
9. Maximum grout pressure should not exceed 1 psi per foot of depth below ground surface at the grout hole location.
10. No more than 15 cubic feet of grout should be injected into any set (isolated row) of grout ports.
11. Stop grouting if grout pressure limit or grout quantity limit is reached.
12. Start grout injection at the ring of grout ports 15 inches above the bottom of the grout pipe. Once the initial set of grout ports has reached the established cut-off (grout pressure or volume), raise packer assembly up 5 feet and repeat. The Engineer may direct the Contractor to grout additional grout ports, based on field conditions and grout take. Once a grout hole has been completed move grouting operations to the next grout hole in sequence (see Figure No. 3 in Attachment 1).
13. During grouting operations, monitor TD-22 and TD-24 with CCTV equipment at least once per day. Stop grouting operations if cementitious grout is encountered in TD-22 or TD-24. If directed by the Engineer, continuously monitor TD-22 and/or TD-24 with CCTV equipment.
14. All cementitious grouting should be performed in the presence of the Engineer.
15. The Engineer may direct the Contractor to install and grout tertiary grout holes, depending on observed grout takes.
16. Revise the grout mix in the field according to site-specific conditions, grout takes, and with the approval of the Engineer.
17. Pressure gauges used to monitor grout pressures during grout placement should have a pressure range such that the maximum specified grout pressure falls in the middle third of the pressure gauge's range.
18. Contractor should maintain a minimum of one calibrated, and fully equipped, pressure gauge as an operable spare at all times. The spare gauge, if of new manufacture, calibrated by the factory, or recently calibrated by an independent agency, may be used as a standard for routine verification of the accuracy of the in-service gauge. Verify the accuracy of the in-service gauge at least once per 100 hours of operation.
19. Contractor should provide a grout mixer with a pump and circulating line capable of effectively mixing, stirring, and pumping grout continuously at a capacity not less than 60 cubic feet per hour.

B. Qualifications

1. Contractor placing cementitious grout must have a minimum of 5 years' experience, including work on 2H:1V slopes.

C. Material Specifications

1. Pea Gravel
   A. Should meet the gradation requirements of MDOT 34R open-graded aggregate.
2. Manchette Tube
   A. The manchette tubes should be PVC or metal pipe manufactured by Strata-Tech, Inc. (or equivalent). Flexible rubber sleeves should cover the grout ports, allowing the grout to flow out of the tube and restricting grout backflow into the tube.
3. 2NS Sand
   A. 2NS sand should meet the requirements of MDOT 2NS fine aggregate.
4. Cementitious Grout
   A. Cementitious grout should be a cement-bentonite grout.
   B. Cement should meet the requirements of ASTM C150 Type I/II and should be furnished in 94-lb, moisture-resistant bags.
   C. The bentonite should be a commercially processed, powdered montmorillonite clay meeting the requirements of American Petroleum Institute API) specification 13A.
   D. Concentration of bentonite should not exceed 5 percent (by weight) of the cement.
   E. Bentonite should be hydrated for a minimum off 12 hours prior to introduction or mixed with a rapid mixer.
   F. Grout fluidizers, accelerators, or admixtures should not be used without the written approval of the Engineer.
   G. The cementitious grout should be tested with a Marsh cone. The flow time for one quart should be greater than 40 seconds.
   H. Perform a bleed test per ASTM C940, utilizing a 250 ml graduated cylinder. Fill the cylinder with grout to the 200 ml mark. Let the cylinder sit undisturbed for one hour before measuring the amount of bleed.
   I. The following table presents a sample mix design:

Component	Ratio	Weight (lbs)
Cement	1	94
Water	1.09	102.83
Bentonite	3.00 %	2.820
Welan Gum	0.10 %	0.094
Rheobuild 1000	1.59 %	1.50

D. Contractor Submittals

1. Details of Contractor's cementitious grouting experience for review and approval by the Engineer.
2. A detailed grouting plan for review and approval by the Engineer. It should contain, at a minimum:
   a. Materials equipment list, including the grout mixer capacity, demonstrating that the grout mixer has adequate capacity to provide required grout without interrupting grout operations.
   b. Grout mix design details.
3. A summary of injection pressures and grout quantities installed at each set of grout ports.

ATTACHMENT W

Construction Dam Safety Surveillance & Monitoring Plan

To Be Provided Upon Approval By FERC

ATTACHMENT X

Quality Control Inspection Program (QCIP)

To Be Provided Upon Approval By FERC